1-1-2006

Risk as a compensating differential in a hedonic wage equation

Cathryn J Santoro
University of Nevada, Las Vegas

RISK AS A COMPENSATING DIFFERENTIAL IN A HEDONIC WAGE EQUATION

by

Cathryn J. Santoro

Bachelor of Science
Boston College
1991

Master of Business Administration
University of Nevada, Las Vegas
2000

A thesis submitted in partial fulfillment
of the requirement for the

Master of Arts Degree in Economics
Department of Economics
College of Business

Graduate College
University of Nevada, Las Vegas
May 2006

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

Thesis Approval

The Graduate College
University of Nevada, Las Vegas

12/12, 20 05

The Thesis prepared by

Cathryn J. Santoro

Entitled

Risk As A Compensation Differential In A Hedonic Wage Equation

is approved in partial fulfillment of the requirements for the degree of

Master of Arts Degree in Economics

Examination Committee Chair

Dean of the Graduate College

Examination Committee Member

Mary Riddel 12/14/05

Examination Committee Member

12/14/05

Graduate College Faculty Representative

1017-53

ABSTRACT

Risk as a Compensating Differential in a Hedonic Wage Equation

by

Cathryn J. Santoro

Dr. Thomas Carroll, Examination Committee Chair
Professor of Economics
University of Nevada, Las Vegas

Risk could be considered both a disagreeable characteristic of employment (i.e. the risk of death, injury) or, as noted previously, a factor in the probability, or more importantly, the improbability of success (i.e. the greater the risk in success, the less stable future earnings and employment). Accordingly, the inclusion of future wage risk in a study of compensating wage differentials is a logical step and, thus, the focus of this study.

Drawing a corollary between the theoretical framework of compensating wage differentials and the theory of risk aversion, this paper seeks to measure whether or not wage risk has an effect on observed wage rates in a hedonic wage equation.

TABLE OF CONTENTS

ABSTRACT iii

CHAPTER 1 INTRODUCTION 1

CHAPTER 2 LITERATURE REVIEW 3

CHAPTER 3 THEORETICAL BACKGROUND 7
Theory of Wages 7
Compensating Wage Differential Theory 11
Hedonic Theory of Wages 12
Theory of Risk 13

CHAPTER 4 EMPIRICAL STRATEGY 14

CHAPTER 5 DATA AND EMPIRICAL RESULTS 18
Data 19
Empirical Results 20

CHAPTER 6 CONCLUSION 23

BIBLIOGRAPHY 25

VITA 28

CHAPTER 1

INTRODUCTION

The theory of compensating differentials was conceived by Adam Smith in *The Wealth of Nations* over 200 years ago. Despite the passage of time, the theory remains an established framework for the analysis of wage differentials in contemporary economic institutions today. In general, the theory holds that differences in pecuniary wages are required to compensate for the non-pecuniary advantages and disadvantages of different employments. Chief among these are differences among workers in levels of education and training and differences among jobs in terms of various noneconomic attributes, such as status, prestige, and the quality of working conditions.

Although singled out as the principal compensating wage differential in the human capital model, a learning requirement is not the only non-pecuniary characteristic of employment noted by Smith. Others include the agreeableness or disagreeableness of the employment, the constancy or inconstancy of employment, the degree of trust required, and the probability of success, this last being a variation on risk.

Risk could be considered both a disagreeable characteristic of employment (i.e. the risk of death, injury) or, as noted previously, a factor in the probability, or more importantly, the improbability of success (i.e. the greater the risk in success, the less stable future earnings and employment). Accordingly, the inclusion of future wage risk in a study of compensating wage differentials is a logical step and, thus, the focus of this study.

Drawing a corollary between the theoretical framework of compensating wage differentials and the theory of risk aversion, this paper seeks to measure whether or not wage risk has an effect on observed wage rates in a hedonic wage equation and is outlined as follows: Section Two serves to address the current literature that which focuses on the effects of earnings variation on individual wages. Section Three provides the core microeconomic theory, with a focus on both compensating wage differentials and risk theory so as to develop the empirical model, that which is illustrated and explained in Section Four. Section Five provides an analysis of the test results, including core tables and statistics; and Section Six concludes the study.

CHAPTER 2

LITERATURE REVIEW

Current literature specifically addressing the effects of earnings variation on individual earnings is small in comparison to the general subject matter of risk itself. Levhari and Weiss (1974) developed a framework to assess the effects of uncertainty as it pertains to human capital, specifically noting the significance of the correlation between human capital and earnings. Although not technically a paper on wage risk (defined as factors related to the uncertainty of future income, including expected length of employment, security of employment (the risk of being made unemployed), promotion prospects...) and its direct effects on individual earnings, this early research opened the door for future studies.

King (1974) was one of the first to introduce the wealth-risk corollary by studying the effects of wage risk and wealth on income within educational groups, specifically males between the ages of 35-44 with four years of college. Measuring risk as the standard deviation of income within occupations for specific classes of workers, King showed that the mean income of workers was higher in those occupations where workers faced more wage uncertainty.

Dividing the sample group even further, Johnson (1977), measured the effects of wage risk on individual earnings within an occupation for individuals categorized by race, education and age. Using a mean-variance measurement, Johnson also showed that occupations with greater risk were found to pay higher mean wages. Johnson expanded upon previous research by drawing the effects of worker mobility (ability of willingness of a worker to change jobs) into the equation and concluding that workers facing more uncertainty have a greater degree of mobility and, in turn, receive lower compensation for earnings uncertainty. They show that workers may actually prefer a riskier situation if they have a sufficiently high degree of mobility.

Feinberg (1981) was one of the first to use panel data to consider the variation in income of an individual over time. Feinberg modified the risk measurement, using the residual of the equation instead of the previous measurements that which relied upon the more popular mean-variance approach. The use of the residual creates potential econometric issues, though, violating a major assumption of classic linear regression, that which requires that explanatory variables and the disturbance term are not correlated. Violation of this assumption results in coefficients that are both biased and inconsistent.

Despite the use of the residual as the source of measurement for risk, Feinberg's findings supported previous studies with greater uncertainty leading to higher wages over time. Similar findings were also supported in a study by Leigh (1983), who also used the residual as the form of measurement, confirming yet again the positive relationship between wage risk and individual wages.

Extending Johnson's earlier concept of worker mobility on compensating wages for earnings risk, McGoldrick and Robst (1996) used simultaneous equations where wages and the degree of mobility were endogenous. Using panel data, the authors' results supported the traditional job-shopping model and found that workers facing more uncertainty with respect to future wage growth had a greater degree of mobility and, in turn, received lower compensation for said uncertainty. McGoldrick further modified the residual form of measurement, with risk quantified as the standard deviation of the residual for each industry and occupation, respectively.

As a further refinement to previous studies that which use the residual as the source of measurement for risk, Hartog, Plug, Diaz Serrano and Vietra (2003) tested for the effect of earnings variation on individual earnings by using a measurement for not only risk but also skewness. Their hypothesis[1] is that workers dislike risk (earnings variance) but like skewness (small probabilities of receiving very high earnings) and, thus, would expect a positive sign on risk and a negative sign on skewness. They argued that one could pull out the systematic risk in the error term by taking the antilog of the original error term, calculating risk and skewness thereafter with the unsystematic portion of earnings variability transferred back to the model.

Accordingly, the authors generated risk and skewness measures by first estimating an earnings equation, then taking the antilog of the error term, third calculating the second and third moments from the antliog, and finally re-running the earnings equation with the values for risk and skweness included. Although the authors were able to reject the null hypotheses that both risk and skewness did not positively affect an individual's wage

---

[1] Their hypothesis remains in this study but the measurement differs so as to avoid the econometric issues noted.

earnings, one cannot rely on these estimates in the presence of a major violation that which was prompted by their use of the error term generated for the current year's observations (previous studies risk was estimated from residual variation over time).

CHAPTER 3

THEORETICAL BACKGROUND

Earnings differentials among workers can be analyzed on the basis of many different characteristics, such as occupation, industry, gender, or race. Occupational differentials are one of the most important, though, because they capture the influence of several of the principal determinants of earnings in the labor market, such as education and training requirements as well as noneconomic attributes including autonomy and flexibility and the quality of the working conditions. The theory of compensating wage differentials is devoted to the study of such differentials, a theory that which was conceived by Adam Smith in *The Wealth of Nations* over 200 years ago and remains an established framework for the analysis of wage differentials in contemporary economic institutions today. To better understand the theory of compensating wage differentials, it is important to develop the foundation of wage determination, which begins with the core elements of the demand and supply of labor.

The demand for labor on the part of business firms is a derived demand – derived from the demand for the good or service produced by the firm – and arises only to the extent that labor is a necessary factor input in the production of said good or service. The labor demand curve represents the employer's estimate of the appropriate rates of labor input in its production function so that the employee's marginal contribution to revenue is equal to the marginal cost of hiring. The employee's marginal contribution to revenue is given by the extra output he/she produces (the marginal product) times his/her market price, the marginal revenue product (MRP), and reflects non-pecuniary characteristics of human capital (proxied by education), experience (proxied by age) and unobserved characteristics, that which would include honesty and intelligence, to name but two.

MRP is downward sloping due to the diminishing marginal productivity of labor with firms hiring up to that point at which MRP=wage rate (w) with profits at a maximum, the goal of the firm in a perfectly competitive environment and other industry structures. In order to maximize profit it is important to seek out those workers who are likely to be the most productive (have the highest MRP) and adjust its use of labor and capital to achieve the lowest costs of production at the same time. Isoquants show those alternative combinations of capital and labor than can produce a given level of output while isocosts show all of the combinations of capital and labor that can be purchased for a fixed dollar expenditure, given the prices of the two inputs. The production duality of capital and labor imply that the same tangency identifies the lowest cost for a given rate of output, or the highest output for a given cost. The point at which the isocost line is tangent to the isoquant curve represents the optimal level of employment and gives the demand for labor.

The supply of labor is derived from the individual's (the "worker") willingness to trade time for income in order to maximize utility - a choice between labor and leisure. Quantity of hours supplied to the labor market is the result of the interaction between the labor/leisure choice (the demand for leisure v. the supply of labor) and the price of this leisure in terms of lost income. Leisure is desired for its own intrinsic qualities and income (received via labor) for the goods and services it can buy.

The choice between labor and leisure results in the indifference curve and measures the number of dollars that the individual psychologically feels that each hour of leisure is worth. Every point on the curve represents those combinations of income and leisure that yield exactly the same level of utility. The curve shifts out at higher levels of utility. To maximize utility, the appropriate decision rule is to keep on working additional hours as long as the wage earned exceeds the psychological valuation of that hour of leisure.

Since leisure is demanded (a normal good) – one expects the curve to be downward sloping (the higher the price of the good, *ceteris paribus*, the lower the quantity of it demanded) with less leisure hours demanded when levels of income are higher. The curve is also convex to the origin – only so many hours of leisure time are available so it is not a one-to-one tradeoff or similar exact ratio but rather a diminishing trade-off. This results in the diminishing marginal rate of substitution (MRS) and represents the slope of the indifference curve or the individual's psychological value of time. The shape and degree of convexity to origin can be different depending upon an individual's preference of income versus leisure.

The price of leisure (which is what is demanded) is equal to the wage rate per hour of work (the higher the wage, the higher the price of leisure) and gives rise to the budget constraint, which shows all the various combinations of income and hours of work that are available to an individual given the wage he or she can earn in the market. The budget constraint represents the value of this person's time to the market with the slope of the budget constraint equal to the negative of the wage rate – the amount of income lost for each extra hour of leisure. It is important to note that an individual's budget is modified in the presence of nonlabor income and the individual's resulting labor supply function now dependent upon both the real wage rate and on the amount of real nonlabor income present, the level of wealth.

It is at the intersection of the indifference curve and the budget constraint that the person maximizes utility. Thus, the quantity of labor supplied is given by the condition that MRS=w and identifies the marginal hour worked. It is only when $MRS=w$ or $MRS < w$ that one will enter the labor market, as w now exceeds the individual's reservation wage, or w_r (the amount of money that this person would have to be paid to be induced to work the first hour).

Ultimately, labor market equilibrium is established through the interaction of individuals' labor supply decisions and firms' decisions about how much labor to hire with the observed wage rate evident at the point of intersection. The firms' decisions about how much labor to hire (labor demand curve) are impacted by their estimate of the workers' MRP while the individuals' labor supply decisions are affected by said worker's reservation wage.

With an understanding of how supply and demand curves are formed, one can turn to the theory of wage determination. The starting point in developing the theory of wages is the model of perfect competition, which best illustrates how market forces operating through labor demand and supply interact to determine the wage rates and the equilibrium level of employment. The five assumptions of the model of perfect competition are as follow:

1) firms seek to maximize profits and workers seek to maximize utility

2) workers and firms have perfect information about wages and opportunities
3) workers are identical with respect to skills and productivity; jobs offered by firms are identical with respect to working conditions and other nonwage attributes
4) composed of many individual buyers and sellers – collusion does not exist
5) all jobs open to competition – complete mobility

If the labor market satisfied all five assumptions of the perfectly competitive model, there would be only one wage paid by each firm in the market (the law of one wage: interaction between buyers (firm) and sellers (worker) will result in the establishment of one going wage rate that is paid by all firms and received by all workers in the long-run equilibrium state). Most real-world labor markets, however, feature factors or circumstances that prevent the forces of competition and labor mobility from completely eliminating all wage differentials, one of the primary factors that of the heterogeneity of workers and jobs.

Competitive theory predicts that a single wage rate will prevail in the market for a set of homogenous jobs and workers; however it is reasonably certain that occupations differ from one another in terms of many characteristics, or job attributes, both positive and negative. Adam Smith, in explaining earnings differentials among occupations, postulated that people selected an occupation not on wage alone, but on the whole of the attributes and choosing the one yielding the highest level of net advantages. For equilibrium to occur in the labor market, wage rates would need to be higher in the least desirable occupations (more negative job attributes: risk of injury, death…) and lower in the most desirable occupations (more positive job attributes: flexible working hours, high social status...) until the total of advantages and disadvantages were equalized. The differences in rates of pay among occupations, thus, would represent compensating wage differentials in the sense that they equalize the net attractiveness of each occupation with the supply and demand for labor.

An empirical analysis of the compensating wage differential theory can be performed within the framework of the hedonic prices model, developed by Sherwin Rosen, one can see how wages adjust to compensate workers for differences in job characteristics. A key feature of the hedonic model is that it allows for differences in worker preferences, as illustrated by their indifference curve, and differences in the firm's isoprofit curves with workers sorting themselves into jobs with different characteristics based on their individual preferences regarding those characteristics. It is at the intersection of the indifference curve (a factor in the supply of labor) and the isoprofit curve (a factor in the demand for labor), achieved through the matching process of workers and jobs that the labor market gives rise to a compensating differential and an equilibrium wage rate attained.

Applied to the theory of compensating wage differentials, the hedonic wage equation is fundamentally a relationship between observed wages, demand side variables (that predict MRP) and supply side variables (that predict w_r). Since the employer must predict productivity before hiring or promotion and the worker can only imperfectly anticipate job characteristics, both MRP and w_r are subject to uncertainty. Furthermore, the researcher can only observe some variables with others playing the role of latent variables, captured by the error term in the structural equations and, thus, represented in the hedonic wage equation, which is a reduced form equation of the structural equations with the endogenous variable, wage rate, expressed solely as a function of the exogenous variables and stochastic disturbance term. The individual coefficients of the exogenous variables reflect supply and demand side effects. The coefficients are nonlinear combinations of demand *and* supply side coefficients.

Although traditional hedonic wage equations typically include noneconomic attributes that are certain and observable, education and age, to name but two, reasoning suggests that in a model that places emphasis on imperfect information of productivity and job characteristics on behalf of the employer and worker, respectively, and uncertainty of future income inclusion of a measure of wage risk would be appropriate.

Risk theory holds that a risk averter, by definition, prefers the certain income as opposed to a fair bet, that which could theoretically result in a higher expected value, while a risk-preferring individual will pay to take on the risk of the bet. Ultimately, the risk averter will pass up the opportunity to earn more for the privilege of certainty while the risk preferring individual discounts certainty and views the ability to take on the risk as a privilege. Generally, an individual chooses a job based upon his/her evaluation of all the principal features of the employment, beyond just pecuniary awards alone. In addition to the non-pecuniary aspects, intrinsic job factors that which could include concerns pertaining to the expected length and security of employment, promotion prospects, and the uncertainty of future income, play a critical role in the ultimate decision. The job searcher ranks job prospects by their pecuniary and their non-pecuniary aspects. If qualified applicants prefer occupation (or industry) A to B because $\sigma_A < \sigma_B$ and qualified applicants are risk averse, then w_A falls and/or w_B rises until the markets clear. The situation will be reversed if job applicants are risk lovers.

CHAPTER 4

EMPIRICAL STRATEGY

The hedonic wage equation, as applied to the theory of compensating wage differentials, is fundamentally a relationship between wages and the human capital characteristics of workers in a particular labor market (Blau and Kahn 2000; Daneshvary and Weber 1991; Low and Villegas 2001; Kumar and Coates 1982; McNabb 1989; Smith 1979; Lucas 1977). Regressing the individual price (wage), against a set of exogenous demand and supply employment characteristic variables, the equation serves to measure the impact of a variety of the demand-side and supply-side characteristics on the observed wage rate and, then, estimate the wage that compensates the individual for those characteristics. As this paper serves to measure the impact of a vector of human capital characteristics, both observed and unobserved (latent variables within the error term) on the observed wage, I use a hedonic wage model.

Under the theory of risk aversion, one would presume that a position that which connotes a higher degree of risk would require a risk premium to entice the risk averse individual to accept the offer. Accordingly, the inclusion of risk as a non-pecuniary job attribute in the model will serve to specify whether the principle of compensating wage differentials holds and that a worker will be compensated through higher earnings.

If most people were risk averse, as theory contends, we would expect to find a positive correlation between wage earnings and risk. Zero correlation or negative correlation would convey risk neutral or risk-preferring behavior, respectively. Since an income distribution is typically skewed to the right with the long tail heading in a positive direction, we must account for skewness[2]. I assume that skewness will have a positive impact on utility with an individual appreciating the possibility of receiving very high earnings, holding risk constant. Omitting skewness from the earnings equation could potentially distort the findings and result in an incorrect sign on the risk coefficient.

As opposed to the most recent studies on risk-wage effect, that which used the residual as the form of risk measurement, this paper reverts to the mean-variance approach with the derivation of risk calculated as the second moment of income. Accordingly, risk and skewness are not generated from the error term but are instead captured by taking the second and third moments of wage earnings noted in the previous year for the individual observations, clustered by both occupation and industry. The fact that observations were observed in a previous period is critical and mitigates the risk of violating a major assumption of the error term: the requirement that the disturbance term and explanatory variables are uncorrelated.

Finally, a proxy for wealth has been included in the model, as the theory of risk aversion rests largely on one's wealth and the utility of said wealth in the presence of uncertainty. Exclusion of wealth would potentially result in omitted variable basis, presuming that the proxy for wealth was an accurate representation of true wealth of the

---

[2] At its most basic level, the distribution or spread of a random variable's values around the expected value is measured by the variance. This is considered the second moment and is a frequently used measure of both univariate and multivariate probability distributions. The third moment is used to study the shape of a probability distribution, and is known as skewness.

individual. Omitting a relevant variable can result in model specification errors ultimately giving rise to misleading conclusions about the statistical significance of the estimated parameters. Additionally, if the omitted variable is correlated with an explanatory variable, the problems are further compounded.

To assess the effects of risk, skewness, and wealth on wage earnings for both occupations and industries, estimation was carried out using the following hedonic wage model:

$$LnW_i = a0 + \alpha_1 X_i + \alpha_2 R_{occ} + \alpha_3 R_{ind} + \alpha_4 S_{occ} + \alpha_5 S_{ind} + \alpha_6 N_i + \varepsilon_i$$

LnW_i is the natural log of wage and salary income, while X_i is a vector of human capital characteristics that represent the most frequently cited attributes in the many studies on compensating wage differentials and include the following: gender, age, education, marital status, hours worked, and weeks worked.

R_{occ}/R_{ind} and S_{occ}/S_{ind} serve as proxies for risk and skewness, respectively, and were calculated by taking the standard deviation and skewness for both industries and occupations[3].

Supported by pure theory and joined in economic observation, the implication of risk theory is that individuals are predominantly risk averters. This characteristic is ultimately captured in risk aversion measure, or risk premium, so that the risk aversion can not only be qualified but also quantified. Although technically derived from industry and occupation statistics as measured by the mean variance approach, the risk and skewness

[3] The variable, varo, noted in the regression results is the variance of labor earnings in the occupation of 2002, while vari is the variance of earnings in the industry; people in occupation j and industry k would have the same pair of variance (and skewness) measures.

attributes in this hedonic wage equation are treated as proxies for an individual's unobserved risk preference.

N_i represents the proxy[4] for wealth, or non-labor income, and is calculated by subtracting an individual's wage income from household income for each individual observation in the data set.

ε_i represents the error (disturbance) terms and is a surrogate for all those variables that are omitted from the model but that collectively affect LnW_i. These variables have been omitted for various reasons, that which include the following: unavailability of data; intrinsic randomness in human behavior, and the principle of Occam's razor.

[4] Note that the American Community Survey does not contain a proxy for one's home or physical assets, that which would clearly serve as a more appropriate measure of wealth.

CHAPTER 5

DATA AND EMPIRICAL RESULTS

I carried out the empirical analysis by using data from the 2003 American Community Survey. The American Community Survey is a comprehensive annual social and economic survey, the annualized replacement of the census long-form, and includes hundreds of variables for recorded observations.

Although a proxy for wealth was included in the initial regression model, it is disregarded in the final model due to data limitations inherent in the model's wealth proxy. The wealth proxy was originally included to test for potential econometric issues inherent with omitted variable bias; however, after running the regression with wealth excluded, it was confirmed that the coefficients on both risk and skewness were not affected by the exclusion of wealth in the final model. For visual purposes, the original regression (including wealth) and the final regression (excluding wealth) have been included and are categorized as Table 1 and Table 2, respectively.

The key focus of this study, the effects of risk and skewness on earnings, were generated from wage information recorded for the included observations. Four variables were calculated and included for both variance and skewness to measure the effects of said elements within both an industry and occupation. The regression was run in stages (primarily to address wealth proxy concerns previously noted) and originally included nearly 600,000 observations, prior to imposing certain restrictions on the data set. Post regression restrictions, the included observations narrowed to less than 400,000 in total.

	Table 1	*Table 2*
Schooling:		
Bachelors	0.486	0.471
	(0.021)	(0.014)
Masters	0.603	0.599
	(0.026)	(0.014)
Professional	0.411	0.402
	(0.036)	(0.016)
Ph.D.	0.605	0.588
	(0.037)	(0.017)
Marital Status:		
Married	0.059	0.060
	(0.005)	(0.003)
Divorced	0.045	0.046
	(0.006)	(0.005)
Widowed	-0.012	-0.013
	(0.009)	(0.009)
Separated	0.005	0.005
	(0.009)	(0.009)
Age	0.106	0.107
	(0.003)	(0.00192)
Age-squared	-0.00173	-0.002
	(0.00009)	(0.00004)
Age-cubed	8.24e-06	8.07e-06
	(2.71e-07)	(6.08e-07)
Weeks/Hours	0.042/0.027	0.042/0.027
	(0.0002)/(0.0005)	(0.00009)/(0.0001)
Female	-0.149	-0.159
	(0.003)	(0.002)
Variance:		
Occupation	5.30e-11	5.27e-11
	(6.94e-12)	(7.94e-13)
Industry	4.63e-11	4.69e-11
	(3.70e-12)	(1.07e-12)
Skewness:		
Occupation	-0.027	-0.027
	(0.0004)	(0.0006)
Industry	-0.048	-0.050
	(0.0005)	(0.0008)
Constant	5.17	5.14
	(0.037)	(0.027)
Wealth	-2.64e-06	
	-(38.27)	
R^2	0.7216	0.721
Root MSE	.67432	.67432
N	381168	381168

NOTE: The dependent variable was the log of wage earnings; there were other estimates for schooling but only college level reported in this table
(standard errors are shown in brackets)

Variance, for both occupation and industry, is statistically significant with expected signs that which support the theory that individuals require a risk premium in situations of uncertainty. As the variance coefficients represent the squared effect of a $1 change in wage earnings (second moment), it is expected that the coefficient would be incredibly small. After the appropriate calculation, one concludes that the percentage change in wage earnings for a $1000 increase in standard deviation (a $1 million increase ($1000^2$) in variance) is .53%, or $110.07. Further calculations result in a variance on industry of .469, or $97.40, with occupational variance effects having a greater impact on wage earnings than that of industry.

Skewness, representing the notion that workers place greater value on the small probability of receiving a high payout as opposed to the alternative, is supported in this model through the statistically significant coefficients on skewness, for both industry and occupation. The skewness coefficient should be interpreted as units. Wage earnings are reduced by the unit change in skew, which for this model corresponds to -0.027 for occupation and -0.050 for industry. Skewness, unlike variance has a greater impact for industry as opposed to occupation.

The statistically significant, positive coefficients on the human capital characteristics of age, education, and effort (hours/weeks) support the theory of compensating wage differentials that earnings compensate workers for favorable attributes. Age (collectively) supports the notion of income increasing at a decreasing rate until it plateaus and then begins to decline. Weeks/hours show that wage earnings increase 4.2% for each additional week worked per year and 2.7% for each hour worked per week. Education, represented in the table as a unit coefficient, reflects increases to wage earnings for a person possessing the degrees so noted as compared to the base state of 1-4 years of education only. To calculate the effect, one must take the exponent of the coefficient and subtract from one (1) to understand the percentage effect. Results in this paper show that the presence of a bachelor's degree increases earning 60%, a masters degree 82%, a professional degree 50%, and a Ph.D. 80%, relative to the reference group who have no formal education. As the variance/skewness coefficients were calculated by occupation and industry and, furthermore, the largest effect of the professional degree impact is captured in the job one attains (i.e. doctor, lawyer...), there is some multi-collinearity effects that which mute the professional degree impact on its own.

Interestingly, only a marital status of widowed has a slightly negative effect on wage earnings reducing wages 1.3%. With married and divorced both positive and statistically significant, increasing wages 6% and 4.6%, respectively, it is somewhat inconclusive as to whether earnings compensate workers for marital status in this study.

Finally, the negative and statistically significant coefficient on female supports the notion that earnings compensate men more than women in this study, with female earnings roughly 85% of males.

CHAPTER 6

CONCLUSION

Drawing a corollary between the theoretical framework of compensating wage differentials and the theory of risk aversion, this paper sought to measure whether or not a measure for risk had an effect on observed wage rates in a hedonic wage equation. As the theory of risk contends that an individual is risk averse, one would expect that wages would compensate the individual for this factor.

The results support the predictions regarding compensating differentials for uncertainty as noted by the positive and statistically significant coefficient of variance for both occupation and industry. Specifically, a $1000 increase in the standard deviation of mean income ($20,767.61 for the regression observations) results in an increase of wage earnings for industry and occupation of .53%, or $110.07, or .469%, or $97.40, respectively. Furthermore, the measure of skewness adds further validity to the prediction that workers place greater value on the small probability of receiving a high payout as opposed to the alternative as represented by the negative coefficient for both industry and occupation of -0.027 and -0.050, respectively. These results parallel the findings of previous studies cited in the Literature Review section, all which reported coefficients on risk that ranged from a low of .523% in Hartog et.al. to a high of 1.7% for McGoldrick and Robst. Skewness measures were also similar and ranged from a low of -

0.003 in Hartog et.al. to a high of -0.887, also in Hartog et.al., as their paper calculated risk and skweness measures in three distinct wage equations classified by country, and included The Netherlands, Portugal and Spain.

In conclusion, this study serves to support Adam Smith's simple and elegant concept, conceived over 200 years ago that differences in pecuniary wages are required to compensate for the non-pecuniary advantages and disadvantages of different employments. Despite the passage of time, the theory remains an established framework for the analysis of wage differentials and an important element in understanding labor markets today.

BIBLIOGRAPHY

Arrow, K. (1984) "Alternative Approaches to the Theory of Choice in Risk-Taking Situations." *Collected Papers of Kenneth J. Arrow.* The Belknap Press of Harvard University Press, Cambridge, MA.

Arrow, K. (1984) "Exposition of the Theory of Choice under Uncertainty." *Collected Papers of Kenneth J. Arrow.* The Belknap Press of Harvard University Press, Cambridge, MA.

Arrow, K. (1984) "Optimal Insurance and Generalized Deductibles." *Collected Papers of Kenneth J. Arrow.* The Belknap Press of Harvard University Press, Cambridge, MA.

Arrow, K. (1984) "The Theory of Risk Aversion." *Collected Papers of Kenneth J. Arrow.* The Belknap Press of Harvard University Press, Cambridge, MA.

Arrow, K. (1984) "The Use of Unbounded Utility Functions in Expected-Utility Maximization: Response." *Collected Papers of Kenneth J. Arrow.* The Belknap Press of Harvard University Press, Cambridge, MA.

Blau, F., Kahn, L. (2000) "Gender Differences in Pay." Journal of Economic Perspectives. pp. 75-99.

Bodie, Z., Kane, A., Marcus, A. (2002) *Investments.* McGraw-Hill Companies, New York, NY.

Brief, R., Owen, J. (1969) "A Note on Earnings Risk and the Coefficient of Variation." The Journal of Finance. pp. 901-904.

Daneshvary, N., Weber, W. (1991) "Sources of Wage Differentials between Native and Immigrant Workers: A Regional Analysis." The Review of Regional Studies. pp. 119-135.

Feinberg, R. (1981) "Earnings-Risk as a Compensating Differential." Southern Economic Journal 48. pp. 156-163.

Gujarati, D. (2003) *Basic Econometrics, Fourth Edition.* Mc-Graw Hill Companies, New York, NY.

Hartog, J., Plug, E., Diaz Serrano, L., Vieira, J. (2003) "Risk Compensation in Wages - Replication." *Empirical Economics*. pp. 639-647.

Jarrett, J. (1970) "A Note on Earnings Risk and the Coefficient of Variation: Comment." The Journal of Finance. pp. 1159-1160.

Johnson, W. (1977) "Uncertainty and the Distribution of Earnings." *The Distribution of Economic Well-Being*. Ballinger, Cambridge, MA. pp. 379-396.

Kennedy, P. (2003) *A Guide to Econometrics, Fifth Edition*. The MIT Press, Cambridge, MA.

King, A. (1974) "Occupational Choice, Risk Aversion and Wealth." Industrial and Labor Relations Review. pp. 586-696.

Kumar, P., Coates, M. (1982) "Occupational Earnings, Compensating Differentials, and Human Capital: An Empirical Study." The Canadian Journal of Economics. pp. 442-457.

Leigh, J. (1983) "Job Choice across Industries When Earnings are Uncertain." Quarterly Review of Economics and Business. pp. 54-69.

Levhari, D., Weiss, Y. (1974) "The Effect of Risk on the Investment in Human Capital." American Economic Review 64(6). pp. 950-963.

Low, S., Villegas, D. (2001) "An Alternative Approach to the Analysis of Wage Differentials." pp. 449-462.

Lucas, Robert (1977) "Hedonic Wage Equations and Psychic Wages in the Returns to Schooling." The American Economic Review. pp. 549-558.

McGoldrick, K., Robst, J. (1996) "The Effect of Worker Mobility on Compensating Wages for Earnings Risk." Applied Economics 28. pp. 221-232.

McNabb, Robert (1989) "Compensating Wage Differentials: Some Evidence for Britain." Oxford Economic Papers. pp. 327-338.

Mendenhall, W., Sincich, T. (2003) *A Second Course in Statistics: Regression Analysis, Sixth Edition*. Prentice Hall.

Nicholson, W. (2005) *Microeconomic Theory: Basic Principles and Extensions, Ninth Edition*. Thomson Corporation, Canada.

Perloff, J. (2001) *Microeconomics, Second Edition*. Addison Wesley Longman, Inc., United States.

Pratt, J. (1964) "Risk Aversion in the Small and in the Large." Econometrica. pp. 122-136.

Pratt, J., Zeckhauser, R. (1987) "Proper Risk Aversion." Econometrica. pp. 143-154.

Rosen, Sherwin (1974) "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." The Journal of Political Economy. pp. 34-55.

Smith, Adam (1937) *TheWealth of Nations*. Modern Library, New York.

Smith, Robert (1979) "Compensating Wage Differentials and Public Policy: A Review." Industrial and Labor Relations Review. pp. 339-352.

Snow, a., Warren, R. (1990) "Human Capital Investment and Labor Supply Under Uncertainty." International Economic Review 31(1). pp. 195-206.

VITA

Graduate College
University of Nevada, Las Vegas

Cathryn J. Santoro

Home Address:
250 Sandrock Pointe Lane
Henderson, NV 89012

Education:
Bachelor of Science, Accounting, 1991, Cum Laude
Boston College

Masters of Business Administration, 2000
University of Nevada, Las Vegas

Thesis Title: Risk as a Compensating Differential in a Hedonic Wage Equation

Thesis Examination Committee:
Chairperson, Dr. Thomas Carroll, Ph.D.
Committee Member, Dr. Nasser Daneshvary, Ph.D.
Committee Member, Dr. Mary Riddel, Ph.D.
Graduate Faculty Representative, Dr. Michael Sullivan, Ph.D.