THESIS

AN INVESTIGATION INTO THE STARTING SALARIES OF MALE AND FEMALE VETERINARIANS

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ABSTRACT

AN INVESTIGATION INTO THE STARTING SALARIES OF MALE AND FEMALE VETERINARIANS

Historically, the United States veterinary industry has been a male-dominated field, but in recent years women have surpassed men in veterinary school enrollment and now make up 60% of practicing veterinarians. There is evidence of a persistent gap between the starting salaries of male and female veterinary school graduates. This research investigates the effect of factors previously used to explain this gap and explores other factors that could further explain the unexplained residual gap heretofore attributed to wage discrimination.

Most studies of wage gap attribute any unexplained residual from their statistical models as being the result of gender discrimination. However, most have not quantified or analyzed the effect of inherent differences between males and females, which could explain more of the unexplained portion instead of simple attribution toward systematic gender bias. Analysis of survey data of graduating veterinary medicine students reveals that the wage differential between the aggregate means of men and women is largely explained by employment self-selection, driven by what sectors the male and female graduates are choosing as their beginning employment within the veterinary field. However, much is still left unexplained. This study quantifies fundamental differences in the effect of male and female attributes through the regression techniques including ordinary lease squares and matching methods to analyze factors that explain the wage gap. The three-step methodology starts from an examination of the wage gap at the mean through the least squares models and then refines the resolution of analysis to identify that the wage gap is actually larger than originally estimated when comparing individuals with the same demographic factors through nearest neighbor matching. From this analysis, the fundamental differences between starting male and female veterinarians provide insight as to why the wage gap exists.

DEDICATION

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TABLE OF CONTENTS

Abstract……ii

Dedication……iii

List of Tables……v

List of Figures……vi

Chapter I: Introduction……1

I.1 Gender……1

I.2 Historical Background……3

I.3 The Origins of the Feminization of the Veterinary Profession……5

I.4 Addressing the Wage Gap……6

Chapter II: Literature Review……10

II.1 The Graduating Population: A closer Look……10

II.2 Traits Associated with Gender……12

II.3 Career Choices……16

II.4 A Perspective from Sociology……19

II.5 Lessons Learned from Australian Veterinarians……21

II.6 Discrimination……26

II.7 Business Acumen……28

II.8 Practice Ownership……30

II.8.1 Pricing……32

II.9 Location……33

II.10 Women and negotiation……35

II.11 Children and Flexibility……36

II.12 Human Capital Theory……38

II.13 Productivity in the Workplace……41

Chapter III: Theoretical Model……44

III.1 Brief Introduction of Methods for Analyzing the Wage Gap……44

III.2 The OLS Model……45

III.2.1 OLS with Female Interaction Terms……46

III.3 Nearest Neighbor Matching Method…….....47
Chapter IV: Data……..50
IV.1 Summary Statistics…….....50
IV.2 Defining Variables…….53
Chapter V: Results……...60
V.1 OLS Regression Results……...60
V.2 OLS Female Interaction Term Regression Results…….....67
V.3 Nearest Neighbor Matching Results……75
Conclusion and Discussion……....……..…86
VI.1 Discussion of Results……..86
VI.2 Career Path Survey…….....90
VI.3 The Future of the Industry…….....92
References..……..……94
Appendix...……..…98

LIST OF TABLES

Table 4.1: Employment Sector Statistics from AVMA Senior Survey (2001-2016)…….…....51

Table 4.2: Workhours Statistics from AVMA Senior Survey (2001-2016)…….……...…52

Table 4.3: Work Region Statistics from AVMA Senior Survey (2001-2016)…..……...…53

Table 4.4: Model Variables……..54

Table 5.1: Senior Survey OLS Regression Results……...…61

Table 5.2: Senior Survey OLS Female Interaction Term Regression Results…….68

Table 5.3: F-test of Statistically Significant Interaction Coefficients at the 1%, 5%, and 10% levels...…73

Table 5.4: NNmatch Employment Sector Results, 2001-2016……..……..75

Table 5.5: NNmatch by Veterinary Colleges – Food Animal Medicine…….78

Table 5.6: NNmatch by Veterinary Colleges – Mixed Animal Medicine……...…79

Table 5.7: NNmatch by Veterinary Colleges – Equine Medicine……...80

Table 5.8: NNmatch by Veterinary Colleges – Companion Animal Medicine……...81

Table 5.9: NNmatch by Veterinary Colleges – Government……...82

Table 5.10: NNmatch by Veterinary Colleges – Industry/University…….....83

Table 5.11: NNmatch by Veterinary Colleges – Continuing Education……...…84

Table 5.12: NNmatch by Veterinary Colleges – Internship/ Residency…….....85

Table 5.13: Comparison of Three-Step Method Wage Gap Estimates……..……..86

LIST OF FIGURES

FIGURE A.1: United States Zip code Regions Map ……..…….98

CHAPTER I: INTRODUCTION

The United States veterinary industry has become feminized in recent years, with females making up approximately 60% of the population of current practicing veterinarians. Historically, veterinary medicine was dominated by men and, as of 1970, women represented only 8% of practicing veterinarians. Between 1980 and 1990 the number of practicing female veterinarians dramatically increased by 288%(Irvine and Vermilya, 2010). This trend of increased feminization in a historically male-dominated field is expected to continue as current enrollment in veterinary medical colleges has shifted to an 80% female population. Despite this dramatic gender shift, a large wage gap has developed with approximately a $2,400 difference between graduating male and females veterinarians annual starting salaries (Bain et al. 2015). Why this wage gap is sustained is largely unexplained. The sections below detail the history of the veterinary profession and highlight the current issues in the gender salary differential. Section 1.1 briefly examines gender identities. Section 1.2 provides the historical background of the veterinary profession. Section 1.3 examines the origins of the gender shift from a male-dominated to female-dominated veterinary profession. Section 1.4 addresses the wage gap in the veterinary field and describes the objective of this manuscript.

1.1 *Gender*

Social differentiation is defined by the social processes that categorizes people by similar social characteristics (Reskin and Bielby, 2005). One such form of social differentiation is defining groups of people by master statuses, such as age, which often correlate to the responsibilities in society based on that status (Reskin and Bielby, 2005). By dividing society into gender groups, characteristics of individuals within each gender are often overlooked. People are defined by more than their gender status, and by delving further into the compositional makeup of the master status of gender, the wage gap can be further examined.

The wage gap could potentially form as the result of characteristic associations within gender and not simply gender itself. Societies often highlight the differences between genders through societal norms and behavioral rules for roles of each gender. This differentiation does not automatically result in unequal treatment across genders (Reskin and Bielby, 2005). However, it does reinforce the notion that people are divided in society by their characteristics. As a result, these differences can serve as a precursor to systematic inequality because of underlying characteristics that result in people being placed into certain groups because of their master status (Reskin and Bielby, 2005).

In this thesis, the differences between gender are further examined as well as the traits associated with gender, which could contribute to further explaining the correlation between differences in gender and the wage gap. Economists have often attributed association between sex differences and career outcomes. Preferences for one sex over another is possible because of the existence of social stratification by gender status, as depicted by the discriminatory practices against females entering in the veterinary profession before the passage of Title XI in the 1970s (Reskin and Bielby, 2005). Preferences for one sex over the other stem from beliefs that people in a particular gender group are less productive or competent based on preconceived notions than span from societal norms.

Because gender is a form of social differentiation, segregation by sex can be seen as a potential mechanism which causes differences between the careers of males and females. Even though there is less emphasis on gender roles and sexual division of labor in the twenty-first century, the differences between males and females and their roles have been ingrained for thousands of years.

Advances have been made in valuing women in the labor force and providing women with benefits to suit their needs in the job market. Some examples include the Family Medical Leave Act of 1993, which highlighted that male and female workers are responsible for raising a family and attending to sick family members (Reskin and Bielby). In addition, the Welfare Reform Bill of 1996 confronted gender roles by challenging the notion that a mother's place was at home and instead of participating in the workforce (Reskin and Bielby, 2005). Progress is slow and change takes time. Challenging the ways of old in which segregation by gender was more prevalent has become the new norm for modern society.

Today, subtle unspoken bias continues to prevail and sexual division of labor still remains in certain occupations, such as teachers or nurses, which are positions which are often seen as being "women's' work".

1.2 *Historical Background*

Veterinary medicine was historically a male vocation, which focused on animal husbandry for livestock animals, especially horses that were at the time necessary for travel and labor. Animal doctors originally evolved from failed blacksmiths who were in charge of equine wellness (Irvine and Vermilya, 2010). In 1852, the first veterinary school in the US was established which was the Veterinary College of Philadelphia that remained in operation until 1866 (Vermilya, 2015). The first US accredited veterinary school, which is still currently in operation, is the school of Veterinary Medicine at the University of Pennsylvania in 1883. Despite the profession finding its origins in the 1800s, it was not until the 1900s that companion animals, such as household pets became one of the primary focuses of the profession (Vermilya, 2015). The early stages of the profession consisted of animal husbandry and performing operations such as castration and surgery, tasks which were at the time seen as unsuitable for females. Treatments of the time were also often seen as very brutal and somewhat inhumane by today's standards due to lack of anesthesia, resulting in requirement of substantial physical strength (Vermilya, 2015).

Women faced many invisible barriers based on stereotypes, which barred them from entry into the profession. Women were not only discriminated against with admissions limits, but they were also widely seen as incompetent and lacking the capacity to study the science of the profession. Before the 1970s some veterinary schools barred females from applying while others would only allow females to be enrolled after all qualified male candidates were accepted (Vermilya, 2015). It was not until the mid-70s when the tide finally changed and females were allowed to apply without facing discrimination and admission barriers. The shift in the profession from male-dominated to female-dominated occurred relatively recently in the span of the history of the profession and, thus, bias against females is likely to

still permeate the profession, especially amongst the older generation practicing in traditional food and large animal medicine (Vermilya, 2015)

During the 1950s only 139 women graduated from accredited veterinary colleges (Slater and Slater, 2000). Though the first US veterinary college was established nearly 60 years prior, it was not until 1910 that the first female veterinarian graduated from Cornell University which is now a top ranked veterinary school (Slater and Slater, 2000). According to the Department of Health, Education, and Welfare, in 1970 only 7.8% of the graduating veterinary population was comprised of females. From 1968 to 1969, females made up 8% of the proportion of students in veterinary school (Heinke and Sabo, 2009). It was not until 1987, that the gender distribution shifted and began to favor females, with females making up 53% of the proportion of all veterinary college students.

Between 1970 and 2000, the number of women attending higher education increased drastically after the passage of the Equal Education Opportunity Act of 1974 (Heinke and Sabo, 2009). This act prohibited veterinary colleges from the historical practice of excluding women or using annual enrollment caps. For example, before the 1972 Title IX education amendment, which prohibited sex discrimination by federally funded education programs, the veterinary college at Cornell University had an annual enrollment limit of two women (Sandler, 2007). Texas A&M veterinary college was the last veterinary program to exclude women, and it was not until the Texas state legislature was forced to intervene that women were no longer barred from entering the program (JAVMA,1963). Another essential piece of legislation was the Higher Education Act of 1973 which helped women enter the profession and slowly change the dogma that women were not only intellectually ill equipped to practice medicine, but also lacked the necessary strength to be a competent veterinarian. This legislation amended the Civil Rights Act of 1964 to include women and prevented discrimination based on gender in federally funded educational programs (Lincoln, 2010).

1.3 The Origins of the feminization of the Veterinary Profession

According to a 2008 American Veterinary Medical Association report, females make a third less than their male counterparts (AVMA, 2008). The gap starts at approximately 6% upon graduation but then continues to increase overtime as variability of experience and human capital differences begin to arise (Heinke and Sabo, 2009). Since AVMA was founded in 1863, only two women have held the office as president of a veterinary college, and females served as deans in only four of the 28 schools as of 2007 (Irvine and Vermilya, 2010). Despite the profession's compositional makeup being disproportionally female, women are still underrepresented in administration and leadership positions.

Growing female presence in an occupation is either the result of increased females entering or increased males abandoning the profession (Lincoln, 2004). Veterinary medicine was 89% male in 1960, but has now shifted to a female-dominated profession. In a 2014 report, females were reported to comprise 76.8% of the population in veterinary medical schools (Irvine and Vermilya, 2010). The majority of female veterinarians today work in small animal private practice, whereas men are more likely to practice in large animal medicine than women.

Plausible explanations for why an increased number of females enter the profession include a flexible work schedule in particular veterinary sectors, such as companion animal medicine, and reduced discrimination in admissions to vet school (Vermilya, 2015). In the 1970s the occupational opportunities for women in the profession expanded. The veterinary market changed from a focus on animal husbandry to a focus on the household pet. As emphasis on the human-animal bond grew and pets became more valued in society the need for veterinarians with a nurturing side resulted in an inflow of females in the profession who filled these openings. Further, the development of tranquilizers allowed for easier restraint of animals, making the old social thinking that women were unsuitable to practice veterinary medicine due to deficiencies in size and strength obsolete (Vermilya, 2015).

With the prohibition of discrimination in veterinary medical colleges after the passage of Title XI and the 1966 passage of the Veterinary Medical Act, granting money for new veterinary college

facilities, class sizes had the opportunity to increase as more veterinary colleges were created (Lincoln, 2004). Though the size of the veterinary profession tripled between 1960 and 1988, fewer men enrolled in veterinary programs each year and slowly began to turn away from the profession (Lincoln, 2004). It is hypothesized that this could have been the result of slow growth in salaries, the large amount of school debt, and increased number of females entering the profession (Reskin 2003). However, many of these hypothesized explanations are difficult to examine from an empirical standpoint. Between 1976-1990, the number of male applicants dropped significantly, with the bulk of this decline occurring in the 1980s. At the same time, professional health training programs in medicine, pharmacy, and dentistry also declined in the number of males attending (Lincoln, 2004). However, the shift in gender composition and the overall feminization of the profession is largely from the increase in female practitioners as opposed to the abandonment of the profession by males.

In the mid-1970s, there were predictions that the size of the veterinary profession would double in the next few decades, but the feminization of the industry was something that was not anticipated. The Women's Movement was a large contributing factor to this shift because it allowed for a change in the political climate of the time which resulted in steps towards equality for women in the workforce. Such steps included congress enacting a series of laws and agencies that attempted to remove barriers faced by females in society and expand their educational opportunities (Slater and Slater, 2000). Today a large number of practicing veterinarians, especially the group of more experienced veterinarians with some of the highest salaries and longest tenure in the field, are still male (Slater and Slater, 2000). This is due to the delayed entry of women into the profession. Because women make up the larger proportion of inexperienced practicing veterinarians, they still face an overall disadvantage in terms of earning potential and experience within the power structure of the profession.

1.4 ***Addressing the Wage Gap***

The gender wage gap is a widely disputed topic in labor economics because it is an imperfect measure. Earnings often depict how individuals are valued socially and economically (Goldin, 2014).

Thus, there is a division between the value of male and female work across society. Wage is a measure of an individual's training, education, experience, and expected future gains in experience and participation within an occupation (Goldin, 2014). The wage gap is a method to summarize the differences in the treatment of genders within occupations, productivity differences, and human capital differences (Goldin, 2014). Unfortunately, it is difficult to capture the scope and complexity of workplace gender inequality.

The wage gap is comprised of explained factors such as differences in education, experience, training, and hours worked as well as other underlying factors that are currently unexplained. The majority of the gender wage gap studies have produced estimates of an "explained" and a "residual" portion of the wage gap. The "residual" is often termed "wage discrimination", since it is the difference in earnings between males and females with identical controlled factors (Goldin, 2014). This unexplained portion of the wage gap has diminished over time as the difference in human capital investment of hiring a man versus a woman has decreased in recent years, due to increased opportunities for females in the job market (Goldin, 2014). Some probable justifications of the unexplained component of the gap include discrimination between genders in the workplace, differences between how genders compete in the workplace, female's lower confidence in negotiating salaries when compared to male equivalents, and differences in promotional opportunities, which result in an increase in the pay gap over time (Goldin, 2014).

Current research lacks methods to test for the magnitude of potential bias or discrimination against women in varying professions. According to Goldin (2014), women without children tend to have higher earnings than women who do and often have earnings comparable to that of males. Another issue that arises is how the workplace rewards those who have different levels of workplace flexibility, not just the particular number of hours worked, but also temporal flexibility. Temporal flexibility is when individuals are needed in the workplace at particular times in order to see clients, having meeting with employees, and being able to meet the other demands of the occupation (Goldin, 2014).

Much speculation has arisen about the impact of the feminization of the veterinary industry and the impact such feminization will have on the profession appears throughout the veterinary literature. Some speculate that the feminization will lead to the loss of prestige of the industry and declining veterinary incomes (Slater and Slater, 2000). However, the majority of this speculation could stem from fears about the feminization of the profession can come from the bias rooted in its male origins. Over time, these perceived beliefs should become obsolete in the same way that women are no longer deemed unsuitable to study veterinary medicine. There is also speculation and worry that females will establish more companion animal practices which will be primarily centered on small animals and less large animal practices will be created. The decreased participation of recent veterinary graduates, particularly females, in food and large animal practice is a concern, and could result in a scarcity of food and rural veterinarians overtime (Slater and Slater, 2000).

Another concern is that because men are more likely to go into practice ownership than females, overall practice ownership will decline. It is suggested that women in general measure their overall satisfaction with their veterinary career less by salary and more by other subjective criteria such as relationships with colleagues and clients (Felsted and Volk, 2000). Thus, it could be hypothesized that women in general measure their quality of life less by their earnings and more by other factors. More and more females seem to be entering the field while at the same time less and less men seem to show interest in the veterinary profession. Current issues in the field have called for a need to increase the business savviness of all veterinarians, continuing to improve practice ownership, and encourage more entry into food animal practice (Lofstedt, 2003).

This document includes analysis of the wage gap with a population of graduating veterinary students. The objective of this thesis is to examine factors that affect starting salary amongst veterinarians, and assess why male veterinarians have been shown to receive higher salaries upon graduation in comparison to their female counterparts. The case of starting salary for DVM graduates presents a unique opportunity. Unlike other wage inequity studies, which assess gender disparities over

the course of the lifetime of males and females in a wide variety of occupations, this research focuses on starting salaries of recent graduates in the same occupational field. Previous studies exploring the determinants of male and female salaries found that the gender wage gap tends to increase as age increases. This increasing gap is largely due to the disproportionate levels of labor market experience amongst older men and women, partly attributed to career disruptions caused by raising a family (Cron et al., 2000). Since young graduates have similar human capital value, and in this case are in the same occupation with comparable DVM schooling, an analysis of the starting salaries of recent male and female graduates allows for the estimation of the gap without concern for differences in work experience between men and women. The conclusion that women make less due to a desire for less hours to raise children is also negligible in this sample considering the vast majority of the starting veterinary population within the dataset are young, single, and lack children.

Upon completion of veterinary school, it is expected that graduates without any fundamental differences, gender aside, would have the same starting salary. However, this has not been the case. Thus, it would suggest either a systematic bias in hiring still exists despite the feminization of the field, or there are underlying factors that contribute to inherent dissimilarities between genders, and if this is the case, the salary gap acts as a measure to capture the disproportionate values placed on these differences in the workplace. The literature and analysis outlined subsequently in this manuscript focus on factors as to why males seem to be receiving higher incomes upon graduation.

CHAPTER II: LITERATURE REVIEW

This section includes a detailed literature review in which potential hypotheses and theories pertaining to the nature of the wage gap are thoroughly examined. Section 2.1 examines why focusing on the graduating population adds a unique perspective to an assessment of the wage gap. Section 2.2 examines traits, which are stereotypically associated with gender and perceptions of these traits in the workplace. Section 2.3 looks at differences in male and female veterinarian's sector choices in the veterinary field. Section 2.4 observes gender from a sociological perspective. Section 2.5 scrutinizes a twenty-year longitudinal veterinary study in Australia and details how the differences in gender and attitudes and aptitudes changed over the course of the participants' veterinary career. Section 2.6 characterizes different types of discrimination in the workplace and subtle ways discrimination is still prevalent in the modern society. Section 2.7 assesses the correlation between greater business orientation and higher veterinary salaries. In section 2.8, differences in practice ownership and pricing between male and female veterinarians are highlighted. Section 2.9 addresses how differences in location results in differences in employment opportunities and annual earnings. How men and women differ in their negotiation skills is further examined in section 2.10. The impact children have on a female's career is highlighted in section 2.11. Section 2.12 observes the human capital theory and how individuals invest in their careers. Lastly, section 2.13 speculates the impact of potential productivity differences between males and females.

2.1 *The Graduating Population: A Closer Look*

The American Association of University Women Educational Foundation found that the gender pay gap in college graduates is not just an issue in the veterinary profession, but also varies across different professions and college majors as well. This study reports that across all of the occupations examined, females one year out of college earn on average approximately 80% as much as their male counterparts and this gap widens after graduation (Goldberg and Hill, 2007). In this study's analysis, even

when controlling for factors associated with pay such as hours, occupation, and children, women were observed to earn less than their male peers. Though the gap varies within different professions, it still persists to varying degrees in all professions examined. For example in the major of education, which is a female-dominated major, women on average earn 95% as much as their male colleagues. However, in mathematics, which is a male-dominated major, women earn 76% of what their male colleagues earn (Goldberg and Hill. 2007). The presence of a gap ultimately is not dictated by what occupation or major females choose because wage inequality is prevalent throughout the workforce.

Both discrimination and cultured gender norms are believed to play a role to some extent in the explained portion of the gap but measurements are difficult to capture (Corbett and Hill, 2012). Major is an important contributor among the driving factors which contribute to the gap when examining aggregate mean of the graduating population. For example, women are more likely to major in fields in the social sciences and education whereas men are more likely to pursue engineering and math. Comparing the earnings of college graduates is important because the similarities in lack of experience allow them to serve as a base reference for comparisons of earnings at a comparable starting point (Corbett and Hill, 2012).

Lower earnings have a negative effect on females after college and set women on a tract to earn less over the course of their lifetime. When females start their career at a wage disparity it will continue to grow as they move further into their career. According to statistics of employment of male and female graduates of US veterinary colleges in 2012, the mean starting salary of $52,255 for males and $43,673 for females. Full time salary was $69,405 for males and $63,844 for females. Educational debt was mean of $147,518 for males and $152,853 for females (Shepherd and Pikel, 2012). Thus, overall women are graduating from veterinary school with more debt and less returns to earnings.

The starting salaries for new veterinary graduates is the result of the balance between supply of new veterinarians entering the market and demand for these graduates. The mean starting salary often fluctuates from year to year with each graduating class depending on the shifts and variations in supply and demand of the market (Williams et al., 2016). However, despite these exogenous market factors

affecting salary, women continue to have lower starting salaries on average than their male counterparts. Thus, as the proportion of females entering the profession continues to increase, the mean starting salary of the profession could decrease overall.

The disparity between male and female veterinarians can be seen as early as graduation since male graduates often receive more offers for employment, with larger benefit packets and salaries. This is the case within every sector of the veterinary profession, even in small animal practice, which has the largest compositional make up of females in comparison to large animal, food animal, and equine sectors (Slater and Slater, 2000). Though these wage differences are relatively small upon graduation the wage disparity continues to progress in the years following graduation.

In a 2001 study on newly graduated veterinarians, respondents ranked people skills, including communication and ability to interact positively with clients, higher than analytic skills when it came to being a successful veterinarian. Employers often desire veterinarians with good people skills because clients rate the veterinarian's communication skills and emotional connectivity as the most important component of their experience. Client satisfaction comes from not just how their animal is treatment but also the treatment of the individual client. The competence of veterinary students in professional and technical skills, how to better handle clients, and caring for animals has increased throughout their years of schooling (Tinga et al, 2001). Women in this study were shown to be equally competent in professional skills but placed more value on these skills than their male counterparts. The value of having professional skills is essential to both males and females for their viability in the modern veterinary profession and such skills could increase likelihood of financial success upon graduation.

2.2 *Traits Associated with Gender*

Previous studies, such as Irvine and Vermilya (2010), have attempted to explain and isolate the variability between male and female veterinarians as a factor of traits associated with each sex. Their study concluded that although the veterinary field has undergone a rapid feminization in recent years, results suggest that because it was historically a male vocation, the profession remains gendered male.

Thus, qualities associated with stereotypical masculine traits hold more value, such as a flexible schedule, which comes from being free of family responsibilities. However, as noted in an earlier study by Vermilya (2006), as the modern veterinary field evolved and the pet became a valued family member in the average household, females were believed to become increasingly valued as veterinarians because of their more nurturing side. The effect has resulted an increase in the profession's care-giving role, which is generally characterized as a more feminine characteristic. Historically, attributes that were associated with males were rewarded whereas women with more feminine characteristics were seen as lacking professional competence (C. Smith, 2002).

Studies claim that genders have different roles when comparing views on animal care. They find that women tend to be more empathetic, which is seen as valuable in companion animal medicine due to that field's emphasis on honoring the importance of the human-animal bond. Female veterinary students seem to have more interest and emphasis on the human-animal bond when practicing veterinary medicine and the majority of graduating females choose to practice in the companion animal sector. The human-animal bond honors the new status of companion animals as being a member of the family in modern US society. This status has resulted in increased demand of small animal companion medicine practice to fit the needs of the consumer (Butler et al. 2002).

In a study of perceptions of fourth year veterinary students, female veterinarians placed more significance on the role of the human-animal bond in medicine and in their own lives, as well as allowing for the emotional care of clients who are experiencing tragedy with regards to their pet's health and need more compassion (Butler et al. 2002). Society deems female veterinarians in general as being more suited to being empathetic and addressing the needs of the clients. These perceptions are based on generalized cultural notions about females. Thus, in small animal medicine the stereotypical gender ideals of females as being nurturers would seem to give females an advantage in suitability for this particular veterinary role because it seems to shy away from the historically masculine traits associated with the profession.

The modern veterinary practice recognizes the importance of the human-animal bond, which called for the need of veterinarians who are dually responsible for the emotional well-being of the human

client as well as the medical care of the animal patient (Hoschild, 1983). An example of bond-centered practice put into play is being supportive of the grief of an owner coping with their animal's a serious injury or even euthanasian. According to Hoschild, the feminization of the field began to occur in order to meet the industry's evolving needs. This sort of practice grew from the need to meet the expanding number of companion animals in the American household because as of 2009, 62% of households in the US had a pet (1983).

Though strong interpersonal and caregiving skills are not taught while in school, females are thought to better embody these to their clients in comparison to their male counterparts. This extra "emotion" work provided to the client in helping them make end of life decisions for their pets is something that is not charged for and cost of treatment does not vary with this added support and counseling (Irvine and Vermilya, 2010). Companion animal medicine often has clients who must face costly decisions that are difficult and tumultuous due to the possibility of losing their companion animal that is seen as a member of the household. These interpersonal skills which are necessary to tend to the needs of the client are more important in a small animal setting and not seen as important in the large animal setting. Women who can relate to the emotional needs of the clients have better skills in terms of assessing and being able to communicate with the emotional needs of their clients

According to psychological reports, women report more often than men that they believe pets are intuitive animals and experience the feelings of their owners (Vitulli, 2006). In a 2004 study, women placed more value on gentle care in veterinary practice than their male counterparts. Females in this same study also showed higher empathy for the animals they were working with (Kogan et al., 2004). Large animal veterinary medicine seems to cater better to male veterinarians (Vermilya, 2015). It could be surmised that females feel as though there are barriers shaped by constraints in society, which result in them being subtly dissuaded and choosing to go into this heavily male populated veterinary sector. It should also be noted that if women are choosing a field in order to comply with the gentle caregiving stereotypical female gender role, large animal medicine is not normally conducive to this stereotype.

Stereotypes and bias aside, it is important to realize that though certain traits can be seen as categorically male or female, these traits are not limited by gender and vary across individuals. For example, some females have more feminine traits and some have more masculine traits. There exists a wide spectrum across gender and thus using gender itself to account for the wage gap might not be entirely accurate because gender trait variability is more important in this regard than gender itself.

However, despite change in the veterinary market, female veterinarians in the field continue to find the occupation still holds preference toward stereotypically male characteristics such as size and strength, less empathy towards clients when allowing for leniency and discounts in treatment fees, and being more overall financially savvy when determining pricing structures and clinics' business models (Irvine and Vermilya, 2010). Though the profession is female-dominated it is still masculinized in the sense that it historically stems from the origins of being a male-only profession. Women would need to distance themselves from the kinder gentler side of the profession, such as companion animal medicine if wanting to break through societal barriers and go into other sectors where the human-animal bond is not as prevalent, such as in large animal medicine

According to a 2000 study, the presence of certain characteristics in veterinarians seem to be correlated with income variations. These personal characteristics were tested for by asking veterinarians questions on self-esteem, cognitive orientation, fear of negative evaluation, personality type, and need for interpersonal control (Cron et al., 2000). Of these, high self-esteem and low fear of negative self-evaluation, which are based on placing less importance of how others perceive one's competency in the workplace, were found to be positively associated with higher incomes. These traits correspond to being more effective in the workplace due to veterinarians having overall more confidence in their abilities. Self-esteem increases with more gains in experience and of those tested, practice owner veterinarians displayed the highest levels of self-esteem whereas female associates had the lowest (Cron et al, 2000).

Though theories have assumed that women base moral decisions on compassion and care whereas males use justice and fairness, recent behavioral studies research show that males and females use these reasoning to some extent, and either grounds for making moral decisions varies from individual to

individual, gender aside (C. Smith, 2002). Instead of being grouped into categories based on gender stereotypes, it may be a better approach to assess attitudes and aptitudes of individuals within gender categories. However, men and women do tend to differ in their self-assessment. If compared at an equal level of performance men tend to inflate their knowledge, exaggerate achievements, and in some cases, be overly confident. In contrast, an equal performing woman in general will underestimate her abilities and have less confidence even if she possesses the same skills (C. Smith 2002). It may be these characteristics which lead to different levels of recognition and salary in the workplace.

2.3 *Career Choices*

In much of the same way other gender studies differentiate the wage gap amongst occupations, the veterinary industry is differentiated into subsectors, resulting in the wage gap at the aggregate mean to be largely a factor of the veterinary sectors males and females are choosing to enter. An example of how job selection is affected by gender is shown by the 2001 gender percent distribution of the DVM graduating class in the United States. In this population, those training for exclusively or predominately large animal accounted for of 4.4% of female and 13.4% of male graduates. Mixed animal practice accounted for 8.6% of females and 14.2% of males, small animal exclusive or predominant was 55.8% of females and 40.1% of males, equine was 3.3% female and 4.0% male, and 5-6% fell in the "other" category. Internships, residency, and advanced study was pursued by 23.7% and 22.4% of female and male graduates in 2001 (Prescott et al., 2002).

A disproportionate number of women gravitate to the sectors that have a lower earnings payoff over their careers, such as companion animal medicine in comparison to large animal medicine. Women also become practice owners at a much lower rate than men. As a result, the majority of females who follow this pattern will make significantly less than males who go into large animal practice and those who become practice owners (Vermilya, 2015). Women in general are statistically less likely than men to own their own practices, contributing to lower average salaries (Britton, 2000). Among veterinarians in private practice, women's incomes are roughly 75% of men's earnings (AVMA, 2008).

While it is true that men tend to dominate the higher paying fields of large animal, industry, and food animal practice, the reason for within sector wage variation among these fields is still to be determined. Understanding why women choose certain employment positions, or in this case certain sectors of the veterinary field and the reason for unequal distributions of males and females within the sectors is largely unclear. Whether females choose certain sectors out of strong preferences or feeling restricted by social norms is still largely speculative. Unless the motivations of males and females, as well as their preferences are more understood, these issues continues to remain a question. This could be determined by research on females' choices at young adulthood in order to assess how their perceptions of their future career options form. However, though this type of longitudinal experiment would be very informative in its data output, it would also be very costly and timely (Anderson et al., 2017).

The feminization of veterinary medicine has not penetrated all sectors of the industry equally. It has instead resulted in feminization of small animal medicine whereas large animal medicine is still a sector primarily dominated by males. The majority of small animal veterinarians are female and, because small animal medicine makes up the largest portion of the field, it can be easily mistaken that the entire profession is feminized. However as shown from 2013 AVMA data, 58.3% of women were exclusively companion animal as compared to the food animal exclusive population which has a makeup of 81.4% male practitioners (Vermilya, 2015).

Though men are a minority in small animal medicine, they receive larger earnings and are more likely to be practice owners. They also represent the numerical majority in large animal medicine and reap higher incomes in general when compared to the aggregate mean of their female counterparts. In general, women earn 80% of what males do one year after graduating and earn 69% after ten years (Bristol, 2011).

In a report by Vermilya (2015), female students revealed that large animal medicine has a "boys only club" mentality, which causes gender bias and influenced females' track decision choice in some aspect. Gendered ideologies amongst vet students are based on the sectors they felt they were a better fit for based on specialty knowledge required and roles that best suited their identities. Women still face

intimidation in penetrating barriers because being female it is not the typical identity of those who enter large animal medicine. Women in this line of work often have to prove themselves in order to gain respect and be accepted (Vermilya, 2015).

Though the veterinary profession is characterized by different sects or tracks, there is also variation based on alleged barriers among genders. These boundaries result in the gender composition of the different subsects. Gender or attributes within gender make choices pursing certain tracks seemingly more conducive to either males of females based on self-selection. This self-selection process is based on choices of where individuals think they will be the best fit due to the fact that organizations often have gendered expectations about workers attitudes, behaviors, and interactions (Vermilya, 2015).

According to a study by Serpell (2005), of students who said that experiences with animals had an effect on moral values in the profession, 84% said that pet ownership was the influential experience. Students who owned only dogs or cats had a strong bias to working in small animal practice. Dog and cat only owners were also less likely to show interest in equine or food animal medicine. Students who owned only food animals had a strong bias to food animal practice and were less inclined to want to enter small animal practice as well. Concerning the gender preferences of the study, the strongest gender bias was male bias towards food animal medicine while less gender biases existed other branches of the veterinary profession (Serpell, 2005).

The North American culture often views people who earn more money as more deserving. This way of thinking, emphasizes that society values men's work more than that of females because males make more (C. Smith, 2002). People who are paid more for the same work rationalize that their inputs are more valuable, and as a result, they deserve a higher salary. However, this is often not actually the case and is instead the result of partialities and discrimination (C. Smith, 2002). It is possible that women expect lower pay than their male equivalents in the workplace because historically that has been the case, and is what they have been taught to expect growing up. When salary transparency does not exist, an underpaid woman could be satisfied if she feels was getting paid what she deserves. Perceptions could

change if she learned there existed a wage discrepancy amongst her male colleagues who were paid more for the same type of work (C. Smith, 2002).

According to the Brakke study, work satisfaction was not often found to be directly correlated with higher incomes (Cron et al., 2000). The majority of female veterinarians studied were highly and moderately satisfied with their current career path and incomes at a lower level than men who were less satisfied. Satisfaction did not seem to be overtly driven by income. Whether the females surveyed were aware of what their male counterparts where making in comparison is unknown, and it is possible that awareness of the gap could create less satisfaction in those females surveyed. As the percentage of women in the profession increases, it will be the salaries of the female population that effectively determines the average salary of the profession. Thus, there is fear that the feminization of the industry will result in stagnated income growth, a loss of prestige for the industry, a depression in expected earnings of the overall salary (Cron et al. 2000).

2.4 ***A Perspective from Sociology***

Sociologists often assume that male and female concentration in different jobs, or in the case of the veterinary fields, different sectors, is the result of differences to their attachments in the labor force, work behavior, and aspirations of their careers (Reskin, 2005). When sociologists use gender segregation to examine a population, work attitudes and behaviors are thought to be linked to different signals males and females get regarding their future career options. Sociologists look at gender inequality in career options and outcomes as a result of individual choices and practices where workers are matched to particular occupations (Reskin, 2005). Until the early 1960s, federal policy with regards to gender segregation was to preserve it instead of minimizing it. Congress did not pass any equal rights legislation until the Equal Pay Act of 1963, which was a step towards equal treatment of both males and females in the workplace. Though this legislation resulted in males and females with the same job in the same firm to have equal pay, employers can still maneuver around this legislation by giving men and women different positions or titles in order to maintain discrepancies in pay (Reskin, 2005). Educational and

occupational differences between genders can help explain a portion of pay gap, but there exist variety of other factors not yet entirely understood.

As far as further potential explanations for the wage gap, it is difficult due to lack of data collected from the veterinary population. The veterinary and wage gap literature provides little information on whether personality and characteristic differences affect the way in which male and females perform at work, or if there are inherently different priorities within each gender which affect work outcomes. Studies are limited in looking at within gender differences beyond simply grouping males and females as different on the basis of sex. Behavioral research highlights how men and women form their attitudes and perceptions affects on how individuals behave in veterinary medicine and preconceived judgements based on gender roles is the result of within gender judgements as well as judgements from the opposite gender (C. Smith, 2002).

Women who make the same occupational choices as men are not likely to earn the same pay. In an analysis of data from the US Census in 2000, it was found that despite working in the same employment sector, females had lower pay rate than their male counterparts holding all explanatory factors equal. It was also found that the wage gap was larger in the private sector in comparison to the public sector (Miller, 2009). In the paradox of the content female worker, women who expect to earn less than their male counterparts are more satisfied with their earnings than men who wish to earn more. In studies women often report more happiness and satisfaction in their careers even when having lower salaries. Though not beneficial for progress, when women have lower wage expectations then those expectations for salary are more likely to be achieved. However, this attitude of lowering expectations and passively ignoring the wage disparity is not going to solve the gender wage gap.

There seems there is a discrepancy with what women believe what are worth and what they actually earn (Bristol, 2011). In a 2011 study where first year students were asked to predict salary expectations 5 years after graduation, males predicted they would earn approximately $9,000 dollars more. When asked for a 30 year salary prediction, men expected to earn approximately $41,000 more.

Males and females in this study had different expectations of what they could actually earn which influenced the salary individuals strived earn. Expectations for females were lower than that of males (Bristol, 2011). It is essential to negotiate for the highest possible starting salary because it is the base from which promotions and raises are determined. Because raises are calculated based on the starting salary, the earning potentials of males and females will differ greatly overtime. If women continue to underestimate their value this could be at a disservice to the veterinary medicine profession, which continues to slowly become more feminized with time (Bristol, 2011).

2.5 *Lessons Learned from Australian Veterinarians*

In an Australian longitudinal study, researchers examined the backgrounds and perceptions of veterinary students while in school and five, ten, and twenty years post-graduation (Heath et al.(a), 1996). When first year students were surveyed 50-64% wanted to enter into private practice upon graduation. There was found to be no relationship between chosen career path and type of animals the student cared for nor the location they lived growing up. This first year population was also surveyed a year after graduation to assess the stability of the chosen career plans. Of the population, 93% of the students gave the same response as they did in their first year. Most who were undecided or not interested in going into a practice during their first year chose work in a private practice (Heath et al.(a), 1996).

The Australian distribution is different than that of the United States because only 28% of students chose small animal medicine whereas 59% decided to go into mixed practice. In the US because over 50% of graduating veterinarians choose to go into companion animal medicine. Students who had very little or no experience with animals prior to veterinary school received job offers at the same rate as those who had experience prior. In general, the choice to study veterinary medicine was largely attributed to attitudes towards animals and many of these attitudes came from interactions and experiences with animals prior to veterinary school (Heath et al.(a), 1996).

Students in this study were also asked to assess the issues facing the veterinary profession. When surveyed, less than 20% of students placed veterinarians in the top three professions when ask to rank with nine other occupations such as being a doctor or a lawyer based on status. Characteristics ranked as most important to a successful veterinarian included ability to handle animals, ability to analyze problems that occur on the job, and ability to gain respect of the clients. It is interesting to note that the emphasis on the importance of interpersonal skills increased from first year to fifth year students. The combination of the different types of knowledge, skill, attitudes, and behaviors of veterinarians were all deemed as important and necessary for a successful career (Heath et al. (b), 1996).

The perceptions of veterinary education of two cohorts of veterinarians in their first year, their final year, and the second year after graduations were analyzed. First year students entered veterinary school with a stamina and a strong desire to learn more about animals. In the first year 38% did not place emphasis on the importance of communication skills with others or clients. However, the importance of these communication skills as well as problem solving skills grew with increased schooling and hands on experience (Heath et al (c). 1996). Though many students base their decision to enter veterinary school initially on the love of animals, students at the time of entering might not have the maturity, wisdom, nor experience to make an informed career choice. As a result, some students realized throughout veterinary schooling that their initial decision to become a vet based off wanting to care for animals was not strong enough, and resulted in some leaving school or not deciding to pursue an occupation in veterinary medicine upon graduation. Until the qualities that make a successful veterinarian are identified, it is difficult to determine which veterinary students will be successful in their career endeavors. The study results also showed that no strong relationship existed between academic ability and interpersonal skills, and thus there are a myriad of components required to being a successful vet other than simply being studious. Following graduation, the majority of students reported they did not feel they were well prepared to go out into the workforce as a veterinarian (Heath et al.(c), 1996).

As with the United States, Australia has also seen an increase of females within the veterinary population. Of those who graduated in 1991-1995, 51% were female. Of the females surveyed, the factors that were most important to females choosing to become veterinarians were love of animals, interest in scientific study of the disease, and the portrayal of veterinarians as they were growing up. The factors that were most important to the population of males surveyed were the desire to be their own boss, and the financial possibilities that came with acquiring a veterinary practice (Heath et al.(d), 1996). There were significant differences however in responses of expected income, and males estimated earning more than their female cohorts. When first year students were asked about their opinion of the status of the veterinary profession, males tended to rank it higher than females. When surveyed at the end of veterinary schooling, there were no significant differences between males and females in career plan. As far as type of work, there was a trend towards small animal practice for females and trend towards mixed animals for males, but differences were statistically insignificant (Heath et al.(d), 1996). However, if Australia mirrors the shift in the US veterinary field, then this trend will most likely become more prominent overtime. More females were also shown to find jobs in capital cities in comparison to males. In the first year of employment there was approximately a $2000 wage gap between average male and female salaries (Heath et al.(d), 1996).

When asked how important certain factors of a list of 26 characteristics necessary to be a successful veterinarian females as a whole placed more emphasis than males on getting enjoyment from the profession, prevention of animal cruelty, and ability to communicate with clients and coworkers. Over 89% of males and were in agreement that gender was not important in order to be a successful veterinarian. Males expressed more concern with the relationship of their bosses and towards the monetary benefits of the profession. Females seemed to be more focused on welfare of animal, curiosity about diseases, and the scientific aspects and the image of veterinarians. The difference in expected incomes between genders was 3.5%, but upon graduation the actual difference was 7.9% (Heath et al.(d), 1996).

Given that females placed veterinarians as being of a lower status when compared to other professionals, is could be an indication of females veterinarians having a lower evaluation of their worth and status. As the veterinary profession continues to feminize, it raises the question as to whether the prestige will diminish as a result. Any change in the overall status and prestige of the profession would come from changes in power and wellbeing of the overall profession and the individuals working within it (Heath at al.(d), 1996). The comparisons of genders within the longitudinal study highlight how there exists different perceptions and motivations amongst males and females. How these perceptions and motivations correlate to variations expected earnings remains fundamentally unknown.

Little information exists about the career paths chosen by veterinarians or the factors that influence why they chose their careers, which is why the longitudinal study was conducted. Upon graduation, 61% of the veterinarians surveyed found position in mixed practice, however five years after graduation only 39% remained in mixed practice. Of those who entered small practice, 66% were still in small practice five years later. Of veterinarians surveyed, 65% said they were working with their preferred species of animal five years post-graduation (Heath, 1998). The mean salary in private practice for females was $44,000 and males was $55,000.

When considering overall opinions on remuneration 94% of females and 75% of males said they thought theirs was low. As for reasons why some veterinarians changed sector following graduation, most cited lifestyle changes, family issues, negative work attributes as the top influencers (Heath, 1998). Approximately 70% of males and 67% of females said their career lived up to their expectations and around the same proportion indicated they were satisfied. Though 95% of respondents said they were glad they chose veterinary medicine only 43% of males and 58% of females agreed that if they had a second chance to decide on their career they would be a veterinarian. No gender effect was found when examining chosen career path and stress related to work- life balance (Heath, 1998)

Ten years after graduation two-thirds said that the career of being a veterinarian lived up to their expectations but two-thirds also said that their work caused them a considerable amount of stress, and

80% though their remuneration was low. Attitudes to hours worked were often associated with income for males and in general females appeared to be less concerned about income despite being paid less for similar hours. Overtime males placed more emphasis of career satisfaction based on hours worked and income earned than females (Heath, 2002). Though not content will all career aspects, the majority felt their career was satisfying.

After twenty years, of veterinarians initally surveyed, 49% were working full time, 29% part time, and 23% said they were no longer working as a veterinarian. The median income for veterinarians working in private practice was $75,000. However, the median of associates was $63,000 and $110,000 for owners. For those who shifted careers, the most common responses were poor remuneration, family priorities, and loss of interest in veterinary medicine. All those who had a salary over $140,000 agreed that their career lived up to their expectations, whereas half of those making between $40,000-$60,000 agreed. Only 57% agreed that they would become a vet if they could do it over again. Initially 10% moved off the veterinary path before graduating. Though 61% started in mixed practice, only 26% remained after five years (Heath, 2007).

Though there was much variability in where the starting group of veterinarians ended up in the study, aptitude and opportunities may have been the largest contributing factor to income variability. In the US, studies have shown that business skills and good practice management are more likely to attribute to financial success. Career satisfaction could be partly related to attitude and incomes about the chosen career. Low income was the main driving factor for negative responses to the survey because career expectations were not met (Heath, 2007). These studies show the differences in choices and attitudes of male and female veterinarians over the course of their career path and shed light on the inherent dissimilarities between the two groups when surveyed.

2.6 *Discrimination*

Discrimination is something that cannot be measured directly, and as a result, empirical methods for such measurements are lacking. However, discrimination resulting in certain societal views and constraints about gender can affect women's earnings in the workplace (Office, 2003). Though discrimination against women is illegal, the only way to discover the extent of discrimination that still exists in the workplace is to eliminate all other explanations of the pay gap, and conclude that discrimination makes up the residual component of the pay gap. The residual portion of the gap is assumed to be linked to systematic bias. Unless a dataset which is all-encompassing of hypotheses relating to sources for gender income disparity is tested, models could potentially show that systematic discrimination, which is represented by the residual portion, appears to explain more of the wage gap than it actually should. If men and women make the same choices with regards to their careers, empirical evidence shows that women and men will not receive the same pay. Even when factors such as hours and occupation are controlled for, the pay gap cannot be fully explained (Goldberg and Hill, 2007).

Historically it has been reasonable to assume that the pay gap is a result of gender discrimination to some extent. The United States work culture is marked by working long hours that are not particularly conducive to familial life and put women who do not have flexible schedules at a disadvantage in the workplace. Discrimination in the labor market can be attributed to a possibility as to why females make less than men in the labor market. Discrimination is hard to uncover because it could stem from a variety of difference sources such as the tastes of employers, customers, and other employees who may have imperfect information or deep-seated biases about the abilities of women in comparison to men (Anderson et al., 2007). Some view the wage gap in as being evidence of sex discrimination between wages in the sense that if the gap still persists after controlling for variables and productivity measurements, then discrimination must exist within the job market (Hellerstein et al., 1997). It cannot be denied that some employers do discriminate based on tastes.

Different types of discrimination exist within the workplace and potential discrimination that females can face comes in a variety of forms. Rational legal discrimination is argued to be a fair form of

discrimination. This type of discrimination is based on an individual's ability to perform his or her job and the individual's treatment and opportunities given in the workplace is based on the ability to do the job (Anderson et al., 2017). Though this definition does not necessarily align with the more common definition of discrimination, it is still a way in which individuals are given different treatment in the workplace. Another type of discrimination is determinist discrimination. With regards to women, it is based on the perceptions of females as a collective and their suitability for a job based solely on their gender (Anderson et al., 2017). In this type of discrimination an individual is not judged on individual characteristics, but instead is seen as belonging to a collective group and takes on that group's traits based on perceived notions and stereotypes (Anderson et al., 2017). Similarly particularistic discrimination looks at women as a whole, but from a moral standpoint of whether it is morally acceptable for women to be in certain occupations (Anderson et al., 2017).

Until the passage of title XI and steps towards allowing women equal opportunity to pursue veterinary education, particularistic discrimination was the primary form of discrimination that women faced. Up until that time in history, the veterinary profession was seen as not suitable for women. Thus, women who are faced with this type of discrimination work particular occupations where they are not accepted. This type of discrimination results in invisible barriers which result in females tending to flock toward more female-dominated occupations.

Patronage is another type of discrimination which is based on how acceptable an individual is for a role based on observations instead of collective group characteristics. It often results in workplace of favors for loyalty (Anderson et al., 2017). These relationships often occur within like genders and could result in segregation for women in the workplace if patronage exists between male employers and employees. Employers who have bias or prejudice could have a preference of one gender over another, in this case male candidates over females, which would put female employees at a disadvantage even if they had comparable worth and were equally as productive and valuable to firm as their male counterparts.

As a way to combat discrimination, supporters of comparable worth, which is a system of creating a mandate of equal work for equal pay, could potentially lessen discrimination in the workplace. This system of pay would be based on an unbiased job evaluation based on the responsibilities, skill, and effort of the employees (Levine, 2001). This could result in employers raising wages of females if they are undervalued and paid lower based on biases in their current positions. Rather than continuing to rely on supply and demand conditions in the labor market to determine wages, comparable worth advocates have proposed using a streamlined job evaluation to determine earnings. Employers would then adjust the wages of workers in all positions deemed to be underpaid on the basis of the evaluation. However, though a good idea in theory, many argue that eliminating wage differentials based on job evaluations instead of market conditions could lead to unemployment in the long run and other unforeseen consequences (Levine, 2001).

Women accumulating in particular occupations is the result of individual decisions as well as societal influences that take the form of invisible barriers affecting the decisions of an individual, including some underlying preconceived gender notions stemming from childhood. A persons' perception of how suitable they are for a occupation is comprised of the job's occupational makeup, peer pressure, societal norms, stereotypes, and their status in society (Smith, 2002). Women and men are different in expressing emotion and communication, have different opportunities in the workforce, statuses at work, and the amount of familial responsibilities at home (Smith, 2002). According to behavioral studies, because women bear children and have a duty to raise their children, people are often quick to make discriminatory and erroneous assumptions about their abilities and time commitments in the workplace. Discrimination today is more subtle than in the past, but assumptions about women based on personality differences stem from societal views, and places limitations on the different needs on women who try to balance career and family life.

2.7 *Business Acumen*

The Brakke study, which started in 1998 and was completed in 1999, concluded that females who indicated having a higher business orientation had overall higher mean incomes in comparison to females

who did not. Business orientation was defined in the study to characterize overall practice management and financial savviness (Cron et al., 2000). Overall, male and females received higher incomes if they had a good sense of business orientation, financial data review, negotiating skills, employee development, leadership, client loyalty and retention, and new client development. Factors that negatively affected veterinarians' incomes included lack of standard practices for management, poor service, low financial awareness of the owner and business related factors (Heinke and Sabo, 2009). The optimization of good business practices have the best impact on income. The questionnaire elicited measured personal characteristics as well as business practices characteristics and found that higher incomes in the veterinary field are usually associated with ownership, more experience, and hours worked. Veterinarians scoring higher in financial acumen and working in practices with better business standards and services had higher average incomes in comparison to those who did not (Cron et al., 2000).

In this study, it was shown that environmental factors such as size and socioeconomic level of the surrounding area of the clinic directly affect the incomes of veterinarians. Low fear of negative evaluation and high self-esteem were associated with higher incomes, which comes with more experience and confidence in the profession. Income and job satisfaction from the study were as expected, where female veterinarians were often found to be satisfied at lower salary levels that males did not find satisfying. Despite holding certain factors constant such as years in practice, employment, personal characteristics, the income variations between genders were still largely unexplained (Cron et al., 2000).

In a study following five tracks of veterinary medicine, it was found that the greatest return on the veterinary degree came from practicing as a full time specialist or through the practice owner career track. The most frequently pursued track is that of a general practitioner and working as a full time associate in private practice. In a 2005 dataset of AVMA board certified specialties, veterinary surgeons had the highest mean income of $183,092, whereas board-certified veterinary behaviorists had the lowest mean income of $90,892.5. Thus, the financial value of a specialist depends highly on the specialty that a veterinarian might choose to pursue (Gordon et al., 2010). Practice ownership is relatively lucrative. Practice owners can earn substantially more than a general practitioner, but largest financial gains come

from owners who purchase early in their veterinary careers. There are different payouts for the tracks chosen based on the track type, specialization, and practice ownership. Results suggest that specialty medicine and practice ownership may be the best tracks as far as minimizing the debt to earnings ratio. However, practice type, mean incomes of the field, lifestyle factors, and overall career interest play the most important role when choosing a career option (Gordon et al., 2010). Possible ways females could increase their earning potential in the profession is to include standardized pricing strategies, better business practices, or practicing in a more prestigious and affluent community.

In the AVMA-Pfzier business practice study the business practices that were predictors of higher income included negotiation skills, client loyalty, leadership, client retention, new-client development, employee development, business orientation, and development of employees (Volk et al., 2005). Financial success was also related to competencies such as good judgement, self-management, leadership, business orientation, and building relationships. Business orientation includes using practices and behaving in ways that are in line with the goals of the practice, and in the study women were found to score lower in business orientation than men. Women who scored higher in business orientation had greater salaries than women who did not. Results indicated that regardless of variation in practice type three essential factors were associated with good financial success: good business management, good employee management, and good client relations (Volk et al., 2005).

2.8 *Practice Ownership*

According to the AVMA-Pfizer study, men outnumber women by three to one in terms of practice ownership. Recent studies have also revealed that new millennia graduates are less likely to own practices and this is even more common amongst females (Heinke and Sabo, 2009).) In a 2007 AAEP survey, 80% of females surveyed decided not to pursue practice ownership due to the stress associated with owning a practice. When newly graduated veterinarians were asked, 86% of men and 71% of women were interested in owning a practice. The study also demonstrated that over time, the desire for practice ownership decreased, for both men and women, but more so for women. Only 38% of established female

veterinarians and 61% of established male veterinarians, expressed desire for practice ownership (Lofstedt, 2003).

Women are less likely to own practices and those who do tend to price their services lower than their male counterparts (Irvine and Vermilya, 2010). Though owning a practice can result in high life and financial satisfaction if the practice is profitable, it can also be stressful and time consuming and many veterinarians are not willing to make the sacrifices to their personal lives to pursue owning a practice (Heinke and Sabo, 2009). The desire for work/life balance is a driving cause for women and millennials not wishing to pursue practice ownership. Sacrificing higher income for more personal time, or vise versa, is the great conundrum of contemplating the pursuit of practice ownership. Women who choose not to pursue practice ownership decide that will not add more value to their lives because the time and personal life sacrifices are too great. People have different expectations for the quality of life they seek and success as a veterinarian, which goes beyond annual earnings. Though salary is often used as a base measuring stick for comparing males and females in the veterinary profession, veterinarians may choose the field and occupation they pursue due to other factors such as career satisfaction, lifestyle, and overall personal happiness. These factors are not necessarily correlated with a higher income but result in a more robust and fulfilling life. Factors that affect both economic and career satisfaction include attitude, experience, skill development, geographic region, patient base, business interest and acumen, and practice culture, amongst other attribute (Heinke and Sabo, 2009).

Practice owners with higher financial acumen earn more than those with lower financial skills. This was measured in the Brakke study by ability to understand and correctly define what revenue performance, profits before taxes, cash flow, rate of return on assets, and rate of return on equity were (Volk at al., 2005). Practice owners who answered three or more of these questions correctly had higher mean incomes and thus had a better sense of how to run a profitable practice in comparison to owners who had a lesser understanding of practice management (Volk at al., 2005).

The shortage of female practice ownership is largely due in part to the balance of work and family that involved responsibilities beyond the typical 9-5 shift (Hoschild and Machung, 2005). Women receiving lower salaries compared to male veterinarians in ownership is often attributed to weaker negotiating skills and undercharging of prices to clients. Though not applicable for all female veterinarians, women are often stereotyped to having limited opportunities due to career constraints. Though women are no longer barred from the profession, they seem to have limited ability to move within compared to their male counterparts (Irvine and Vermilya, 2010). This raises the question as to whether women are choosing career path based on optimization of skills and attributes within a constrained framework; the constraint being barriers placed on females based on gender. According to Britton (2000), it is essential to figure out the way in which certain occupations (i.e. practice ownership), are gendered in culture where having male or female characteristics is seen as less or more valuable, which benefits one group while hurting the other. Male and female practice owners exhibit large salary variations (Bristol, 2011). Some hypotheses as to why large gender salary differentials exist surmise that female owners may be reinvesting into their practices more, paying associates more, or practices could be making less income because of business management strategies or prices. (Britton, 2000).

2.8.1 ***Pricing***

Pricing of services is a factor that influences success and profitability of the practice as well as practice owner incomes. In an experimental study by (Cron et al., 2009), it was found that female owners are more likely to use compassionate pricing in comparison to their male counterparts. This study focused on pricing behavior differences between male and female professionals from a national sample of more than 500 practicing veterinarians owning and operating practices. The veterinarians were given a scenario in which a pet dog is diagnosed with advanced kidney failure and were told to choose three options of treatment and then price the three options chosen. It was found that gender influenced price setting through relationship orientation. Female veterinarians appear to have considered client characteristics when setting price and on average charged $270 for an elder widow versus charging a young professional

$376 for the identical treatment (Cron et al., 2009). Relationship orientation is a combination of client empathy and fear of negative evaluation in order to have positive connections to others. Empirical studies have shown that gender affects pricing and that women generally place more value on relationship orientation than men. While men are more likely to adjust prices with client characteristics, females are more likely to adjust based on sensitivity towards the client. Relationship orientation and fear of negative evaluation, as well as sensitivity to the cues of the negotiator has also been cited as a reason why females have a lower performance in negotiations. Veterinarians with a high relationship orientation will be more concerned with having a positive impact on the client in order to maintain trust and mutual liking (Cron et al., 2009). The study also found that pricing decisions are more often based on judgements instead of a flat treatment rate.

Women are found to have a higher relationship orientation than men which results in a bias towards compassionate pricing over purely transactional pricing (Cron et al., 2009). Price is essential in terms of financial health of the practice and has the largest impact on profits in comparison to other financial decisions the practice may choose to make including revenue, and fixed and variable costs. Although lower prices directly have a negative effect on owner income, relationship orientation can have either a positive or negative effect on income by influencing client retention rates. Why female practice owners have significantly lower incomes in comparison to their male counterparts is not well understood. Overall, the Cron et al. (2009) study weakly confirmed that gender related pricing can partially explain why female owners earn less than their male counterparts. This study also showed that within gender, there are certain attributes, such as relationship orientation which can influence income. Thus, it can be hypothesized that other attributes within gender are likely to explain more of the overall wage variation among male and female veterinarians than simply gender itself.

2.9 *Location*

As far as other explanations of the wage gap, aversion to rural areas has remained consistent over the years amongst veterinarians in general, but it has recently strengthened amongst females (Wang,

2016). Demand for veterinary services for animal agriculture in rural areas has also weakened overtime, while concurrently strengthening in urban areas. An increase in the proportion of female veterinarians, a decrease in the price of farm animals, and an increase in an average per capita disposable income of urban areas have contributed to influencing the shift of more veterinarians entering the companion animal sector. Thus, from the location argument, female veterinarians are more adverse to rural areas and as a result compete for jobs in a saturated market in suburban or urban areas that can better support companion animal practice. As far as flexibility of schedule, which allows for veterinarians to focus on the dual life of having both a career and a family, some studies suggest that small animal private practices are more appealing to females in comparison to a large animal practice because this market structure has more flexible hours (Heinke and Sabo, 2009).

The United States population has become more urbanized overtime and distanced itself from agriculture and food animals, placing more emphasis on care of companion animals. Large processors place more emphasis on overall efficiency and less on the health of an individual animal. For these and other reasons, food animal medicine seems to be less attractive to veterinary students. For example, in 2006 an employment survey by the AVMA only 0.9% women and 7% males took jobs in large animal medicine. The flight from rural settings and agriculture has resulted in a shortage of veterinarians in food animal medicine. It is important to note that economic factors in rural areas may not provide the desired jobs for spouses of veterinarians or even veterinarians themselves (Narver, 2007).

In a study by Villarroel et al. (2010), in the choice of whether or not to pursue a career in rural veterinary practice veterinarians were concerned about their personal lifestyles and professional careers. Living a rural lifestyle was ranked as a high determining factor as to why veterinarians were not interested in rural or food animal practice. In addition, of male veterinarians surveyed, they placed more importance on herd care whereas females assigned higher importance and preference to individual animal care. This study revealed that there are differences in behavior and preferences by gender in determining where they want to live and work in the veterinary field.

2.10 *Women and Negotiation*

Some studies suggest that the wage gap persists because women lack the same confidence in negotiating salary when compared to their male counterparts (Irvine and Vermilya, 2010). It is suggested throughout the wage gap literature that women could shrink the gender pay gap by negotiating for higher compensation. However, this is often an issue because research shows that women in some instances can be penalized socially for attempting to negotiate higher pay, and as a result, many women are afraid of appearing overtly pushy (Bowles et al., 2007). Gendered compensation expectations arise because men typically earn more than women, and thus have higher compensation expectations in comparison to females when negotiating. Evidence indicates that women are more reluctant than men to negotiate for higher compensation (Bowles et al., 2007). If this is the case, women may have lower pay than their male counterparts simply due to the fact that they did not ask for a higher income. If this holds true within the veterinary profession and the educational system were adjusted so that all veterinarians were taught better business and negotiating skills in veterinary school, it is possible that the gap between male and female salaries could be further closed.

In a study by D. Smith (2002), the same percentage of male and females reported negotiating salaries. However, men often ask for more and women are disadvantaged if they do not know the scope of what they can request. Women's salaries will continue to fall behind in the profession if they do not start with equal footing as males, making another argument for education in veterinary school with regards to negotiation skills. According to (Bristol, 2011) when limits on negotiation opportunities are made transparent, both genders will make similar asking in negotiations. When the limits of negotiation are not clear, cues based on the situation result in women and men making different negotiation decisions and more often males will negotiate higher salaries (Bristol, 2011).

2.11 *Children and Flexibility*

Women who participate in the work force have increased pressures to balance both a family and professional life. Though the profession allows for flexibility, female veterinarians continue to approach the pattern of engaging in full time professional work. Flexibility of the profession is not something that usually occurs until veterinarians have gained more experience. In the first few year after veterinary school, veterinarians are likely to be committed to their position working in a practice and will often be on call or have to go in for emergency after hours, potentially working more than 50 hours per week on average (Slater and Slater, 2000). This type of structure is not particularly conducive to females who have children or wish to start a family after graduating. In male-dominated fields, historically females have implemented two strategies in order to deal with gender differences. The first is to ignore or overcome genders differences and potential constraints of familial responsibility by either avoiding marriage or not having children focusing solely on careers. Another option for females was to acknowledge the differences in the needs of males and females in the workforce and choose careers that were less demanding or prestigious in order to allow the ability to keep up with the demands of dual career and home life (Slater and Slater, 2000). Those ways of thinking largely exist in the past. In the modern era women expect equal opportunity in the workforce whether they wish to have children or not.

A female veterinarian's worth should be based on their educational skills, production, and work ethic; their professional careers should not be hindered by having a family. Professional achievement, which is reflected in earnings, should be based on standards of merit, gender aside. Career does not necessarily have to be incompatible with raising a family, and women should not have to choose home life over professional life. The quality of veterinary work standards is not diminished with females entering the profession and dually raising children, though a certain amount of immeasurable sacrifice is involved in order to perform both tasks (Slater and Slater, 2000). Having children can potentially result in reduced hours spent working to provide more time to raise a family, thus reducing temporal flexibility or when veterinarians can be at the practice tending to clients (Goldin, 2014).

Women have made much progress in the past forty years with regards to living the dual life of being a mother and participating in the labor force. Before the Civil Rights Act of 1964 and Title XI in the 1972, employers could refuse to hire women for occupations that were seen as unsuitable for females, limit their schedules, or fire females who became pregnant (Goldberg and Hill, 2007). With regards to motherhood, women's' personal choices to raise a family seem to result in more of a sacrifice than that of a male who pursues fatherhood. Though not all women have children, it is possible that females could be viewed as potential mothers by employers, which could result in fewer professional opportunities. Men appear to spend more time at work after becoming a father whereas mothers spend more time at home and thus, the wage gap continues to widen as women take more time off from work to raise a family (Corbett and Hill, 2012).

Research found that mothers faced an earning penalty in the workforce in comparison to mothers who do not have children when assessing differences in full time female workers (Correll et al., 2007). Individual choices make a difference in earnings and though woman cannot avoid the gap, some choose not to pursue becoming mothers in order to enhance earnings potential by not having to devote extra time to child rearing. Even when females decide to return to the workforce later in life after raising a family, they are behind their male counterparts when it comes to experience and human capital measures (Corbett and Hill, 2012). Women in veterinary medicine sometimes choose to accept lower incomes in exchange for benefits in order to allow for flexibility when raising a family and thus do not demand for as much in terms of salary (Irvine and Vermilya, 2010).

Large animal and equine medicine often require on call hours due to the nature of being focused on production and reproduction which do not have a set schedule. This can pose a problem in terms of flexibility and the dual responsibilities of raising a family due to the demands of this type of work (Irvine and Vermilya, 2010). According to the congressional report, some women trade advancement or higher earnings in a job for the flexibility to jointly manage the responsibilities of work and a family life (Office, 2003). There is still an expectation in society that women perform the majority of the care work within

the family. It is often taken for granted that women want to have families and preform the majority of household work due to stereotypes based on gender roles. For these reasons, is often assumed that mothers make the choice of small animal medicine because the work is flexible and better suited to fulfill familial gender roles (Irvine and Vermilya, 2010).

Flexibility is often seen as a prized benefit within the work place, however is comes at a high price in terms of lesser earnings. It is up to each individual if this tradeoff is conducive to their lifestyle. Gaining increased flexibility results in a change in temporal flexibility, and negatively impacts when veterinarians are needed to be in the workplace at certain times, then they are more costly to the practice and their pay could take a cut as a result (Goldin, 2014). In order to increase flexibility of schedules, veterinarians within a practice could act as substitutes for each other in order to create less cost for the practice. How a decrease in pay for a trade-off in greater benefits varies from sector to sector and practice to practice and the overall effect of trading salary for increased benefits within the veterinary profession is largely unknown.

2.12 *The Human Capital Theory*

Due to the increased feminization of the field, it was important to refer to studies assessing the wage gap in primarily female-dominated fields. A study by Hwang and Polachek (2004) cites occupational self-selection as the main reason for the gender wage gap. This means it is relatively advantageous for women to be in an occupation with a large majority of females because it was found to be associated with gendered comparative advantages in job specific skills, which relates to the human capital model. Both Polachek (1975, 1981) and Becker (1985) are proponents of a human capital approach to occupational self-selection. Becker's model accounts for gender differences in the labor market based on the individual job seeker's utility of maximizing job choices. However, this model is somewhat outdated because it implies that women put less effort towards their jobs in comparison to men with the same level of experience and education because of familial responsibilities. (Reskin and Bielby, 2005). This approach would indicate that workers choose trades by matching their own attributes with particular job characteristics, and thus, these chosen characteristics define the profession. This way of

thinking could potentially shed light on the division of genders and their groupings within different sectors of the veterinary field. However, it is important to keep in mind that, gender aside; individual choices are what ultimately affect career satisfaction, total compensation, and personal happiness.

Human capital theory is a school of thought, which seeks to explain the wage gap through inherent differences in males and females with regards to differences in experience, education, and training which translate into measures that serve as proxies to assess differences in productivity (Anderson et al., 2017). Based on the human capital theory women select occupations requiring investments in human capital that better suit of their daily schedules or long-term labor force participation. From childhood, women are bombarded with subtle messages of certain occupations being deemed as men's work or women's work and these messages subconsciously shapes them as they enter the working world and choose their desired occupation (Boraas and Rodgers III, 2003).

Women have had a historically inferior status relation to men in the employment market until recently which has resulted in traditionally female skills (i.e. skills associated with domesticity) to be undervalued in society when compared to men's work and men's skills. This issue still occurs in the workforce today when women feel discouraged to apply to occupations which are inferred to be male jobs because of invisible boundaries and result in women to crowding into lower level occupations. It is a possibility that the reason women may be concentrated in lower paying jobs is due to restrictions in labor market options (Anderson et al., 2017). Many studies have theorized that females tend to put less importance on the salary associated with a job and more on the benefits, whereas in comparison men tend to be driven more by which occupations pay a higher salary (Anderson et al., 2017). This raises the question as to whether this difference is based on pure preference or the result of constraints faced by females within the labor force

Economic models of supply and demand can be applied to wages where the market for labor determines the equilibrium wage. In the case of the veterinary industry, suppliers of labor are veterinarians who attempt to sell their labor for the highest price or salary, and demanders of labor are veterinary practices that provide the salary attempt to buy labor at the lowest price. Wages are a measure

of the equilibrium price for veterinary labor (Heinke and Sabo, 2009). The wage gap is concerning for both male and female veterinarians because, based on the supply and demand framework, lower compensation for females implies at the wage equilibrium women with similar experience and similar hours to their comparable male counterparts may be producing less. However, this assumption does not entirely explain the wage gap. Several other factors, including number of hours worked, level of experience, negotiation skills, pay satisfaction, and gender discrimination, can be important in this explanation. In addition, it is important to keep in mind that individual choices are what ultimately affect career satisfaction, total compensation, and personal happiness.

Under the economic model of a perfectly competitive labor market, employers are assumed to pay workers based on their value or overall contribution to the firm. Thus, those that are more valuable to the firm will move up the ranks, be rewarded with promotions, and pay increases. Human capital theory argues that women are less productive than men in general due to differences in characteristics, abilities, skills, and the decrease in human capital when females focus outside of work to raise a family. However, the human capital theory is based on studies by Becker in 1964 and Polachek in 1974, and as a result is somewhat outdated in its expectations of gender roles. (Anderson et al., 2017). Becker was a proponent of the belief that individuals used education and training to supplement their innate abilities depending on the expected returns of labor they would have across their lives. Traditionally, due to the division of labor in the family, females would expect to spend less time in the workforce when taking breaks to bear and care for children. Proponents of the human capital theory believed this would result in females having less incentive to invest in greater education and training due to the shorter period of time they would be expected to collect earnings for their labor (Mincer and Polacheck, 1974).

Though somewhat outdated and less applicable today as the human capital gap between males and females decrease, the basis for this human capital perspective is that innate differences in the abilities of males and females exist which result in their work being valued differently. The component of the human capital theory, which remains relevant today, is that there exist differences in gender characteristics that seem to be valued differently in the workforce today. These differences can lead to

differences in occupational choice and productivity. Though proxies for productivity such as education and experience are not as useful as practice or firm level measures of productivity, if there was more data on workplace and practice characteristics, this could potentially better capture other factors that influence the wage gap and further explain why the gap exists.

2.13 *Productivity in the Workplace*

According to the efficiency wage theory by Schwieren (2003), employers do not pay employees the lowest possible wage. Instead, they pay the lowest possible wage in "efficiency units" to motivate workers to exhibit higher efforts. In this framework, women's lower wages could be explained by observing that the efficiency wage for women is not the same as it is for men. Firms could conclude, that either women exhibit high effort and thus lower wages are sufficient to get the desired behavior, or that women do not react with more effort to higher wages (Schwieren, 2003). If the latter were the case, firms would attempt to employ women at the minimum possible wage due to profit lost from lack of increased effort.

In an experiment that involved a double auction of workers and firms making wage offers to assess the efficiency wage explanation through salary negotiation, it was shown that both male and female-dominated firms pay lower wages to women despite what women asked for when negotiating their salaries. Additionally, both male and females reacted to lower wages with lower efforts and higher wages with higher efforts. However, in comparison to the men in the study, though women increased efforts with increased wages, effort was still low enough to cause the firms to lose money when women were paid higher wages. This study demonstrated how some employers might potentially justify wage discrimination. However, employers would be incorrect to assume they could make higher profits by paying women lower wages because in the long run this decision could result in lower effort by women and overall losses by the firm. The differences in productivity of male and female veterinarians has yet to be measured, but this study could provide insight as to the possible explanations of the productivity gap if male and female veterinarians' productivity was found to vary through further analysis and data collection.

Economic theory predicts that workers' wages are correlated with their productivity. As a result, if men and women of equal productivity are paid unequal wages there exists wage discrimination (D. Smith, 2000). However, data on individual's productivity is something that is empirically lacking in wage gap studies. Since men and women in the veterinary field have similar career choices and training, they should be relatively similar in human capital and ability in comparison to assessing differences between men and women in the workforce for the general population.

Pay and productivity differences between male and female veterinarians receiving salaried wages indicate that among veterinarians, women earned 15% less than men did on average. Results of revenue estimates revealed statistically insignificant gender differences in revenue production (D. Smith, 2000). This study provided evidence against simply using human capital explanations for differences in earnings without the inclusion of measures of productivity. If gender differences in human capital existed, they should have reflected differences in revenue production amongst gender. Thus, this study concluded that ultimately human capital assessment using a decomposition model is not ideal for an assessment of the wage gap, and instead, the inclusion of male and female productivity estimates could potentially largely explain revenue production.

A study in Denmark analyzed the wage gap in five different industries, to measure the productivity gap (Gallen, 2015). This study estimated a firm-level production function where labor, material goods, and capital were inputs; and male and female units of labor were treated as perfect substitutes. Differences in pay were unexplained by differences in the output firms could expect when hiring a man versus a woman. Results indicated that three-quarters of the residual wage gap of 16% could be explained by productivity differences. This productivity gap could arise from differences in effort, extra hours worked, or overall effectiveness of men relative to women. The remaining residual wage gap that was not accounted for could be driven by factors such as discrimination by employers, differences in salary negotiation by gender, or other factors. Though the productivity estimates of a male compared to a female veterinarian are still unknown, Gallen's study shows the importance of taking into account productivity measures when analyzing the gender wage gap. The above productivity studies reveal

potential reasons as to why differences in male and female productivity could exists, but there has been not evidence in the veterinary field as to whether male veterinarians are more, less, or equally as productive as female veterinarians.

As can be seen through the expansive wage gap literature, there are many hypotheses for factors which influence the wage gap. Many of these factors stem from cultural norms and inherent beliefs about differences in gender. While many studies have been conducted, there is still no consensus as to what factors capture the unexplained portion of the wage gap. This thesis examines factors affecting salary discrepancies amongst starting male and female veterinarians and proposes a new instrument which would result in a model that would make up for shortcomings in the analyzed dataset. By incorporating measurements of productivity, salary negotiation, and other potential factors influencing the wage gap as addressed in the literature review, the residual portion of the wage gap can be further explained as being influenced by other factors instead of being completely attributed to gender discrimination.

CHAPTER III: THEORETICAL MODEL

There are many variations for models in the wage gap literature. This chapter explains which models were implemented in order to analyze the gender wage gap in starting veterinary professionals. The methodology used involves a three-step approach, where the wage gap is first evaluated at the mean using two types of ordinary least squares (OLS) models. The second OLS model used in step two is a OLS regression with female interaction terms which highlight which variables remain significant when interacted with a gender effect. An exclusive focus on the aggregate average can result in a misleading impression of the variability in the magnitude of the *ceteris paribus* wage gap across wage distributions (Abadie and Imbens, 2006). In addition to creating OLS models, in the third step, propensity score matching using the nearest neighbor method was implemented to compare male and female veterinarians of the same caliber in order to determine the scope of the wage gap between individuals with similar characteristics. Section 3.1 briefly introduces common methodologies to examine the wage gap. Section 3.2 describes the type of OLS models chosen in this study. Section 3.3 describes the nearest neighbor matching method, which is the last component of the three-step process.

3.1 *Brief Introduction of Methods used for Analyzing the Wage Gap*

Economists have analyzed the gender wage gap using wage regressions, which specify the relationship between wages and productivity related characteristics for men and women (Hejase et al., 2015). According to Hejase et al. (2015), the literature on the gender wage gap incorporates a handful of techniques, namely the Oaxaca-Blinder decomposition, which results in two separate gender wage equations, and the use of dummy variables in varying types of regressions. However, according to Goraus et al. (2017), these methods cannot measure the differences outside the mean nor correct for selection into employment. Another method commonly used is the Mincerian model of earnings. Mincerian wage equations are commonly used to examine the wage gap and are estimated as a semi-elasticity wage regression, which expresses income as a function of schooling and experience. The framework estimates returns to schooling and measures the impact of work experience on gender wage gaps (Hejase et al.,

2015). Though there are a variety of methods which can be considered when examining the wage gap, the following chapter details the rationale behind what methods were chosen for the analysis conducted in this paper.

3.2 *The OLS Model*

The first empirical model in this study uses an OLS multiple linear regression model. Using an OLS model is most appropriate because the errors have the minimum variance, are uncorrelated, unbiased, and consistent in that the estimator's value approaches the actual parameter value as the sample size increases.

The general OLS form will be used to create a linear regression, which relates earnings to explanatory occupational variables and demographic factors (Gujarati, 2009). Unlike the Mincerian wage equation, the model depicted in Equation 1 does not use a semi-log format, which is common amongst wage equations (Wooldridge, 2013). The semi-log format stems from the classical human capital model where individual choices in wage growth are a result of acquiring more education and experience. Due to the fact that the data sample which is composed of graduating veterinarians is very similar in education and experience, the basic Mincerian equation does not do the graduating veterinarian population justice in modeling income as being linked to differences in schooling and experience. Unlike the Mincerian equation, the OLS model includes other explanatory variables that have impact on wage earned, such as location and employment sector for example.

The semi-log format reflects growth rate. In comparison, a linear OLS model reflects change in levels or dollar amounts (Wooldridge, 2013). The purpose of this analysis is to assess differences in factors affecting salary upon the starting position (time = 0) and veterinarians enter the work force for the first time. Using a linear approach allows for comparison of the base differences in dollar amount among male and female graduates in cross section. This analysis was not interested in using a semi-log equation to determine factors influencing growth rate of earnings, but instead examines the effect of independent variables on starting salary using a dollar comparison. Though semi-log format is common in wage gap

literature, to compare percentage changes it is not necessary due to the departure from the typical Mincerian format.

In the theoretical model, starting salary is a function of demographic factors, workplace/schooling characteristics, and human capital factors. The specific variables used in the model are further defined in Chapter 4. The general multiple linear regression model can be written as:

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots . + \beta_k X_k + u \quad (1)$$

where y is the dependent variable, starting salary, X_i is the indexed set of independent variables affecting wage. Beta 0 is the intercept of the regression equation. Beta i is the parameter associated with X_i and measures the change in y with respect to X_i, holding all factors fixed (Wooldridge, 2013).

The OLS model will provide an estimate of the wage gap at the aggregate mean of the sample population by minimizing the sum of squares of the differences between observed responses in the dataset and responses predicted by a linear function of explanatory variables. Extrapolating the average wage gap is the starting point for this analysis, and the following models in this three-step process will further depict how the wage gap changes when analyzed beyond the mean estimate.

3.2.1 *OLS with Female Interaction Terms*

The female interaction model is the second step in the three-step methodology process and further examines the wage gap. Like the OLS model in step one, the coefficient estimate examined are based on an assessment of the aggregate mean of the sample population. Incorporating female interaction terms allows for an analysis of how coefficient's signs and significance changes when looking at only the female population in the sample. This model will reveal which factors are have the most significant effect on female wages.

This model creates the opportunity to observe the interaction between female individuals and all variables included in the original OLS model. Interaction terms allow for nonlinearities where the result is the product of explanatory variables (Wooldridge, 2013). In examining the significance of the interaction term's estimated coefficient, if it is statistically significant then the interaction is necessary to capture the

relationship in the model. In order to assess the gender affect, "female" is the interaction term where female=1, if female and female=0, if male. A general interaction term model can be written as:

$$y = \delta_0 + \delta_1 X_1 + \delta_2 * female + \delta_3 X_3 * female + u \quad (2)$$

The interaction term for female, represents the added effect of Xi on y, which is conditional on the value of *female* (Wooldridge, 2013). The incorporation of interaction terms allows for the assessment of the combined effect of the two variables, as well as the marginal effect in earnings.

3.3 ***Nearest Neighbor Matching Method***

In propensity score matching, the average effect of the treatment is estimated by averaging within-match differences in the outcome between the treated and untreated units (Abadie and Imbens, 2006). The propensity score matching technique used was the nearest neighbor matching method, which accounts for missing potential outcomes for each subject by using an average of the difference of the outcomes of similar subjects that receive the other treatment (StataCorp, 2015). The similarity of observations is based on a weighted function of covariates for each observations. The treatment affect in this case is when an individual is gendered female, whereas an untreated individual is male.

There are two treatment levels: treatment group with t=1 and a control group where t=0. Since treatment in this model is gender, when female= 1 is the treatment group and female=0 is the control group. For individual i, i = 1,...,N, let $Y_i(1)$ be the outcome of individual i when exposed to the treatment, and $Y_i(0)$ be the outcome of individual i when not exposed to the treatment. If both $Y_i(0)$ and $Y_i(1)$ are observable, the effect of the treatment on unit I is observable as $Y_i(1) - Y_i(0)$ (Abadie et al., 2004).

To estimate the average effect of a binary treatment the variable W_i, with $W_i \in \{0, 1\}$, indicates the treatment received. In the case when $W_i = 1$, the individual is female and the treatment has been received. In the case where $W_i = 0$, the individual is male and does not receive treatment. Only one of the two outcomes is observed for average treatment effects where Y_i is the observed outcome:

$$Y_i = Y_i\,(W_i) = \begin{Bmatrix} Y_i(0)\ if\ W_i = 0 \\ Y_i(1)\ if\ W_i = 1 \end{Bmatrix} \quad (3)$$

Thus, there are two potential outcomes, $Y_i(0)$ for the outcome of the control treatment, males, and $Y_i(1)$ for the outcome for the treated group, females. The main focus is on the population average treatment effect and its counterpart for the population of the treated:

$$\tau = E[Y_i(1) - Y_i(0)] \text{ and } \tau^t = E\, Y_i(1) - Y_i(0)|W_i = 1 \quad (4)$$

The unit-level treatment effect is $\tau_i = Y_i(1) - Y_i(0)$ (Abadie and Imbens 2006). For the units in the sample, only one of the potential outcomes, $Y_i(0)$ and $Y_i(1)$, is observed and the other is unobserved or missing. The numbers of the control and treated units are N_0 and N_1, where N, is the population sample and $N= N_0 + N_1$. The matching estimator imputes the missing potential outcomes as

$$Y_i(0) = \begin{cases} Y_i & if\ W_i = 0 \\ \frac{1}{M} \sum_{j \in Jm(i)} Y_j\,, & if\ Wi = 1 \end{cases} \quad (5)$$

In Equation 5, where a potential outcome is unobserved, it is assumed that $N_0 \geq M$ and $N_1 \geq M$. It is also assumed that $j_m(i)$, represents and index of *m*th closest units to i, in terms of covariate values. J_m (i) denotes the set of indices for the first M matches for unit I (Abadie and Imbens, 2006).

The regression estimators of τ and τ^t are defined as:

$$\widehat{T^{reg}} = \frac{1}{N} \sum_{i=1}^{N} \left(\bar{Y}_i(1) - \bar{Y}_i(0)\right) \quad (6)$$

$$\widehat{T^{reg,t}} = \frac{1}{N_1} \sum_{W_i} (Y_i - \bar{Y}_i\,(0)) \quad (7)$$

Due to the fact that assessing the treated group is the focus of this analysis because it provides an estimate of the wage gap, Equation 7 is the best representation of the regression estimator used. For nearest neighbor matching there is no explicit functional form for neither the outcome model nor the treatment model. This flexibility results on the estimator needing more data to get a true value than an estimator which imposes a functional form. The NNmatch estimator converges to the true value at a rate

slower than the parametric rate, which is the square root of the sample size, when matching on more than one continuous covariate (StataCorp, 2015).

In nearest neighbor matching, each observation is matched with at least one observation from the other treatment level, in the case where no exact matches were computed the result was left as N/A, where no value was assigned. To further refine the matches, the nearest neighbor matching method incorporated an exact match component by matching with chosen categorical covariates from the OLS models, in this case variables chosen where veterinary college attended and employment sector. Due to the fact that gender is used as treatment, all matches were refined by exact match to be of the same employment sector and school in order to establish if there was a premium on veterinary school chosen and to observe how differences in education and training affected the wage gap. For nearest neighbor matching, the "nearest" is determined by a weighted function of the covariates for each observation using Mahalanobis distance. This distance measure weights based on the inverse of the covariates variance-covariance matrix (StataCorp, 2015).

CHAPTER IV: DATA

The data used in this analysis was provided by a partnership with the American Veterinary Medical Association. The dataset included 35,056 observations of students' survey responses from seventeen years (2001-2016) of the AVMA Senior Survey, which was distributed annually between March and April to every new graduate of 28 AVMA-accredited colleges of veterinary medicine in the United States. The survey was an exit survey which collected information about graduates post veterinary school employment endeavors. Each veterinary college had approximately 1,400 to 1,500 respondents with 553 observations from Oregon State University and 2,017 observations from The Ohio State University being the outliers. The Senior Survey dataset had a 93% response rate and was used to assess the variation in starting salaries amongst the graduating veterinary population. The dataset was comprised of surveys created and collected by the AVMA. Section 4.1 provides descriptive summary statistics for the dataset. Section 4.2 defines the variables used in the three-step model analysis of the dataset.

4.1 ***Summary Statistics***

Of the 35,014 observations, 23% (8,107 observations) were male, and 77%, (26,907 observations) were female. Upon graduation, 85% of graduates were 30 years of age or younger. Of the observed population, 65% were single, 32% were married and the remaining 3% were either widowed or divorced. In the population, 92% did not have children. Of those who did have children, 45% were male and 55% were female. The sample population was comprised of 89% of individuals who were Caucasian, and 11% being either Hispanic, Black/African American, Asian or Pacific Islander, or other. The first survey year of 2001 had 1,610 respondents with a gradual upward trend in respondents until 2016 with 2,640 respondents.

The next few tables depict income summary statistics of the data categorized by gender and veterinary sector employment chosen, workhours, and employment region. It is important to note that due to some seemingly high workhours and income estimates, some students who had not yet secured

employment upon graduation could have overestimated potential salary and workhours. Thus, some of the observations are hypothesized to be estimates and not exact measures. Table 4.1 depicts the veterinary sectors male and female respondents pursued for employment following graduation. The table highlights that the percent of the male population is significantly larger than that of females who pursued employment in the food animal section, and slightly larger in mixed food animal. Females dominate the companion animal sector, with nearly half of all graduating females choosing this sector for future employment. Ten percent more of the female population also chose to pursue and internship or residency compared to the male population. With the exception of continuing education, males across the board make more income than females in all sectors.

Table 4.1: Employment Sector Statistics from AVMA Senior Survey (2001-2016)

	Female				Male			
Employment Type	Obs	Percent (%)	Mean Income ($)	Std. Dev	Obs	Percent (%)	Mean Income ($)	Std. Dev
Food	523	2.8	57368	15377	710	11.3	61652	14919
Mixed	1592	8.4	57425	11556	844	13.4	58962	13759
Equine	544	2.9	37638	14597	207	3.3	42680	16524
Companion	8105	42.6	61959	15523	2282	36.2	63098	16535
Government	456	2.4	59927	12196	158	2.5	62435	12523
Industry/University	183	1.0	48455	21941	100	1.6	51378	23516
Internship/Residency	6059	31.9	29116	5632	1433	22.7	29199	6447
Continuing Education	1559	8.2	24942	8091	575	9.1	24851	7632

Table 4.2 depicts employment hours divided into four tiers. Observations were divided as such due to the fact that a large group of respondents indicated they would be working more than 80 hours per week. It was not made known in the survey whether hours consisted of on call hours, over estimated hours, or were school hours for those continuing with an internship, residency, or advanced education. Though males earned more income in each workhours tier, it should be noted that income drops for both males and females working over 60 hours a week. Those working in the second tier of 38-59 hours per week, which contains the largest majority, have the highest earnings based on the summary statistics.

Table 4.2: Workhours Statistics from AVMA Senior Survey (2001-2016)

	Female				Male			
Workhours	Obs	Percent (%)	Mean Income ($)	Std. Dev	Obs	Percent (%)	Mean Income ($)	Std. Dev
Less than 38 hrs/wk	680	2.5	53938	17377	125	1.5	58007	19239
38-59 hrs/wk	10857	40.4	57000	17579	3769	46.5	58401	17701
60-80 hrs/wk	5312	19.7	33651	14669	1837	22.7	39816	19729
Greater than 80 hrs/wk	10058	37.4	29515	10592	2376	29.3	29817	12280

Table 4.3 depicts different work regions based on the first number in each United States zip code (refer to Appendix A or Table 4.4 for definition of region). The states that belong in each zip code region have geographical similarities. Males make more than their female counterparts at the mean across all the regions. Region 3 and region 9 are the most heavily populated and sought out for employment amongst the graduating veterinary population. Males are shown to have the highest mean incomes in Region 5, whereas females are shown to have the highest mean incomes in Region 7. Regions from the dataset were created with data identifying veterinarian's choice of state for employment. Unfortunately, the dataset does not contain information about employment zip codes, whether the community was rural, urban, or suburban, the size of the community, or the affluence of the community. While region serves as a proxy for location, neither state nor region is very telling about the nature of the location of the chosen employment due to the large variability of communities within each state.

Table 4.3: Work Region Statistics from AVMA Senior Survey (2001-2016)

	Female				Male			
Region	Obs	Percent (%)	Mean Income ($)	Std. Dev	Obs	Percent (%)	Mean Income ($)	Std. Dev
Region0	1641	8.6	39689	19925	386	6.1	40935	21121
Region1	1621	8.5	44598	19783	467	7.4	46481	21274
Region2	2214	11.7	47447	19529	592	9.4	51256	20539
Region3	2598	13.7	46130	19972	973	15.4	48896	20277
Region4	1986	10.5	47799	18393	651	10.3	48546	19199
Region5	1218	6.4	50748	17386	518	8.2	56031	16905
Region6	1612	8.5	49628	18800	556	8.8	52826	17749
Region7	1919	10.1	51635	20151	884	14.0	53000	20449
Region8	1425	7.5	43884	19822	505	8.0	46077	21039
Region9	2676	14.1	49205	22252	774	12.2	54678	23421
Region10	100	0.5	39161	19502	39	0.6	46426	30203

4.2 *Defining Variables*

The variables defined in Table 4.4 are all the independent variables that make up the function of annual starting salary among graduating veterinary students. These variables are used in all of the models in the three-step methodology process. The variables are divided into demographic factors, workplace/schooling characteristics, and human capital factors. The variable female was coded in binary with female taking a value of one if female, due to the majority of the veterinary population being female. Benefits was a count variable which was comprised of a number of possible benefits graduating veterinarians could receive upon starting their first employment out of veterinary medical school.

Due to the fact that workhour estimates in the dataset were inconsistent and much greater than hours seen in a typical workweek, workhours were divided into four tiers. Workhours2 of between 38-60 hours was the omitted workhours dummy variable because it contained largest group of students. Whether a student had children or not was coded as a binary variable with child taking a value of one if they had one or more children. Marital status was divided into three categories with single being the omitted dummy variable because the majority of students at the time of survey were single. Ethnicity was coded into Caucasian and other ethnicities, with Caucasian being the base dummy variable because it represented the largest majority of all graduating veterinary students. Age and DVM debt accumulated at

the time of graduation were both included as continuous variables.

The 28 veterinary medical schools were coded as dummy variables, with University of California Davis, the top ranked veterinary school, acting as the omitted dummy variable. Veterinary colleges were coded into dummy variables in order to assess the premium of attending each veterinary school and to assess if the training and education received influenced annual income. Employment sector was divided into seven categories with companion animal medicine acting as the base dummy variable because it was the sector where the largest population of veterinary students chose to be employed upon graduation. In order to compare income variation over time as a result of inflation, the year of the survey was coded into 16 dummy variables, with 2015 being the base year of comparison for the nominal value of the dollar. In order to assess location, 10 regions were established based on first zip code number, with the 10^{th} region representing employment locations outside of the United States. The base dummy variable was zip code region 3 due to it containing the largest amount of graduating veterinarians. The variables below were used in the three models defined in Chapter 3.

Table 4.4: Model Variables

Variable	Type	Description
Female	Binary	=1 if respondent is female, and 0 if male
Benefits	Count	=1 when respondent has the ability to earn ability to earn additional cash, life insurance, disability insurance, paid sick leave, provide continued education funds, allow for continued education, pension plan, IRA, paid legal holidays, Dental Plan, Medical Plan, Liability Insurance, paid annual vacation leave, moving expense, tax deferred retirement plan, tax match retirement plan, gain license, discount for own pets
Workhours1	Binary	=1 if respondent works less than 38 hrs/week
Workhours2	Binary	=1 if respondent works between 38-59 hrs/week (omitted dummy variable)
Workhours3	Binary	=1 if respondent works between 60-80 hrs/week
Workhours4	Binary	=1 if respondent works more than 80 hrs/week

Table 4.4: Model Variables Continued

Variable	Type	Description
Child	Binary	=1 if respondent has children
Single	Binary	= 1 if respondent is single (omitted dummy variable)
Married	Binary	=1 if respondent is married
Divorced/Widowed	Binary	=1 if respondent is divorced or widowed
Caucasian	Binary	=1 if respondent is Caucasian (omitted dummy variable)
Other ethnicity	Binary	=1 if respondent is an ethnicity other than Caucasian
Age	Continuous	= respondent's age at time of taking survey
DVM debt	Continuous	=respondent's debt accumulated while attending veterinary school (continuous variable)
Davis	Binary	=1 if respondent attended UC Davis (omitted dummy variable)
Auburn	Binary	=1 if respondent attended Auburn University for veterinary school
Tuskegee	Binary	=1 if respondent attended Tuskegee University
Colorado State	Binary	=1 if respondent attended Colorado State University
University of Florida	Binary	=1 if respondent attended University of Florida
University of Georgia	Binary	=1 if respondent attended University of Georgia
University of Illinois	Binary	=1 if respondent attended University of Illinois
Iowa State	Binary	=1 if respondent attended Iowa State University
Kansas State	Binary	=1 if respondent attended Kansas State University
Louisiana State	Binary	=1 if respondent attended Louisiana State University
Cummings	Binary	=1 if respondent attended Cummings School of Veterinary Medicine at Tufts University
Michigan State	Binary	=1 if respondent attended Michigan State University
University of Minnesota	Binary	=1 if respondent attended University of Minnesota
Mississippi State	Binary	=1 if respondent attended Mississippi State University

Table 4.4: Model Variables Continued

Variable	Type	Description
Purdue	Binary	=1 if respondent attended Purdue University
Cornell	Binary	=1 if respondent attended Cornell University
Oklahoma State	Binary	=1 if respondent attended Oklahoma State University
Texas A&M	Binary	=1 if respondent attended Texas A&M University
Washington State	Binary	=1 if respondent attended Washington State University
Columbia	Binary	=1 if respondent attended Columbia University
Ohio State	Binary	=1 if respondent attended Ohio State University
Oregon State	Binary	=1 if respondent attended Oregon State University
University of Tennessee	Binary	=1 if respondent attended University of Tennessee
Virginia-Maryland	Binary	=1 if respondent attended Virginia-Maryland College of Veterinary Medicine
North Carolina State	Binary	=1 if respondent attended North Carolina State University
University of Wisconsin	Binary	=1 if respondent attended University of Wisconsin
Western University	Binary	=1 if respondent attended Western University
Companion	Binary	=1 if respondent is employed in predominantly and exclusively companion animal medicine, (omitted dummy variable)
Food	Binary	=1 if respondent is employed in predominantly and exclusively food animal medicine
Mixed	Binary	=1 if respondent is employed in mixed animal practice
Equine	Binary	=1 if respondent is employed in equine animal medicine
Government	Binary	=1 if respondent is employed in uniformed services, non-profit, and federal, local or state government sectors of veterinary medicine
Industry/University	Binary	=1 if respondent is employed in industry and commercial organizations of the veterinary field, or at colleges and universities

Table 4.4: Model Variables Continued

Variable	Type	Description
Continuing Education	Binary	=1 if respondent is pursuing advanced education upon graduating from veterinary school
Internship/Residency	Binary	=1 if respondent is pursuing an internship or residency upon graduating from veterinary school
Year01	Binary	=1 if respondent graduated from veterinary school in 2001
Year02	Binary	=1 if respondent graduated from veterinary school in 2002
Year03	Binary	=1 if respondent graduated from veterinary school in 2003
Year04	Binary	=1 if respondent graduated from veterinary school in 2004
Year05	Binary	=1 if respondent graduated from veterinary school in 2005
Year06	Binary	=1 if respondent graduated from veterinary school in 2006
Year07	Binary	=1 if respondent graduated from veterinary school in 2007
Year08	Binary	=1 if respondent graduated from veterinary school in 2008
Year09	Binary	=1 if respondent graduated from veterinary school in 2009
Year10	Binary	=1 if respondent graduated from veterinary school in 2010
Year11	Binary	=1 if respondent graduated from veterinary school in 2011
Year12	Binary	=1 if respondent graduated from veterinary school in 2012
Year13	Binary	=1 if respondent graduated from veterinary school in 2013
Year14	Binary	=1 if respondent graduated from veterinary school in 2014
Year15	Binary	=1 if respondent graduated from veterinary school in 2015 (omitted dummy variable)
Year16	Binary	=1 if respondent graduated from veterinary school in 2016,
Region0	Binary	=1 if respondent is employed in a zip code region beginning with 0: (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey)
Region1	Binary	=1 if respondent is employed in a zip code region beginning with 1: (New York, Pennsylvania, Delaware)

Table 4.4: Model Variables Continued

Variable	Type	Description
Region2	Binary	=1 if respondent is employed in a zip code region beginning with 2: (District of Columbia, West Virginia, Maryland, North Carolina, South Carolina)
Region3	Binary	=1 if respondent is employed in a zip code region beginning with 3:(Tennessee, Alabama, Mississippi, Georgia, Florida), (omitted dummy variable)
Region4	Binary	=1 if respondent is employed in a zip code region beginning with 4: (Michigan, Ohio, Kentucky, Indiana)
Region5	Binary	=1 if respondent is employed in a zip code region beginning with 5: (Montana, North Dakota, South Dakota, Minnesota, Iowa, Wisconsin)
Region6	Binary	=1 if respondent is employed in a zip code region beginning with 6 : (Nebraska, Kansa, Missouri, Illinois)
Region7	Binary	=1 if respondent is employed in a zip code region beginning with 7: (Texas, Oklahoma, Arkansas, Louisiana)
Region8	Binary	=1 if respondent is employed in a zip code region beginning with 8: (Idaho, Wyoming, Utah, Colorado, Arizona, New Mexico)
Region9	Binary	=1 if respondent is employed in a zip code region beginning with 9: (Alaska, Hawaii, California, Nevada, Oregon, Washington)
Region10	Binary	=1 if respondent is employed outside of the United States

The data was analyzed using STATA, an econometric software analysis. After coding the data, the testing up approach to model fitting was used to create the regression (Gujarati, 2009). This method of model fitting is efficient but biased due to a possible omission of relevant variables. This is a classical approach which starts with fewer explanatory variables and gradually adds more if available in the data (Gujarati, 2009). The variables included in the model were selected based on noted importance and significance in the wage gap literature with regard to factors that contribute to explaining variability in income.

For the OLS model, it is expected that the female variable coefficient will be negative and capture the wage differential between males and females. As far as signs to be expected, workhours are expected to be positively correlated with income, in that the more hours one works the more can expect to earn. School attended is expected to have a negative sign when compared to earnings one receives from attending UC Davis. Employment sectors are expected to have a negative marginal effect on earnings when compared to companion animal medicine because it has the highest mean income out of all the sectors. Years are expected to follow inflation trends and have a negative marginal effect on income when compared to 2015, with the exception of 2016.

The nearest neighbor matching method produces an estimate of the wage gap by matching similar males and females based on the variables above. The wage gap estimate is determined from matching residuals based on closeness of proximity. The individual effect of each variable's influence starting salary cannot be estimated by the nearest neighbor matching model because it only reveals the result of the treatment effect.

In creating the regression models, the largest source of bias came from lack survey questions that appeared meaningful in previous research, such as wage negotiation and qualitative variables assessing variability of non-cognitive skills between genders. There was no way to measure the quality of a veterinarian, such as rank, GPA, etc. and thus the model was a function of the above variables that affect income variations in the literature. Another source of bias were large outliers workhours and starting salaries which could have been inflated by students who has not yet secured employment and were overestimating these values.

The purpose of the model analysis is to investigate the factors influencing the initial earnings of graduates, with a particular focus on gender. The current study involves creating models with AVMA Senior Survey Dataset using variables shown as important in the effect on wage in the wage gap literature to create a sound wage model.

CHAPTER V: RESULTS

This section presents the results of a statistical analysis described in Chapter 3 in a series of tables below and provides discussion and analysis of the estimated coefficients. An OLS model, an OLS model with female interaction terms, and propensity score results were estimated in STATA. Section 5.1 details the base OLS regression results and gives an in depth analysis of the interpretation of coefficients in the model. Section 5.2 presents the OLS Female Interaction Term regression and observes how the significance of the original model coefficients changed when interacted with a female dummy variable. Section 5.3 is comprised of NNmatch results, which reveal how the wage gap is actually larger, when comparing similar male and female veterinarians, then initially predicted at the mean.

5.1 ***OLS Regression Results***

Table 5.1 presents the results from the base OLS model. Significance tests with p-values at the 0.05 level were used to determine whether to reject the null of the coefficients equaling zero and their significance to the interpretation of the model. Multicollinearity was not an issue in the data, as the regressors had a variance inflation factor of less than 10. The White test and Bruesch-Pagan LM test for heteroscedasticity both resulted in p-values of less than 0.001, thus indicating that heteroscedasticity was present within the model. This was corrected for by using White's Robust Standard errors when running the regression. The results reveal the estimated wage gap female veterinarians face upon graduating from veterinary school, which is identified as the coefficient on the female variable. The significant coefficients further explain factors contributing to individual earnings as well as the estimated income disparity between male and female veterinary graduates.

Table 5.1: Senior Survey OLS Regression Results

Variable	Coefficient Estimate		Standard Error
Female	-2179.11	***	170.05
Benefits	901.31	***	31.34
Workhours1	-6365.68	***	550.79
Workhours3	-1288.16	***	78.33
Workhours4	-1503.76	***	72.56
Child	584.30	*	322.83
Married	323.53		157.16
Divorced/Widowed	323.53		442.45
Other Ethnicity	388.36		336.19
Age	73.90	***	23.30
DVM debt	0.0046	***	0.0011
Auburn	429.57		572.93
Tuskegee	1803.10	**	727.21
Colorado State	-590.55		561.51
University of Florida	1975.01	***	610.73
University of Georgia	-2.33		569.95
University of Illinois	1836.04	***	564.73
Iowa State	421.76		569.62
Kansas State	-357.61		567.99
Louisiana State	2619.72	***	598.09
Cummings	398.68		571.18
Michigan State	672.24		581.61
University of Minnesota	1060.24	*	582.77
Mississippi State	800.99		657.02
Purdue	885.48		609.13
Cornell	511.22		565.66
Oklahoma State	-363.14		597.87
University of Pennsylvania	1013.72	*	610.18
Texas A&M	2679.41	***	562.23
Washington State	-1030.86	*	592.35
Columbia	442.38		593.13
Ohio State	411.34		535.24
Oregon State	-3048.11	***	693.79
University of Tennessee	-750.11		601.01
Virginia-Madison	249.33		564.10
North Carolina State	-619.20		578.48
University of Wisconsin	-242.44		581.38
Western University	-134.17		715.38
Food	-752.83	*	418.33
Mixed	-4095.74	***	241.81
Equine	-17998.35	***	599.98

Table 5.1: Senior Survey OLS Regression Results

Variable	Coefficient Estimate		Standard Error
Government	-5500.98	***	497.18
Industry/University	-7666.45	***	1440.56
Continuing Education	-23699.29	***	324.00
Internship/Residency	-33243.56	***	307.80
Year01	-18954.86	***	566.21
Year02	-20816.93	***	497.93
Year03	-19197.04	***	507.76
Year04	-18171.41	***	499.92
Year05	-16248.23	***	491.80
Year06	-10413.81	***	487.38
Year07	-8473.29	***	482.45
Year08	-5874.31	***	474.64
Year09	-3680.64	***	503.19
Year10	-2837.13	***	368.20
Year11	-2538.97	***	356.06
Year12	-3161.74	***	385.32
Year13	-1277.25	***	375.88
Year14	-882.24	*	358.06
Year16	2209.48	***	349.54
Region0	1347.73	***	331.37
Region1	2202.72	***	312.70
Region2	906.92	***	282.97
Region4	-539.47	*	294.29
Region5	-1529.05	***	356.09
Region6	-988.31	***	325.49
Region7	285.47		333.39
Region8	308.49		345.65
Region9	5848.36	***	320.05
Region10	1103.32		1404.26
_cons	61919.28	***	937.19
Obs:23,825			
F(70,23754): 1510.29			
Prob>F:0.0000			
R-squared: 0.7626			
Root MSE: 10148			

Statistically significant at the 10%(*), 5%(**), and 1%(***) levels.

Table 5.1 depicts the OLS regression results after estimating demographic factors and job characteristics as a function of annual starting salary of veterinarians. The standard base comparison in the OLS models is the income of graduating veterinary students is a single, Caucasian, female student with no children who has graduated Veterinary School at UC Davis in 2015 and is currently employed in

companion animal medicine in California working in the range of thirty-eight to sixty hours a week. This allows for comparison of ceteris paribus conditions in the base model to alternative. The regression constant was $61,919.28 indicating the expected mean earnings if all other independent variables were equal to zero.

Both genders fell within the same confidence interval when assessed through a simple OLS method. As a result, it was not statistically supported to create two OLS regressions in order to examine the estimated mean wage for males and females separately. The method in which two separate estimates for male and female wages are calculated by creating two separate regressions is the seminal decomposition technique proposed in the Oaxaca-Blinder method (Hejase et al. 2015) However, this method was not appropriate to use, and a gender dummy variable which accounted for a gender effect provided a more accurate estimate. Thus, in order to capture the gender wage gap, a female dummy variable was incorporated into the model. The female dummy variable captures the wage differentiation of a female's salary compared to that of a male veterinarian. Reviewing the results presented in Table 5.1, the wage gap is estimated to be -2179.11. In other words, males earn, on average, $2,179.11 more annually than their female counterparts, where all other factors would be the same. A hypothesis test where the null hypothesis was that gender coefficient equaled zero and the alternate was that gender was statistically different from zero was conducted in order to assess the gender's significance in contributing to the wage gap. The null hypothesis was rejected, indicating the gender parameter was significant and statistically different from zero at p-value.

In the OLS model depicted in Table 5.1, dummy variables for veterinary college attended, year graduated, gender, ethnicity, marital status, children, and employment field were included in order to better understand these factors and capture their marginal effect on income.

The benefits variable coefficient was statistically significant at the 1% level and had a positive sign, which was an indication that increased job benefits results in increased earnings. Benefits were hypothesized to have a negative effect on the starting salary since benefits represent another form of

monetary salary. Results show that benefits increased income by $901.3. It was expected that benefits would have a negative correlation with income, and that veterinarians who had more benefits were compensated with a better benefits package in lieu of increased earnings. Instead of a tradeoff existing where veterinarians had to choose increases in benefits for a lesser salary, results indicate that increased benefits is directly correlated with increased income. Intuitively, benefits are frequently a ratio of income. For instance, in an example where an employer contribution to a retirement savings plan was 3% of income, an increase in income would also increase benefits of this nature.

Workhours categories were all statically significant, but signs were not as expected. The base category, which all results should be compared to is 38-60 hours a week. This is considered full time for the average veterinarian. Veterinarians that reported expecting to work 60-80 hours or 80 plus hours made less compared to those reporting a 38-60 hour work week. The result is unexpected, as it would be expected that additional work would result in additional income. Due to this finding, it is helpful to discuss why increased work hours may result in lower incomes. This could indicate that respondents could have included their on-call or emergency hours as part of their reported hours. This would result in a deflated overall income value. Those completing an internship, residency, or advanced education could have reported extra hours for studying as well, which would have skewed workhours. In order to further examine why workhours had a negative effect, workhours was sorted by employment sector at the mean. Those pursuing an internship and residency, as well as continuing education, which are the lowest paying sectors, had a mean reported workhours per week of 66.46 and 60.36 hours. The sectors that grossed the highest mean starting salaries were companion and food animal medicine and had mean reported hours of 45.60 and 53.32 hours. The comparison between these sectors with the highest paying starting salaries and those with the lowest depicts how more hours reported in the lower paying sectors causes an increase in workhours to appear as having a negative impact on salary.

Another unexpected finding was that neither children nor marital status were statistically significant at the 5% level or below. The insignificance of the children coefficient was unexpected. As

observed in Chapter 2 Section 11 in the literature review, Corbett and Hill, (2012); Correll et al., (2007); and Slater and Slater (2000) indicated that having a child can result in less earnings for a female due to the time required to raise a family. Of the graduating population surveyed, only 7.7% of graduates had children. Specifically, 15.1% of the male population and 5.5% of the female population reported having children at the time of graduation. Male veterinarians represent the majority of veterinarians with children, which could be the result of the burden of raising a family being the responsibility of their spouse, and thus not serve as a potential time constraint or impediment to male's earnings.

Demographic factors other than gender did not have large effects on starting salary. Ethnicity had no statistically significant impact on earnings and although age and DVM debt levels were each statistically significant at the 1% level, they were small in magnitude. These variable coefficients had minimal effect on the increase of ones earnings. An increase in age by one year resulted in an increase in earnings by $73.90 while a $1 increase in DVM debt increased anticipated earnings by less than a penny, $0.0046 dollars, *ceterus paribus*.

The OLS model reveals that there are different premiums for receiving veterinary training and education at each of the 28 veterinary medical schools. The base to which these premiums were compared is UC Davis, which is the highest-ranked veterinary school in the United States. The four top ranked veterinary schools after UC Davis, are Cornell, Colorado State University, North Carolina State University and Ohio State University. Their coefficients in this analysis are not statistically significant. When compared to the value veterinary schools, there is no difference in income earned from a veterinarian who attended the top ranked school versus a rank five school, such as Ohio State University. Some of the schools have statistically significant earned income variability in comparison to UC Davis, such as University of Florida which has a premium of $1975.01 of income, or Oregon State with expected earnings of $3048.11 less than that of UC Davis. This finding would indicate that the education and training received at particular institutions does have a marginal impact on salary. As a result, the value of the education received from particular schools only differs from the top ranked school in some cases.

Surprisingly, three schools (University of Florida, University of Illinois, and Texas A&M), which ranked well below UC Davis had a premium of upwards of 2,000 dollars compared to those who received their training at the top ranked veterinary college. Where one goes to school does matter for certain schools in particular, but not all schools. There is no apparent pattern as to which schools have statistical significance. Veterinary college attended served as a proxy for the quality of the education and training received by the veterinarians, but findings would indicate that because only six of the twenty-seven schools compared to UC Davis were statistically significant at the 5% level, it would suggest that the rank of the school is not an important factor in predicting income.

Companion animal medicine was used as a base comparison for veterinary field employment because it is the veterinary sector in which the largest amount of graduates chose to be employed. Food animal medicine and the industry and university sector, which were fields having the largest male percent of the male population pay higher than that of the female-dominated sector of companion animal medicine overtime (Bain et al., 2015). The reason a greater percentage of males are choosing to go into sectors with higher salaries overtime and why females are not is largely unknown. Arguments as to the location and limited flexibility of the nature of these two fields have been speculated. Even though sectors outside of companion animal medicine have been highlighted as having a higher earnings potential with increased experience, results indicate that all other employments sectors had lower starting salaries in comparison to companion animal medicine. Equine, mixed practice, government, continuing education, and internship or residency coefficients all indicated a negative marginal effect on income in comparison with those practicing companion animal medicine at the 1% level of significance. Those pursuing an internship or residency had the lowest salary, earning $33,243.56 less than that of companion animal veterinarians. Though food animal medicine has the next highest earnings in comparison to companion animal medicine, the difference is insignificant.

The base year, which was used to account for the change between real income over the years, was 2015. The value of the dollar changes overtime and faces adjustments because of inflation. Thus,

dummy year variables were used to serve as a proxy for the changing value of the dollar. All year coefficients were statistically significant at 1% level, with the exception of 2014. This indicates the difference between the income earned in 2014 and 2015 is insignificant at the 5% level. As predicted, the significant years before 2015 all have negative signs, indicating that veterinarians made less in those years compared to the real value of the incomes earned in 2015 due to inflation. There was a positive marginal effect on income in 2016 when compared to 2015.

Regions were chosen as a location proxy to group states with the same starting zip code number together, as further defined in detail in the table 4.4 and displayed in a map in the appendix. Zip code region 3, or the southeast region was chosen as the omitted dummy variable due to the fact that most veterinarians found employment in that region upon graduation. Only zip code Regions 0,1,2,5,6 and 9 were statistically significant at the 1% level, indicating that differences in income between Regions 4, 7, 8, 10 were insignificant in comparison to Region 3. Findings indicate that location only had a significant impact on income earned for those practicing in the South East when compared with those practicing in the North East and East Coast Regions, the Midwest Regions, and West Coast Regions of the United States. Though better proxies for location exist, with the limited data in the Senior Survey dataset results would indicate that the majority of region chosen for employment have an effect on income. Location does matter in certain circumstances when determining a veterinarian's income. The region with the highest income was Region 9, with veterinarians making $5,848.36 more than that of those who chose Region 3 for employment.

5.2 *OLS Female Interaction Term Regression Results*

Table 5.2 below depicts the results from the female interaction term OLS model. The results reveal the estimated wage gap female veterinarians face upon graduating from veterinary school, which is identified as the coefficient on the female variable. The significant coefficients further explain factors which contribute to individual earnings as well as the estimated income disparity between male and female veterinary graduates. Significance tests using p-values at the 0.05 level were used to determine

whether or not to reject the null of the coefficients being significant to the interpretation of the model. Multicollinearity was not present in the data, as the model had a variance inflation factor of less than 10. The White test and Bruesch-Pagan LM test for heteroscedasticity both resulted in p-values of less than 0.001, thus indicating that heteroscedasticity was present within the model. This was corrected for using White's Robust Standard errors when running the regression.

Table 5.2: Senior Survey OLS Female Interaction Term Regression Results

Variable	Coefficient Estimate		Standard Error
Female	-398.69		2222.31
Benefits	837.58	***	69.58
Workhours1	-3035.73	***	1430.94
Workhours3	-1017.63	***	156.74
Workhours4	-1397.24	***	162.50
Child	679.58		468.78
Married	289.72		345.52
Divorced/Widowed	2023.73	**	1160.37
Other Ethnicity	1100.49	*	777.72
Age	76.04	*	44.93
DVM debt	0.0040	*	0.0026
Auburn	2111.96	**	1280.25
Tuskegee	2059.35		1684.07
Colorado State	1099.50		1311.35
University of Florida	3508.76	***	1395.61
University of Georgia	1373.90		1316.52
University of Illinois	3296.91	***	1329.12
Iowa State	1417.36		1262.62
Kansas State	245.34		1270.23
Louisiana State	3713.99	***	1336.71
Cummings	1223.87		1363.70
Michigan State	751.58		1421.49
University of Minnesota	3410.13	***	1393.58
Mississippi State	2857.28		1376.58
Purdue	1008.84		1433.94
Cornell	937.35		1389.06
Oklahoma State	792.38		1285.21
University of Pennsylvania	1384.42		1437.63
Texas A&M	3388.42	***	1245.35
Washington State	128.22		1296.17
Columbia	1744.85		1350.34
Ohio State	1134.87		1260.40
Oregon State	-3396.43	**	1586.01
University of Tennessee	1223.41		1383.66

Table 5.2: Senior Survey OLS Female Interaction Term Regression Results Continued

Variable	Coefficient Estimate		Standard Error
Virginia-Madison	955.03		1259.99
North Carolina State	538.09		1293.45
University of Wisconsin	916.20		1327.11
Western University	-519.30		1769.32
Food	339.80	***	633.54
Mixed	-3313.71	***	481.24
Equine	-15465.95	***	2546.93
Government	-4633.83	***	984.25
Industry/University	-5466.49	***	2546.93
Continuing Education	-25232.34	***	644.46
Internship/Residency	-35583.78	***	651.01
Year01	-20958.70	***	1282.11
Year02	-23094.47	***	1076.73
Year03	-20879.19	***	1081.57
Year04	-20094.44	***	1079.31
Year05	-18146.16	***	1071.29
Year06	-11979.24	***	1079.78
Year07	-10610.53	***	1070.20
Year08	-7770.35	***	1050.82
Year09	-3559.58	***	1167.89
Year10	-3066.58	***	795.29
Year11	-2056.25	***	799.11
Year12	-2581.28	***	856.99
Year13	-715.26		872.23
Year14	-933.06		822.34
Year16	2444.03	***	842.53
Region0	1177.29		778.90
Region1	2942.60	***	721.22
Region2	2243.02	***	606.76
Region4	231.17		660.37
Region5	-948.11		770.81
Region6	-1137.54		745.91
Region7	1332.54	*	697.09
Region8	1226.60		822.59
Region9	7553.26	***	723.76
Region10	4066.28		3158.08
Fem*Benefits	75.87		77.63
Fem*Workhours1	-3846.97	**	1547.28
Fem*Workhours3	-380.98	**	180.56
Fem*Workhours4	-149.24		181.56
Fem*Child	-655.18		660.45
Fem*Married	-692.62	*	387.75
Fem*Divwid	-2134.09	*	1247.23
Fem*Other ethnicity	-904.38		861.17
Fem*Age	-2.78		52.54

Table 5.2: Senior Survey OLS Female Interaction Term Regression Results Continued

Variable	Coefficient Estimate		Standard Error
Fem*DVM debt	0.0010		0.0029
Fem*Auburn	-2328.29		1428.50
Fem*Tuskegee	-389.52		1859.35
Fem*Colorado State	-2208.90		1448.41
Fem*University of Florida	-1996.80		1551.91
Fem*University of Georgia	-1819.98		1456.26
Fem*University of Illinois	-1900.42		1467.41
Fem*Iowa State	-1430.01		1414.39
Fem*Kansas State	-736.49		1418.86
Fem*Louisiana State	-1442.82		1493.18
Fem*Cummings	-1135.16		1501.09
Fem*Michigan State	-202.86		1557.32
Fem*University of Minnesota	-3062.70		1532.32
Fem*Mississippi State	-2852.80		1565.89
Fem*Purdue	-100.14		1581.79
Fem*Cornell	-594.21		1517.58
Fem*Oklahoma State	-1524.88		1453.04
Fem*University of Pennsylvania	-508.70		1586.64
Fem* Texas A&M	-960.44		1396.52
Fem*Washington State	-1521.38		1502.57
Fem*Columbia	-1778.30		1502.57
Fem*Ohio State	-999.98		1391.23
Fem*Oregon State	403.91		1761.86
Fem*University of Tennessee	-2597.76	*	1534.45
Fem*Virginia-Madison	-844.84		1408.88
Fem*North Carolina State	-1480.75		1445.78
Fem*University of Wisconsin	-1563.01		1474.26
Fem*Western	563.65		1929.27
Fem*Food	-2828.75	***	852.93
Fem*Mix	-1180.40	**	555.54
Fem*Equine	-3526.77	**	1392.58
Fem*Govern	-1118.91		1140.93
Fem*Industry/University	-3698.11		3063.49
Fem*Continuing Education	2084.91	***	745.76
Fem*Internship/Residency	2992.87	***	738.81
Fem*Year01	2548.91	*	1420.33
Fem*Year02	3032.21	**	1213.58
Fem*Year03	2103.29	**	1213.58
Fem*Year04	2490.93	**	1217.64

Table 5.2: Senior Survey OLS Female Interaction Term Regression Results Continued

Variable	Coefficient Estimate		Standard Error
Fem*Year05	2462.87		1205.70
Fem*Year06	1937.72		1208.81
Fem*Year07	2738.14	**	1198.30
Fem*Year08	2454.37	**	1177.13
Fem*Year09	-226.39		1290.28
Fem*Year10	256.56		896.64
Fem*Year11	-728.61		890.34
Fem*Year12	-783.18		958.67
Fem*Year13	-811.76		962.53
Fem*Year14	-22.35		911.98
Fem*Year16	-297.41		926.14
Fem*Region0	82.25		860.04
Fem*Region1	-963.82		798.62
Fem*Region2	-1751.17	**	685.03
Fem*Region4	-1033.45		736.56
Fem*Region5	-688.29		867.85
Fem*Region6	125.40		827.87
Fem*Region7	-1488.25	*	792.85
Fem*Region8	-1317.47		899.97
Fem*Region9	-2301.30	***	804.62
Fem*Region10	-4203.92		3472.17
_cons	60673.99	***	1961
Obs: 23,825			
F(139,23685)			
Prob>F : 0.0000			
R-squared: 0.7651			
Root MSE: 10110			

Statistically significant difference at the 10%(*), 5%(**), and 1%(***) levels.

Table 5.2 contains the results for an OLS model that includes all variables from the previous model, as well as each of those variables interacted with a female dummy variable. These interaction terms were included in order to capture the individual effect being gendered female had on each variable. It is important to note that some of the residual wage gap in the statistical analysis may reflect occupational differences between men and women that the broad occupation control variables did not capture.

The interaction term model highlights which coefficients remain significant when one is gendered female. The interaction term is the combined marginal effects of female term and variable coefficients. In this case, many of the variables that were significant in the original OLS model were no longer significant once they were interacted with the female dummy variable. The interaction model allows for a comparison of the female and male group for each of the variables. Variables that are significant in Table 5.2 are the variables within the model for which being female has the largest impact on income. Among the variables that remained significant, only the employment veterinary sectors exhibited consistent statistical significance. Thus, the model depicts that female salaries are highly influenced by what sector of the veterinary field they work in. The aggregate group of females in the dataset appear to be making less money than males in the same employment sectors.

Interaction coefficients which appeared statistically significant at the 1%, 5%, and 10% levels in the OLS female interaction term regression were further analyzed using an F-test. This test determines whether interaction variables that appeared as significant in the interaction model had p-values that indicated if they were statistically different from zero. The null hypothesis was that the interactions were equal to zero, and 5% was decided to be the acceptable level for which the null would be rejected. Interaction variables which were not statically different from zero included the female term interacted with workhours3, married, University of Tennessee, Region7, and Region9. The remaining interaction terms which are statistically different from zero will be further discussed in the analysis.

Table 5.3: F-test of Statistically Significant Interaction Coefficients at the 1%, 5%, and 10% levels

Variable	Significance Levels	
Fem*Workhours1	0.0243	**
Fem*Workhours3	0.0590	*
Fem*Married	0.0590	*
Fem*Divwid	0.0001	***
Fem*University of Tennessee	0.0557	*
Fem*Food	0.0001	***
Fem*Mix	0.0256	**
Fem*Equine	0.0002	***
Fem*Continuing Education	0.0000	***
Fem*Internship/Residency	0.0000	***
Fem*Year01	0.0000	***
Fem*Year02	0.0000	***
Fem*Year03	0.0000	***
Fem*Year04	0.0000	***
Fem*Year07	0.0000	***
Fem*Year08	0.0000	***
Fem*Region2	0.0000	***
Fem*Region7	0.0950	*
Fem*Region9	0.0605	*

Statistically significant difference at the 10%(*), 5%(**), and 1%(***) levels.

In Table 5.3, when employment section coefficients combined with the female interaction term, with the exception of government and industry or university, all were significant at the 5% level. This indicates that different veterinary sector career paths result different incomes. This holds true when accounting for both genders as indicated in Table 5.1, as well as when just observing female veterinarians. The difference in income earned between a female in companion medicine, government practice, or an industry or university setting in inconsequential. In food animal medicine though, females will make less than females in companion animal medicine. Females in mixed practice, equine practice, those pursuing advanced education, and those pursuing an internship or residency have large wage gaps in comparison to females in companion animal medicine. Results suggest that the wage gap amongst females is partially stems from sector earnings variability. Reasons the gap occurs among females within each sector is still unexplained and makes up the residual portion of the wage gap.

When examining the change of significance in Table 5.2 to the original OLS model, females working less than 38 hours and still made less than those females who were working between 38-60 hours per week. However, females working above 80 hours per week showed no significant differences in income when compared females who worked between 38-60 hours a weeks. Thus, females working over 80 hours per week received earnings comparable to those who worked between 38-60 hours a week. The reason for this change in significance for individuals working the highest number of hours from the first model to the second model is unknown.

There existed no statistical difference at the 5% level between the earnings of those females who attended any of the 28 veterinary schools. This would indicate that amongst females, the quality of education and training received at each of the different veterinary schools was inconsequential compared to initial earnings in their employment out of veterinary school. Coefficients on the variables DVM debt, age, and benefits, which were all statistically significance in the OLS model, have an insignificant impact on female's earnings in the interaction term model. Region 2 was the only region that retained its significance after the F-test was conducted. The lack of significance amongst regions when examining females in the population suggests that amongst females, region of the United States chosen to practice does not exhibit a discernable pattern. Thus, the differences in income based on the effect of region chosen for employment exhibits a largely significant effect when looking at the entire sample. However, the effect is somewhat negligible when examining the income differences amongst the female population.

Females made more mean income in 2015, when compared to 2002, 2003, 2004, 2007, and 2008. These differences were significant at the 5% level. These results vary greatly from the initial OLS model in which 2015 was also used as a base comparison year to account for changes in the value of a dollar overtime. In these years, females made more than those in 2015 which goes against expected results of salaries increasing overtime. When comparing earnings, females appear to be making less earnings overtime which could indicate a stagnation of salary growth of the profession, or a deflation of females wages overall.

The regression constant was 60,673.99 indicating the expected mean earnings if all other independent variables were equal to zero and represents the average female earnings. This amount is 1,245.20 less than regression constant in the original OLS model.

5.3 *Nearest Neighbor Matching Results*

Table 5.4 presents the results from the NNmatch Employment Sector Results model. To further examine why veterinary sector was having the largest negative impact on salary for females, the wage gap was examined using the nearest neighbor matching (nnmatch) method in STATA (StataCorp, 2015). The treated group were females and the non-treated group were males. In order to match based on employment choice, the exact match method was utilized. Table 5.4 shows results from incorporating exact matching by employment and the results reveal the estimated wage amongst males and females with similar demographic traits in various veterinary employment sectors. Using this method, matches were determined based on proximity of residuals. In this case, similar individuals who had the same employment categories were matched. The average treatment effect, which measures the effect of the treatment group, was used for this analysis. The nnmatch command provided in STATA allows for a more robust evaluation of the wage gap beyond the mean and provides a within-employment wage gap of males and females with similar demographic backgrounds and employment factors.

Table 5.4: NNmatch Employment Sector Results, 2001-2016

Variable	Female Estimate	AI Robust S.E.
Food Animal	-3131.08	336.37
Mixed Animal	-3516.75	331.63
Equine	-3987.62	327.35
Companion Animal	-4045.47	267.11
Government	-3806.46	325.94
Industry/University	-3851.60	329.78
Continuing Education	-3739.51	316.12
Internship/Residency	-2090.83	218.49
Observations	23,917	

All estimates are statistically significant and the 1% (***) level

In Table 5.4, the within-employment wage gap is larger than the previously estimated OLS model gap of -$2179.11 in almost all sectors. The exception was the -$2090.83 wage gap for the sector of

pursuing an internship or residency. All coefficient estimates calculated in the above table had a statistical significance at the 1% level. The results indicate that the wage gap is actually much larger within sectors than the overall wage gap reported on the mean. Females earn between $3,000-$4,000 less in each sector compared to like male counterparts. Companion animal medicine, which is not only the largest veterinary sector, but also the sector with the largest percent of females, has the largest gender wage gap of $4,045.47. Though veterinarians were shown to earn the highest starting salary in companion animal medicine at the aggregate mean, this sector results in the largest wage disadvantage to females when compared to males of the same caliber. It is interesting that the largest gap exists in the sector where most females are choosing to find employment. Though veterinary sector choice does have an impact on income for both men and women, these findings indicate that no matter the job chosen a wage gap still exists within each sector. Thus, more of the wage gap must be explained in order to further understand why there is still a wage gap within veterinary sectors, as well as what other factors encapsulated within the context of being of a particular gender, contributed to females having an overall lower income.

In Tables 5.5 – 5.12, the nearest neighbor matching method was applied to estimate the treatment effect, using exact matching on both schools attended and employment chosen. Veterinary schools were included to see how, within each employment sector, the wage gap would differ based on variations in the quality of education and training received. Though the OLS models indicated that where one chose to attend veterinary school did not have a statistically significant impact on starting salary, schools were incorporated in exact matching to determine if wage gaps varied amongst institutions. In the dataset there is not measure of the quality of an individual. Thus, school was treated as a proxy for differences in education or training received based on school rankings. From this analysis, female earnings can be compared to those of their male counterparts, based on similar students who chose the same employment and school attended. A result of N/A indicated that fewer than two exact matches existed within the sample. At least two matches are required to produce a viable result. Overall, there was a lack consistency between school premium and effect on the wage gap when mapped across all sectors, which is similar to

results from the OLS models. University of Florida, University of Georgia, Louisiana State University, University of Tennessee and University of Wisconsin had some of the highest wage gaps in food animal practice, mixed animal practice, government, equine practice, continuing education, and internship and residency sectors. Auburn University, University of Pennsylvania, Colorado State University, and University of Minnesota had some of the lowest wage gaps among schools. No one school has the lowest or highest wage gap in all sectors, but the above schools tended to trend towards having the highest or lowest wage gap across sectors. Though employment gaps did vary slightly between employment sector, and all estimates were significant at the 1% level, the gap between the school with the lowest wage gap and the highest wage gap was never more than $400.

Table 5.5: NNmatch by Veterinary College – Food Animal Medicine

Variable	Female Estimate	AI Robust S.E.
Auburn	-2441.68	313.20
Tuskegee	NA	NA
Davis	-2538.74	316.35
Colorado State	-2588.74	321.80
Univ. of Florida	-2734.54	315.95
Univ. of Georgia	-2754.76	317.32
Univ. of Illinois	-2610.04	319.04
Iowa State	-2639.94	318.41
Kansas State	-2616.84	319.48
Louisiana State	NA	NA
Cummings	-2543.81	320.33
Michigan State	-2651.65	320.93
Univ. of Minnesota	-2561.88	322.88
Mississippi State	-2676.32	320.57
Purdue	-2603.134	321.66
Cornell	-2629.87	322.84
Oklahoma State	-2682.66	317.71
Univ. of Penn	-2542.02	316.08
Texas A&M	-2818.35	320.81
Washington State	-2664.87	317.06
Missouri-Columbia	-2543.266	320.25
Ohio State	-2644.68	316.25
Oregon State	-2549.85	317.78
Univ. Tennessee	-2752.99	319.86
Virginia-Maryland	-2624.09	317.58
North Carolina State	-2699.71	320.53
Univ. of Wisconsin	-2722.44	317.67
Western Univ.	NA	NA
Observations	23,917	

All estimates are statistically significant and the 1% (***) level

Table 5.6: NNmatch by Veterinary College – Mixed Animal Medicine

Variable	Female Estimate	AI Robust S.E.
Auburn	-2957.33	302.89
Tuskegee	-3101.12	306.86
Davis	-3089.27	307.41
Colorado State	-2947.75	309.75
Univ. of Florida	-3149.57	304.75
Univ. of Georgia	-3149.28	305.74
Univ. of Illinois	-3094.42	308.84
Iowa State	-3111.52	308.33
Kansas State	-3099.98	307.85
Louisiana State	-3169.50	305.13
Cummings	-3011.71	311.20
Michigan State	-3075.92	309.52
Univ. of Minnesota	-2987.82	312.21
Mississippi State	-3141.15	310.39
Purdue	-3111.75	308.61
Cornell	-3102.48	310.19
Oklahoma State	-3128.58	307.54
Univ. of Penn	-2988.30	306.99
Texas A&M	-3191.89	307.14
Washington State	-3115.61	308.61
Missouri-Columbia	-3020.26	307.29
Ohio State	-3095.23	304.97
Oregon State	-2956.88	305.74
Univ. Tennessee	-3223.47	309.50
Virginia-Maryland	-3044.00	307.70
North Carolina State	-3121.39	310.00
Univ. of Wisconsin	-3229.21	308.42
Western Univ.	NA	NA
Observations	23,917	

All estimates are statistically significant and the 1% (***) level

Table 5.7: NNmatch by Veterinary College – Equine Medicine

Variable	Female Estimate	AI Robust S.E.
Auburn	-3061.49	302.44
Tuskegee	NA	NA
Davis	-3232.69	305.55
Colorado State	-3140.20	309.76
Univ. of Florida	-3346.35	302.93
Univ. of Georgia	-3349.60	304.28
Univ. of Illinois	-3309.79	309.29
Iowa State	-3204.49	306.52
Kansas State	-3264.01	307.67
Louisiana State	-3325.48	305.33
Cummings	NA	NA
Michigan State	-3191.76	310.14
Univ. of Minnesota	-3148.48	311.73
Mississippi State	-3262.86	307.36
Purdue	NA	NA
Cornell	-3197.67	311.34
Oklahoma State	-3283.84	307.94
Univ. of Penn	NA	NA
Texas A&M	-3365.87	307.47
Washington State	-3269.97	308.85
Missouri-Columbia	NA	NA
Ohio State	-3237.09	303.95
Oregon State	NA	NA
Univ. Tennessee	-3311.60	308.89
Virginia-Maryland	NA	NA
North Carolina State	-3269.66	310.31
Univ. of Wisconsin	-3339.00	307.311
Western Univ.	NA	NA
observations	23,917	

All estimates are statistically significant and the 1% (***) level

Table 5.8: NNmatch by Veterinary College – Companion Animal Medicine

Variable	Female Estimate	AI Robust S.E.
Auburn	-3545.74	259.12
Tuskegee	-3703.94	259.80
Davis	-3768.17	261.48
Colorado State	-3687.47	259.08
Univ. of Florida	-3667.11	259.02
Univ. of Georgia	-3784.64	258.82
Univ. of Illinois	-3746.16	259.90
Iowa State	-3746.99	264.23
Kansas State	-3688.21	262.92
Louisiana State	-3788.58	263.07
Cummings	-3664.74	257.88
Michigan State	-3652.02	261.52
Univ. of Minnesota	-3643.36	263.57
Mississippi State	-3666.69	257.04
Purdue	-3791.80	259.91
Cornell	-3681.71	261.08
Oklahoma State	-3798.07	261.14
Univ. of Penn	-3548.27	257.10
Texas A&M	-3834.02	262.46
Washington State	-3753.23	261.48
Missouri-Columbia	-3689.94	262.57
Ohio State	-3588.32	256.15
Oregon State	-3675.37	257.24
Univ. Tennessee	-3701.03	261.20
Virginia-Maryland	-3706.91	260.26
North Carolina State	-3722.64	264.01
Univ. of Wisconsin	-3770.53	259.77
Western Univ.	-3745.16	259.87
observations	23,917	

All estimates are statistically significant and the 1% (***) level

Table 5.9: NNmatch by Veterinary College – Government

Variable	Female Estimate	AI Robust S.E.
Auburn	-3043.66	305.02
Tuskegee	NA	NA
Davis	NA	NA
Colorado State	-3090.12	311.60
Univ. of Florida	-3271.19	304.37
Univ. of Georgia	-3272.64	306.99
Univ. of Illinois	NA	NA
Iowa State	-3122.21	308.45
Kansas State	-3165.55	308.72
Louisiana State	-3277.68	307.41
Cummings	-3107.68	314.12
Michigan State	-3157.83	312.37
Univ. of Minnesota	-3095.65	314.44
Mississippi State	-3224.99	309.38
Purdue	-3154.06	310.14
Cornell	-3191.66	313.23
Oklahoma State	-3292.61	309.12
Univ. of Penn	NA	NA
Texas A&M	-3317.87	308.15
Washington State	-3221.53	312.01
Missouri-Columbia	-3123.63	308.74
Ohio State	-3198.81	304.42
Oregon State	-3292.61	309.12
Univ. Tennessee	-3272.89	310.00
Virginia-Maryland	-3205.52	306.70
North Carolina State	-3224.14	311.88
Univ. of Wisconsin	-3288.73	307.96
Western Univ.	NA	NA
observations	23,917	

All estimates are statistically significant and the 1% (***) level

Table 5.10: NNmatch by Veterinary College – Industry/University

Variable	Female Estimate	AI Robust S.E.
Auburn	NA	NA
Tuskegee	NA	NA
Davis	NA	NA
Colorado State	NA	NA
Univ. of Florida	NA	NA
Univ. of Georgia	NA	NA
Univ. of Illinois	-3259.83	313.08
Iowa State	-3177.71	312.01
Kansas State	-3190.64	311.44
Louisiana State	NA	NA
Cummings	NA	NA
Michigan State	-3161.83	314.33
Univ. of Minnesota	-3104.80	317.72
Mississippi State	-3205.86	311.80
Purdue	-3163.30	312.21
Cornell	-3150.71	315.38
Oklahoma State	NA	NA
Univ. of Penn	NA	NA
Texas A&M	-3321.42	331.23
Washington State	NA	NA
Missouri-Columbia	NA	NA
Ohio State	-3213.55	304.30
Oregon State	NA	NA
Univ. Tennessee	NA	NA
Virginia-Maryland	NA	NA
North Carolina State	-3208.30	312.84
Univ. of Wisconsin	NA	NA
Western Univ.	NA	NA
observations	23,917	

All estimates are statistically significant and the 1% (***) level

Table 5.11: NNmatch by Veterinary College – Continuing Education

Variable	Female Estimate	AI Robust S.E.
Auburn	-3030.02	294.79
Tuskegee	-3164.21	298.64
Davis	-3197.66	297.49
Colorado State	-3112.72	303.42
Univ. of Florida	-3269.43	295.91
Univ. of Georgia	-3312.77	296.18
Univ. of Illinois	-3224.21	301.16
Iowa State	-3144.21	298.52
Kansas State	-3156.87	298.11
Louisiana State	-3252.22	297.82
Cummings	-3128.79	305.37
Michigan State	-3183.52	300.17
Univ. of Minnesota	-3106.40	304.98
Mississippi State	-3195.42	300.88
Purdue	-3161.78	300.48
Cornell	-3169.00	301.80
Oklahoma State	-3238.06	299.20
Univ. of Penn	-3101.25	299.84
Texas A&M	-3306.17	299.07
Washington State	-3220.15	301.36
Missouri-Columbia	-3132.17	298.11
Ohio State	-3177.10	294.97
Oregon State	-3113.04	296.84
Univ. Tennessee	-3276.59	300.18
Virginia-Maryland	-3141.25	296.25
North Carolina State	-3201.26	301.15
Univ. of Wisconsin	-3269.41	297.12
Western Univ.	NA	NA
Observations	23,917	

All estimates are statistically significant and the 1% (***) level

Table 5.12: NNmatch by Veterinary College – Internship/Residency

Variable	Female Estimate	AI Robust S.E.
Auburn	-2178.25	214.71
Tuskegee	-2190.79	211.12
Davis	-2205.82	212.96
Colorado State	-2135.17	213.42
Univ. of Florida	-2184.19	210.16
Univ. of Georgia	-2181.17	211.22
Univ. of Illinois	-2257.08	211.02
Iowa State	-2133.80	211.43
Kansas State	-2161.55	211.06
Louisiana State	-2198.93	210.69
Cummings	-2154.72	210.07
Michigan State	-2133.18	215.17
Univ. of Minnesota	-2092.26	214.31
Mississippi State	-2156.95	209.31
Purdue	-2189.07	211.83
Cornell	-2114.33	211.64
Oklahoma State	-2179.88	212.88
Univ. of Penn	-2102.71	211.32
Texas A&M	-2220.77	211.02
Washington State	-2206.08	215.36
Missouri-Columbia	-2150.17	211.20
Ohio State	-2062.41	206.01
Oregon State	-2105.79	210.94
Univ. Tennessee	-2169.45	210.22
Virginia-Maryland	-2172.12	211.68
North Carolina State	-2177.86	211.88
Univ. of Wisconsin	-2181.42	212.68
Western Univ.	-2180.69	212.86
Observations	23,917	

All estimates are statistically significant and the 1% (***) level

Table 5.13 presents a comparison of the wage gap estimates from the different methods applied in the three-step approach. The female coefficients for the OLS Regression and the Nearest Neighbor Matching Method are estimates of the wage gap. The Nearest Neighbor Matching estimate is a single estimate of the wage gap without incorporating the use of exact matching by employment sector or veterinary college attended. When matching males and females of the same caliber the wage gap is much larger than the estimated OLS wage gap, or the aggregate average wage gap. As shown above in the

previous NNmatch tables, when exact matching is implemented, the wage gap can be further examined by chosen employment sector and college.

Table 5.13: Comparison of Three-Step Method Wage Gap Estimates

Method	Coefficient	Standard Error	Interpretation
OLS Regression	-2179.11***	170.05	Wage Gap Estimate
Propensity Score Matching: Nearest Neighbor	-2830.322***	307.09	Wage Gap Estimate

From the OLS analysis, it can be concluded that factors, such as work region, sector employed, benefits, year graduated from veterinary school, and workhours have an effect on income variability. However, the wage gap appears larger than it does on the mean when examined further by comparisons in job sector and education and training received. When examining the results from all models presented, it cannot be denied that a substantial wage gap exists between graduating male and female veterinarians. This gap grows increasingly larger when stepping away from comparisons of the mean population and similar individuals who differ only in gender are compared. Thus, the remaining residual portion of the wage gap can still not be explained by the variables presented in the models. At this time the residual portion of the wage gap inferred as being linked to discrimination or systematic bias. It is important to note that other factors not included in the model that appeared in the literature review could also further explain the residual, as opposed to simply determining the unexplained portion as being entirely the result of gender discrimination. The factors that contribute to the wage gap are still largely based on theories and hypotheses, but could be potentially linked to preference for workhours flexibility, business acumen, confidence in ability, salary negotiation, veterinary market location, productivity measures, factors influencing career choices, as well as discrimination. Unfortunately, none of these elements appeared in the dataset, so whether the residual can be explained by any of these, or whether is purely based on discrimination cannot be determined at this time. The variables in OLS model can explain 76% of the model, but what explains the rest is uncertain.

CHAPTER VI: DISCUSSION AND CONCLUSION

Though many different models and methods have tried to explain the wage gap over the years, results about the unexplained portion of the wage gap are still largely based on conjectures. The residual unexplained salary gap could be partly attributed to other inconsistencies between male and female veterinarians beyond the scope of the current data and models.

5.1 Discussion of Results

Findings from the OLS models indicate the aggregate wage gap may largely be explained by employment characteristics, year graduated from veterinary school, location, and demographic factors. In further analyses with propensity score matching, within sector wage gaps were shown to be larger than that of the aggregate mean when comparing like male and female veterinarians. The three-step methodology process essentially starts from the magnified lens of examining the wage gap at the mean through the OLS models, and then further zooming in to look at how the wage gap is actually much larger than originally calculated when comparing individuals with the same demographic factor through nearest neighbor matching. The treatment effect of being a female veterinarian results in a wage gap estimate which varies based on job sector, as well as training and education received from the 28 accredited veterinary colleges.

Evaluation of the nearest neighbor matching wage gap differences was particularly revealing. While the OLS models estimated that females made the highest starting salaries in companion animal medicine, NNmatch estimates indicated that in this sector females had the largest wage disparity in comparison to their male counterparts. Thus, the field with the highest number of females actually results in a huge discrepancy in how males and females in this sector are paid and how their worth is values. Though food animal medicine is a male-dominated sector of the veterinary field, and was shown to pay less than companion animal medicine, it is the employment sector, with the exception of further training through pursuit of an internship or residency, with the lowest wage gap. Females and males in the food

animal sectors have more similar wages than when comparing males and females in the companion animal sector medicine. This analysis sheds light not only on differences in average salary between the varying veterinary sectors, but also how valuation of a women's salary in comparison to men varies between sectors. Within sector wage gap variability is a factor that is still largely unexplained and lies within the residual component of the wage gap and these findings set the stage for further research on this topic. Revealing the invisible preferences and barriers, which result in male and female veterinarians choosing different areas of employment within the industry, could potentially provide more insight as to why the wage gap exists by revealing more of the illusive unexplained portion.

Even though the veterinary field is now eighty percent female, it is not the entire veterinary field that is feminized, only certain sectors of it. For example, while females dominate companion animal medicine, males still outnumber females from a population percentage in large animal and food animal medicine as well as in becoming private practice owners. In comparison, these veterinary fields dominated by men are rewarded with in higher salaries than companion animal medicine. Further research as to why male and female veterinarians are being drawn to different areas of employment in the veterinary industry could give insight as to why the wage gap exists. The possibilities of a systematic bias in hiring and weak salary negotiation amongst females should still be kept in mind as a possible contribution to females overall lower salaries when compared to their male counterparts.

The coefficients of employment type were significant across all models, and studies have depicted how most females are drawn to companion animal practice and are dissuaded from large animal, food, or industry. This evidence implies that barriers between males and females within the profession, which influence employment choice, could be a main cause in explaining female veterinarians lower salaries in comparison to males. Further research needs to be conducted to determine what barriers still exist between males and female veterinarians, which translates to differences in choices of employment and career. The desired lifestyle of veterinarians is also a factor that needs to be taken into account in employment and income differences. Whether women are choosing their desired employment based on

the benefits and other utility it provides beyond income must be further researched in order to determine if differences in gender objectives and choices in life are linked to the wage gap in the veterinary field. The potential impact of lifestyle and choices on salary raises the question as to whether men are more driven to choose employment on basis of income potential in comparison to females, or if choices do not actually explain the wage gap, and the income disparity is simply the result of bias from a flawed system. The analysis section above revealed the bare bones of the explained portion of the wage gap. While these unobserved characteristics could potentially correlate with gender variability, the differences could also be explained by discriminatory practices within the workplace.

More research and a new dataset which is comprehensive in the sense that it includes measures of stated hypotheses in the wage gap literature be implemented before one can correlate a particular hypothesis to being the cause of the wage gap. Such hypotheses include preference for workhours flexibility, business acumen, confidence in ability, salary negotiation, veterinary market location, productivity measures, factors influencing career choices, as well as discrimination. The data in the Senior Survey was not comprehensive enough to reveal the unexplained portion of wage gap. Further examination of male and female veterinarians' productivity, their aptitudes and attitudes, as well as other factors as to why veterinarians choose given sub fields within the industry could provide greater understanding of the unexplained portion of the wage gap. Such an assessment would allow the AVMA to better understand the discrepancy of wages between genders, as well as potential implications of the wage gap for both male and female veterinarians as a continued disproportional growth of females enters the field.

There were a few other issues in the research and analysis conducted because of the Senior Survey dataset. In creating the model, the largest source of bias came from lack of observations for particular survey questions that had an impact on determination of income. For example, location is an essential factor in determining variations in income, but after creating a location index for veterinarians working in either rural, urban, or suburban areas, it was discovered that not enough observations had been

collected in comparison to other variables, and thus this variable could not be included in the model. Instead, region was used as a location proxy, but did little to reveal the affluence of the community or market in which the graduating veterinarians worked. As mentioned in the data section, potential overestimation of self-reported workhours and expected salaries resulted in some very large and seemingly implausible figures which could have resulted in an imprecise measure of the estimated wage gap.

5.2 Career path Survey

Taking into account theories from literature, new survey data, which would allow the creation of a model to ascertain the affect having certain aptitudes and attitudes, as well as categorically associated male or female stereotypes, could potentially further explain more of the unexplained portion of the wage gap. The AVMA did not create a comprehensive survey geared towards asking questions relating to gender differences between veterinarians. A survey with a comprehensive set of questions which highlight differences in veterinary quality, productivity and attitudes, what women and males seek in a job, and the opportunities would allow for an in depth analysis of gender differences, and if any of these particular differences are significant in explaining the residual portion of the wage gap.

The driving mechanism behind the Career Path Survey is to understand why the wage gap occurs between male and female veterinarians in their first employment following graduation, despite the fact that both have similar training, experience, and education. This survey could build off the AVMA Senior Survey dataset, while incorporating questions that allow for the determination of attitudes and aptitudes of individual veterinarians, an evaluation of the employment opportunities for males and females, potential barriers faced in their job search, and skills necessary to be a successful veterinarian. Such questions would provide insight as to whether males and females are inherently different in their employment choices.

This survey would be designed for the dual purpose of addressing the gender wage gap and tracing the career paths of veterinarians from their first employment following graduation to their current

employment. Questions about the nature of first employment space and what veterinarians look for when searching for first employment would reveal if there are differences in the driving factors behind what positions males and females choose, as well as potential explanations for income variability. The survey would also ask questions pertaining to current employment in order to reveal how veterinarians collectively have evolved in their careers and how their employment choices and income changes overtime. If the driving mechanism behind choices is inherently different amongst gender, this survey would further provide insight as to how veterinarians are optimizing career choice based on the optimization of their capabilities as a veterinarian and lifestyle choices.

In addition to including questions that allow for assessment of the quality of a veterinarian, the designed survey instrument should contain questions pertaining to measurements of productivity. These measures would allow for an assessment of potential gender productivity differences. It can be hypothesized that having a higher individual value to the practice or organization could potentially be a driving force behind salary determination. An examination of factors affecting value could highlight if discrepancies exist within gender, which could potentially influence wages.

As far as survey sample, the intended target audience would be a sample of veterinarians who have been in their career for 2-6 years has been deemed to be an appropriate audience by the AVMA. This target group would have minimal to moderate experience in working in the profession, somewhat comparable salaries to the graduating student population, and would be able to remember their first employment experience.

The survey questions outlined above accomplish the goal of providing data to answer underlying questions pertaining to potential differences between male and female veterinarians, which could further reveal why the wage gap exists in starting salaries. All of these questions are derived from and consistent with findings in the wage gap literature which highlight prospective explanations for the wage gap. It is hypothesized that some fundamental difference within gender exists which is correlated to the differences in starting salaries. The proposed survey design would allow for further understanding of these differences.

Further, examination of male and female veterinarians' productivity, their aptitudes and attitudes, as well as other factors as to why veterinarians choose given sub fields within the industry would provide greater understanding of the unexplained portion of the wage gap. This assessment would allow the AVMA to better understand the discrepancy of wages between genders, and assess the implications of this gap for all veterinarians as a continued disproportional growth of female veterinarians enter the field.

5.3 The Future of the Industry

Though the wage gap is not entirely understood, conjectures have been made in order to account for the change in the gender structure of veterinary medicine. For example, according to Slater and Slater (2000), women would benefit from a corporate model of veterinary health care, which could potentially be the model of veterinary medicine in the future. A system which gives practitioners a known work schedules and benefits without afterhours emergency duty would allow for more flexibility between professional and personal life. Though this is one option, and many more are sure to be considered in the future, the needs of female veterinarians must be taken into consideration as a priority in the profession if the structure of the profession is going to continue evolve into a more female-dominated atmosphere.

There is a worry that with the increase of feminization in the veterinary profession will result in less rural and food animal veterinarians. However, incentives such as the Veterinary Medicine Loan Repayment Program, which was established by the National Veterinary Medical Services Act on December 6, 2003, exchange a loan repayment of three years with $25,000 dollars for each year served for service in a location suffering from a shortage of veterinarians (AVMA.org, 2017). Legislation resulting in government inducements and repayment programs can incentivize female veterinarians to expand more into rural veterinary medicine or the fields or large and food animal medicine as the aggregate mass of DVM debt continues to increase overtime.

In conclusion, the veterinary market has changed rapidly since females first entered the profession. The veterinary market will change more in the future and the consequences, whether positive

or negative are still yet to be seen. The understanding of the wage gap is essential due to the fact that if females consistently make less than male veterinarians, then overtime as more females enter the profession the mean wage will be set lower for the profession overall. There is no women's work or men's work when it comes to veterinary medicine. All veterinarians, regardless of gender should be paid what they are worth.

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APPENDIX A

Figure A.1 is a map of the different United States zip code regions and the states included in each region. These numbered regions were categorically defined in variable Table 4.4.

Figure A.1