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An Explanation of a Gender Earnings Gap in the Veterinary Profession

By David Smith[*], Demos Vardiabasis[+], Samuel Seaman[±]& Yury Adamov[°]

Analysis of a unique data set of U.S. veterinary firms and veterinarians provides evidence of significant differences in earnings between self-employed males and females. After controlling for important concomitant variables, including training and experience, self-employed female veterinarians generally own smaller clinics and have lower earnings than their male counterparts. This study considers which demographic/economic factors may be associated with observed gender differences in earnings. The gender gap for average earnings is about 44 percent; however, when controlling for certain characteristics, the gap narrows to as little as 23 percent, depending on the model specification. Firm size was found to be the strongest contributing factor in explaining the gender gap in earnings, and so, possible explanations for differences in firm size have also been discussed. Whilst the analysis is not conclusive, there is evidence that self-employed females may face customer discrimination, which may constrain the growth and size of female-owned firms. (*JEL* D21)

Keywords: *Gender differences, salaries, self-employment, veterinarians*

Introduction

After a long period of decline following World War II, the population of self-employed veterinarians in the United States experienced a growth spurt from 1975 to 1990. During this period, the percentage of self-employed among nonfarm workers increased from 7.4 to 9.7 percent (Devine 1994a).[1] Females led the increase in nonfarm self-employment during this period, as the female self-employment rate increased from 4.1 percent in 1975 to 6.7 percent in 1990. This represents almost one-eighth of the total increase in female nonfarm employment during this period. Despite these gains, available data sources report that self-employed females earn significantly less than self-employed males, as well as less than both males and females in the wage-salary sector. According to Devine, in 1990 self-employed females earned less than half the wages of their male counterparts, even among full-time full-year workers. Although there has been

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[1]Bregger (1996) shows that self-employment rates remained relatively stable from 1990-94, providing evidence that growth spurt ended in 1990.

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some research exploring the recent rise in self-employment among females,[2] little work has been done to examine the low relative earnings position of self-employed females.

Other researchers, notably Rosa et al. (1996), along with Du Rietz and Henrekson (2000), have documented that female-owned firms tend to be smaller than male-owned firms, both in terms of employees and sales. The positive correlation between firm size and earnings in the wage-salary sector is well established (e.g., Brown and Medoff 1989, Even and MacPherson 1994). However, this relationship has not been examined within the context of self-employment.

This paper studies the impact of firm size on the earnings of the self-employed, and the extent to which gender differences in firm size may contribute to observed gender differences in earnings. The US Bureau of Census (1996) reports that in 1992, female-owned firms earned on average 43 percent less revenue than male-owned firms. Thus, a portion of the earnings gap could be explained by gender differences in this characteristic. This finding would immediately motivate the next question: Why are female-owned firms smaller than male-owned firms? This paper explores potential answers to this question, examining whether a discriminatory process or gender differences in preferences explains this observed phenomenon.

This paper uses a unique new data set on veterinarians and veterinary firms. This data set has some particular advantages for studying gender differences in self-employment earnings. First, veterinarians receive virtually identical education and training. Therefore, differences in earnings and self-employment behavior are not likely to be derived from differences in human capital. Second, veterinarians have relatively high rates of self-employment giving a large number of observations to utilize. Last, the data used here contains valuable measures of productivity, specifically measures of patients seen per hour and hours worked per week, in addition to detailed firm-level data. This will allow for a careful analysis of the factors that impact earnings in self-employment. Since the data set is specific to one occupation, its findings should not be generalized to the entire population of working men and women; however, the findings may be suggestive of the mechanisms that determine earnings for other populations of self-employed workers.

Background and Data

The data come from annual wage surveys conducted in 1994 and 1995 by Medical Economics Research Group, at the direction of Veterinary Economics. Veterinary Economics is a practitioner management journal sent monthly, free of charge, to all private practice veterinarians who request it. Among veterinary publications, Veterinary Economics' circulation rate is relatively high, as their readership includes more than two-thirds of all veterinarians in the United States.

[2]See Aronson (1991), Blau (1987), and Devine (1994b).

Stratified random samples[3] of 4,319 veterinarians in 1994, and 4,322 in 1995, were mailed surveys with a total of 3,187 usable surveys returned (37 percent usable return rate). The sample is limited to full-time, private practice veterinarians who have at least one year of experience.[4] A comparison with 1990 census data provides evidence that the sample is representative of the general population of veterinarians.[5]

The self-employed are defined as those who are sole-owners of their firms, incorporated or unincorporated. Individuals in partnerships are not treated as self-employed. It may be reasonable to classify partners as "self-employed," since the median partnership size in the sample is 2. However, in order to maintain a more theoretically satisfying definition of self-employment, classification of the self-employed is limited to sole-owners of firms. Using this definition, approximately one-half of the survey respondents are self-employed. All veterinarians self-report their earnings as the answer to the following question: "Which of the following best represents your personal 1993 (or 1994) compensation from the practice before taxes were withheld?"[6]

Table 1 reports summary statistics for the sample of self-employed veterinarians. Note from this table that males earn on average $72,441 per year, while females earn on average $43,874 per year. Differences in hours worked per week are not significant, but male self-employed veterinarians have, on average, 7.5 more years of experience than the sample of female veterinarians. Thus, differences in experience could account for a significant portion of the gender earnings gap. Also available in the data is a measure of patients seen per hour, which will serve to control for differences in productivity. Table 1 also reports a variable called average fee. This represents a measure of the average charge per

[3]Some smaller veterinarian specialties were over-sampled. Summary statistics are weighted by specialty to reflect the "true population" of veterinarians, which is Veterinary Economics' subscriber list.

[4]145 observations were dropped from the 94 data, which appeared as likely duplicates in the 95 survey. In addition, 4 observations that appeared as subject to coding errors were dropped. A data appendix, available from the author upon request, provides more details and copies of all surveys.

[5]An Appendix A, which details this comparison, is available upon request.

[6]Using responses to this question as a measure of earnings for the self-employed may pose a problem, particularly since there are tax avoidance incentives unique to the self-employment sector, which may lead owners to underreport their earnings. A more theoretically satisfying measure of earnings for the self-employed may be firm profits, a measure of which may be obtained from data available on firm revenues and expenses. However, there are potential problems with using such a measure with these data, specifically an increased potential for measurement error and small sample problems. A measure of firm profits, which is constructed from revenue and expense variables, may be subject to a higher degree of measurement error than a measure of earnings. And, it is a smaller sample of veterinarians that reports measures of revenues and expenses. In addition, an incentive to underreport earnings may still reflect itself in a measure of gross profits. Given these concerns, self-reported earnings are used as the preferred measure of earnings in self-employment. In separate regressions, all equations are reestimated using gross profits as the measure of earnings, with qualitatively similar results.

client visit. Veterinarians typically keep track of this measure since it is thought to be a general indicator of clinic productivity (Bowman and Douglas 1996).[7]

Table 1. *Summary Statistics for Self-Employed Veterinarians*

	Males	**Females**	**Male to Female Ratio**
Data at the Individual Level			
Annual Earnings[a]	72,441	43,874	1.65
Experience[a]	20.1	12.6	1.60
Age[a]	46.3	39.3	1.18
Hours worked/wk[a]	53.2	54.5	.98
Patients per hour	1.51	1.24	1.22
Average Fee	65.54	64.92	1.01
Data at the Firm Level			
Clinic Specialty:			
Small Animal	0.60	0.76	0.79
Mixed	0.26	0.16	1.63
Equine	0.04	0.05	0.80
Large Animal	0.09	0.03	3.0
Other vets employed	1.0	0.8	1.25
Non-vet employees	3.5	3.0	1.17
Total clients	2,463	1,897	1.30
Gross Revenue	300,885	199,062	1.51
Gross Expenses	219,793	150,725	1.46
Gross Profits	81,091	48,337	1.68
Sample Size[b]	1,302	220	5.92

Notes: Table is weighted to correct for over-sample of some specialties. [a]Data are reported as categorical variables. Means are obtained by using the midpoint of the reported range. [b]Smaller samples for some variables.

Respondents report various statistics at the firm level. The data report that most self-employed veterinarians are located in small animal clinics, females more so than males. Also revealed in Table 1 is the fact that the firms studied here are relatively small. Male sole-owners employ on average 1.0 other veterinarians, while the sample mean of this variable for females is 0.8. In addition, male owners employ on average 3.5 other (non-veterinarian) workers compared to 3.0 workers for their female counterparts. As another indication that men own larger firms than women, male owners report an average of 2,463 total clients with a corresponding figure of 1,897 for females.

Survey respondents also report measures of firm gross revenues and gross expenses, and the means of these variables are also reported in Table 1.[8] Male

[7]In the veterinary literature, this is referred to as the ACT (Average Client Transaction charge). Clinics with higher ACTs are generally thought to be more profitable, since each client is spending, on average, more money on each visit to the veterinarian.

[8]Firm owners are asked the following questions: "Which of the following best represents the practice's 1993 (or 1994) total gross revenue?" and "What were your total 1993 (or 1994)

sole-owners report an average of $300,885 per year in gross revenue, approximately $100,000 greater than the corresponding figure reported for female sole-owners. Mean average expenses are also greater for males than females, reported as $219,793 and $150,725, respectively. A crude measure of "gross profits" is constructed by subtracting mean gross expenses from gross revenues. Mean gross profits for male-owned firms are $81,901, while the corresponding figure for female-owned firms is $48,337.

These statistics lend support to the theory that gender differences in firm size may account for a significant portion of the gender gap in earnings. From Table 1, the gender gap in mean earnings is 39 percent with a corresponding gap in gross revenue of 34 percent. In addition, the gender difference in the measure of gross profits is 40 percent. Assuming owners compensate themselves out of gross profits, this coincides well to the gender gap in mean earnings.

Empirical Framework

A standard earnings decomposition (Oaxaca 1973) is used to analyze the impact of firm size on earnings in a more rigorous framework. First, separate earnings equations are estimated for self-employed females and males:

$$\ln \overline{E}_f = \sum B_f \cdot \overline{X}_f \quad (1)$$

$$\ln \overline{E}_m = \sum B_m \cdot \overline{X}_m \quad (2)$$

The natural logarithm of Earnings, *E*, is used as the dependent variable. The *X* variables include controls for experience, hours worked per week, patients seen per hour, clinic specialty, region, metropolitan statistical area (msa), and year of survey dummies. In addition, three variables will be used to control for firm size: number of veterinarians, total clients, and total revenue.

If $\sum B_m \cdot \overline{X}_f$ is added to both equations (1) and (2), and then equation (1) is subtracted from equation (2), the following decomposition is obtained:

$$\ln \overline{E}_m - \ln \overline{E}_f = \sum B_m (\overline{X}_m - \overline{X}_f) + \sum \overline{X}_f (B_m - B_f) \quad (3)$$

The first term on the right-hand side of equation (3) evaluates the difference in mean values of the X's using male prices or coefficients. This is generally referred to as the "explained portion" of the earnings gap. The second term on the right-hand side is the conventional measure of wage discrimination with $\beta_m > \beta_f$ indicating a higher price received by a male worker relative to a female worker for the same characteristic. Since there will always exist unobserved differences that

practice expenses, excluding all owner compensation?" Not included in the means reported in Table 1 are respondents who did not report *both* revenues and expenses. In addition, owners who reported total expenses as less than 25 percent of total revenue were assumed as reporting with error, and their responses were not included in the reported figures.

cannot be controlled for, it is preferable to refer to this term as the "unexplained portion" of the earnings gap rather than a direct measure of wage discrimination.

An alternative representation of the difference in ln earnings may be expressed as follows:

$$\ln \overline{E}_m - \ln \overline{E}_f = \sum B_f (\overline{X}_m - \overline{X}_f) + \sum \overline{X}_m (B_m - B_f) \qquad (4)$$

This utilizes female coefficients to evaluate gender differences in mean characteristics. Equation (3) implies that in the absence of discrimination the male earnings structure would prevail, while equation (4) implies that the female earnings structure would exist in a nondiscriminatory environment. The two assumptions do not yield the same result and, thus, estimates of both equations (3) and (4) will be reported.

Prior to a discussion of results, two econometric notes should be made. First, the earnings data are not reported as continuous variables, but into 14 unequal intervals.[9] With data reported in intervals as the dependent variable, the appropriate estimation technique is an extension of the tobit model due to Stewart (1983). Second, it should be noted that there is no control for sample selection bias in the estimates. It is possible that veterinarians who select into the self-employment sector may differ in unobservable ways from veterinarians in the partnership and wage-salary sectors. Unfortunately, the available data do not allow for a convincing control for sample selection bias, since there is no variable that is thought to impact self-employment choice that does not also impact earnings. Since the analysis is focused on earnings differences within the self-employment sector, selection may only pose a problem if there are gender differences in selection behavior (e.g., females negatively selecting into the self-employment sector, with males positively selecting into the sector). In light of the potential sample selection problem, the ability to control for productivity will be advantageous. If gender differences in ability appear in self-employment, they may be controlled for with the available productivity variables, patients seen per hour and hours worked per week.

Results

The gender difference in mean ln annual earnings in the sample is 0.581, representing an unadjusted earnings gap of 44 percent. A decomposition of this earnings difference, prior to controlling for differences in firm size, is reported in Table 2. The coefficients on the experience variables are positive and jointly statistically significant for both females and males. As expected, gender differences in experience explain a considerable portion of the gender gap in earnings. Measured with male coefficients, the set of experience variables explains

[9]There are 14 intervals with a median range of $10,000. Top-coding is not a problem, for exact earnings are reported when they fall in the highest category (over $200,000).

0.072, or 12 percent, of the difference in mean ln earnings. Evaluation with female coefficients accounts for 0.140, or 24 percent, of the earnings difference.

Table 2. *Earnings Decomposition for Self-Employed Veterinarians*

Variable	Female Coefficient (std error)		Male Coefficient (std error)		Explained Portion of the Wage Gap Evaluated with Male Coefficients	Explained Portion of the Wage Gap Evaluated with Female Coefficients
Experience					[0.072]	[0.140]
1 to 2 years	-1.152*	(0.495)	-0.193	(0.291)	0.005	0.031
6 to 10 years	0.394*	(0.182)	0.140	(0.093)	-0.029	-0.082
11 to 20 years	0.412*	0(.178)	0.350**	(0.083)	-0.021	-0.024
21 to 30 years	0.629*	(0.285)	0.374**	(0.086)	0.080	0.135
31 to 40 years	0.724	(0.538)	0.313**	(0.094)	0.035	0.080
over 40 years	[e]		0.056	(0.133)	0.002	0.000
Hours per week[b]					[0.020]	[0.020]
under 25 hours	[e]		-0.593**	(0.202)	0.010	0.000
25 - 30 hours	-0.118	(0.537)	-0.266	(0.141)	-0.003	-0.001
41 - 50 hours	0.500**	(0.184)	0.276**	(0.071)	0.0004	0.001
51 - 60 hours	0.565**	(0.181)	0.377**	(0.069)	0.020	0.031
61 - 70 hours	0.631**	(0.183)	0.552**	(0.074)	-0.010	-0.011
71 - 80 hours	0.438	(0.224)	0.488**	(0.087)	-0.003	-0.003
over 80 hours	0.484	(0.318)	0.578**	(0.101)	0.004	0.004
Patients per hour	0.189**	(0.071)	0.157**	(0.019)	0.038	0.046
Constant	9.568**	(0.295)	10.410**	(0.158)	-	-
Clinic Specialty[c]	yes		yes		[0.005]	[0.002]
Location and Year[d]	yes		yes		[-0.047]	[-0.046]
Sample Size	185		1094			
Log-likelihood	-386.0		-2540.3			
Total explained					[0.089]	[0.163]
Total unexplained					[0.494]	[0.416]

Notes: *Estimation technique is maximum likelihood. Numbers in brackets refer to the portion of the ln earnings gap explained by groups of variables. *Statistically significant at the .05 level; ** at the 0.01 level. [a]Excluded category is 3 to 5 years. [b]Excluded category is 31-40. [c]Categories are small animal, mixed, equine, and large animal. [d]Controls for msa status, region, and the survey year. [e]No data.*

Coefficient estimates on the productivity variables, hours worked per week and patients per hour, are reported next. Point estimates on the hours worked per

week variables are positive and jointly statistically significant, for both females and males. Since this sample includes only full-time veterinarians, gender differences in hours worked per week are not large. Differences in hours worked per week explain only 0.020 of the earnings gap when evaluated with male or female coefficients. The female coefficient on the patients per hour variable is 0.189 and statistically significant, indicating a 21 percent increase in earnings for seeing one additional patient per hour. Similarly for males, the coefficient estimate is 0.157, suggesting an increase in earnings of 17 percent for seeing one additional patient per hour. Since self-employed females see fewer patients per hour, on average, than males, differences in this characteristic account for 0.038 or 0.046 of the earnings gap, when evaluated with male and female coefficients respectively. Thus, differences in this productivity variable account for approximately seven percent of the total earnings gap.

Differences in location, and a control for survey year, actually serve to widen the earnings gap by 0.047 when evaluated with male coefficients, and a similar amount when using female coefficients. Added together, differences in observed characteristics explain 0.089, or 11 percent, of the gap in earnings when evaluated with male coefficients. When evaluated with female coefficients, differences in observed characteristics explain 0.163, or 28 percent, of the earnings gap. This leaves an unexplained earnings gap of 0.494 or 0.416 depending on the specification of the earnings decomposition. Thus, prior to controlling for differences in firm size, the unexplained earnings gap is 39 or 34 percent, depending on the specification. Notably, a large portion of the gender earnings gap remains unexplained, even after controlling for various productivity-related characteristics.

The earnings decomposition reported in Table 3 adds controls for three different measures for firm size: number of veterinarians, ln total clients, and ln total revenue. A priori, it is questionable whether these variables, particularly the revenue variable, should be controlled for. Firm size may not be exogenous to earnings. For example, it may be that customer discrimination causes females to have fewer clients than males. Consequently, female firms would be smaller, leading to lower relative earnings on the part of females.

Despite the danger of "over-controlling," and with the caveat that potential endogeneity is introduced into the model, the size variables are added to the decomposition reported in Table 3. Most notably, both male and female coefficients on the ln total revenue variable are positive and highly statistically significant. The coefficient for females is 0.682 suggesting that a ten percent increase in firm size, as measured by total sales, would increase earnings by 6.8 percent, other factors held constant. Similarly, the corresponding estimate for males is 0.597. The impact of the other size variables, number of veterinarians and total clients, is swamped by the inclusion of the total revenue variable. These coefficients are estimated as close to zero, and in all but one case, statistically insignificant. Most of the other coefficients retain their expected sign from the decomposition reported in Table 2, although the statistical significance of each coefficient is reduced after adding a control for total revenue. This is not surprising

given the correlation that these variables should be expected to have with a measure of total sales.

Table 3. *Earnings Decomposition for Self-Employed Veterinarians, Controlling for Firm Size*

Variable	Female Coefficient (std error)		Male Coefficient (std error)		Explained Portion of the Wage Gap Evaluated with Male Coefficients	Explained Portion of the Wage Gap Evaluated with Female Coefficients
Experience[a]					[0.048]	[0.114]
1 to 2 years	-0.778	(0.419)	-0.062	(0.231)	0.002	0.021
6 to 10 years	0.222	(0.151)	0.032	(0.077)	-0.007	-0.046
11 to 20 years	0.200	(0.145)	0.140*	(0.070)	-0.008	-0.012
21 to 30 years	0.465*	(0.229)	0.163*	(0.072)	0.035	0.110
31 to 40 years	0.460	(0.432)	0.209**	(0.079)	0.023	0.051
over 40 years	[e]		0.082	(0.115)	0.003	0.000
Hours per week[b]					[0.008]	[0.007]
under 25 hours	[e]		-0.405*	(0.183)	0.007	0.000
25 - 30 hours	-0.027	(0.434)	-0.110	(0.118)	-0.001	-0.0003
41 - 50 hours	0.263	(0.167)	0.081	(0.059)	0.0001	0.0004
51 - 60 hours	0.242	(0.162)	0.102	(0.058)	0.006	0.013
61 - 70 hours	0.246	(0.182)	0.189**	(0.063)	-0.003	-0.004
71 - 80 hours	0.146	(0.199)	0.083	(0.074)	-0.001	-0.001
over 80 hours	-0.156	(0.292)	0.058	(0.085)	0.0004	-0.001
Patients per hour	0.080	(0.059)	0.067**	(0.016)	0.016	0.019
Size Variables					[0.212]	[0.245]
Veterinarians	-0.029	(0.061)	-0.030*	(0.012)	-0.003	-0.002
Ln Total Clients	-0.027	(0.073)	-0.034	(0.020)	-0.006	-0.005
Ln Total Revenue	0.682**	(0.092)	0.597**	(0.026)	0.221	0.253
Constant	2.443*	(0.983)	3.805**	(0.312)	-	-
Clinic Specialty[c]	yes		yes		[-0.003]	[-0.016]
Location and Year[d]	yes		yes		[-0.043]	[-0.030]
Sample Size	165		996			
Log-likelihood	-306.5		-2077.9			
Total explained					[0.238]	[0.339]
Total unexplained					[0.356]	[0.255]

Notes: *Estimation technique is maximum likelihood. Numbers in brackets refer to the portion of the ln earnings gap explained by groups of variables. *Statistically significant at the .05 level; ** at the .01 level. [a]Excluded category is 3 to 5 years. [b]Excluded category is 31-40. [c]Categories are small animal, mixed, equine, and large animal. [d]Controls for msa status, region, and the survey year. [e]No data.*

The contribution of the firm size variables accounts for 0.212, or 36 percent, of gender gap in earnings when evaluated with male coefficients, and 0.245, or 41 percent, of the gap when evaluated with female coefficients. Including the contributions made by differences in other observed characteristics, a total of

0.238 or 0.339, representing 40 or 57 percent of the gender gap in earnings, may be accounted for. This leaves an unexplained earnings difference of 0.356 or 0.255, depending on the specification of the earnings decomposition. Thus, the earnings gap between self-employed male and female veterinarians, adjusted for differences in firm size and other observable characteristics, is 30 or 23 percent depending on the specification.

A relatively substantial earnings gap remains unexplained even after controlling for differences in firm size. Note however, if total revenue is reported with error, the presence of measurement error will downward bias the estimation of both male and female coefficients on the total revenue variable. Such a bias would reduce estimations of the explained portion of the earnings gap $\beta_m(\overline{X}_m - \overline{X}_f)$ *or* $\beta_f(\overline{X}_m - \overline{X}_f)$. It is well known that individuals often report measures of earnings with error. It is reasonable to expect that some of the same factors that cause individuals to misreport earnings could cause owners to misreport measures of total revenue. Thus, if measurement error is present, differences in firm size could potentially explain a greater portion of the earnings gap than reported in Table 3.

Potential Determinants of Firm Size

Since differences in firm size by gender of ownership explain a significant portion of the gender gap in earnings, it is important to consider the underlying factors related to gender differences in firm size. Three potential factors that may form the basis for these differences are discussed. Since the analysis focuses on factors that are not available in the data, specifically preferences and constraints, this study can only provide clues to the underlying factors.

Preferences

Females may have preferences for smaller firms. On average, females are more likely than males to have interruptions in their lifetime pattern of labor force participation, mainly due to family-related reasons (Polachek 1981). Thus, female owners may choose to operate on a smaller scale anticipating periods when they will not be working full-time. This seems plausible assuming a smaller firm may be more manageable in a period of part-time employment. This would be consistent with the findings of a recent study by Boden (1999). Using data from the Contingent Work Survey of the February 1995 CPS, the author presents direct evidence that females are more likely than men to cite flexibility and family-related reasons for becoming self-employed.[10] Further support for this theory is offered by Rosa et al. (1996) in a study of British small businesses. The authors'

[10]Approximately 39 percent of the women in Boden's sample cite flexibility of schedule, child-care problems, or other family/personal obligations as primary reasons why they chose to become self-employed. This compares to a corresponding figure of 14 percent for men.

findings suggest that men have significantly stronger preferences for growing their businesses than women.

If females demonstrate preferences for smaller firms, they will employ fewer inputs relative to males. Two important inputs for veterinary clinics are reported in the data under consideration: Non-veterinarian labor along with capital, proxied by a measure of rent. In order to test whether there are gender differences in the employment of these resources, the following two equations are estimated:

$$\ln(K) = \beta_0 + \beta_1 F + \beta_{j+1} X + e \; ; \qquad j = 1\ldots..p. \tag{5}$$

where
ln(K) = ln (Annual rent)
F = Dummy variable for female
X = p controls including experience, clinic specialty, number of veterinarians, along with region, msa, and year of survey dummies.

$$\ln(L) = \beta_0 + \beta_1 F + \beta_{j+1} X + e \; ; \qquad j = 1\ldots..p. \tag{6}$$

where
ln(L) = ln (Number of non-veterinarian employees)
F = Dummy variable for female
X = p controls including experience, clinic specialty, number of veterinarians, along with region and msa dummies

Estimation of equation (5) reports the coefficient on the female dummy as -0.389 and statistically significant at the 0.01 level. Assuming rent a good proxy for capital, this suggests that female veterinarians employ 32 percent less capital than their male counterparts, holding other factors constant. Also notable is the coefficient estimate on the number of veterinarians. It is reported as positive and statistically significant, indicating an increase in rent paid of 15 percent for each additional veterinarian employed. This result implies complementarity between veterinary labor and capital in the production of veterinary services.

Estimation of equation (6) reports the coefficient on the female dummy as negative and statistically significant at the 0.01 level. The point estimate is -0.195, suggesting that female owners employ 18 percent less non-veterinarian labor than male owners, other factors held constant. Notably, the coefficient on the number of veterinarians variable is 0.38 and highly statistically significant. This suggests a 35 percent increase in non-veterinarian employees for each additional veterinarian employed. This result implies complementarity between veterinary labor and non-veterinarian labor in the production of veterinary services.

These results are consistent with the theory that females prefer smaller firms and utilize lower levels of resources in the production of veterinary services. However, lower levels of resource utilization could also reflect factors that constrain the growth of female-owned firms.

Credit Market Constraints

Female owners may be constrained in their ability to borrow funds and purchase capital.[11] This would be consistent with the result from the estimation of equation (5): females employing less capital than males, other factors held constant. If true, females would employ fewer complementary resources, such as non-veterinarian labor, which is the result reported from the estimation of equation (6). Also, the relative magnitudes of the coefficient estimate on the female dummies in equations (5) and (6) lend some support for this theory. Point estimates for gender differences in capital employed (32 percent) are greater than gender differences in non-veterinarian labor employed (18 percent).[12] A constraint in the ability to acquire capital could induce some substitution toward other factors of production, such as non-veterinarian labor.

Although there is evidence of discrimination in credit markets on the basis of race,[13] available empirical evidence with regards to gender, though limited, sheds doubt on the existence of gender discrimination in credit markets. Elliehausen and Lawrence (1990), in a study of loans by Texas finance companies, provide evidence that lenders do not discriminate on the basis of gender. And, in a more comprehensive study of small firms, the US Census Bureau (1997) asked 40,000 business owners in 1995 the following question: "Did difficulty in obtaining credit prevent your business's ability to expand in the last 5 years?" Only 12.8 percent of female owners answered in the affirmative compared to 11.5 percent of males, a statistically insignificant difference.

Customer Discrimination

Customers may discriminate against female veterinarians constraining the size and growth of female-owned firms. Customer discrimination could present itself in two ways: female sellers charging lower prices on average than males sellers (to attract customers who prefer male sellers); or, female sellers charging the same prices as male sellers but, as a result, having fewer customers.[14] In order to test for differences in prices, the following equation is estimated for each specialty:

$$\ln(P) = \beta_0 + \beta_1 F + \beta_{j+1} X + e \; ; \qquad j = 1\ldots..p. \tag{7}$$

where
ln(P) = ln average fee
F = Dummy variable for female
X = p controls including experience, patients per hour, along with region, msa, and year of survey dummies.

[11]See Coate and Tennyson (1992) for a model that offers an example of discrimination in credit markets for self-employed females.
[12]It should be noted that this difference is not statistically significant.
[13]For example, see Bates (1991).
[14]For a detailed model of customer discrimination in self-employment, see Borjas and Bronars (1989).

β_1 estimated as less than zero would be evidence consistent with the existence of customer discrimination. Note the regression includes as an independent variable patients per hour, which effectively controls for differences in time spent with each client.

Equation (7) is estimated separately for veterinarians in all 4 specialties: small animal, mixed, equine, and large animal. Within each specialty, the coefficient on female is not statistically different from zero, suggesting that fees do not vary by gender.[15] A separate regression pooling all specialties, and including a dummy variable for each specialty, was estimated with the same main result.

Customer discrimination could still be present if female sellers charge the same prices as male sellers but, as a result, have fewer customers. Manifested in this manner, customer discrimination would reflect itself in fewer patients per hour for female veterinarians. In order to study this more carefully, the following equation is estimated:

$$\ln(P) = \beta_0 + \beta_1 F + \beta_{j+1} X + e \; ; \text{j} = 1\ldots..\text{p.} \qquad (8)$$

where
ln(P) = Ln patients per hour
F = Dummy variable for female
X = p controls including experience, clinic specialty, ln fee, number of veterinarians, along with region, msa, and year of survey dummies

Estimation of equation (8) reports the coefficient on female as negative and statistically significant at the 0.01 level. The point estimate, -0.203, suggests that females see 18 percent fewer patients per hour, other factors held constant. The coefficient on ln fee is estimated as negative (-0.159) and statistically significant. This finding should be expected: if a veterinarian charges a higher average fee, it may indicate that he or she is providing more services to each client and, thus, spending more time with each customer.

The same equation is estimated with wage-salary veterinarians, with a very different result: other factors held constant, female veterinarians in the wage-salary sector see 13 percent *more* patients per hour than male veterinarians, a statistically significant difference. Finding the opposite result among the self-employed is evidence consistent with existence of customer discrimination against females in the self-employment sector.

Table 3 reports that the gender difference in patients per hour explains six to seven percent of the earnings gap among the self-employed, depending on the specification of the earnings decomposition. This may indicate the direct impact of customer discrimination on the earnings of the self-employed. However, customer discrimination may also have an indirect impact working primarily through differences in size or revenue. For example, customer discrimination may not only impact the number of patients that a female sole-owner sees, but the number of patients for all other employed veterinarians at her clinic. This potential indirect

[15]In addition to reporting average fee, survey respondents report fees across an array of medical services. The large majority of the means of these fees do not differ significantly by gender.

impact of customer discrimination may not be reflected in a reduced form earnings equation. Thus, customer discrimination remains a plausible contributor for explaining gender differences in firm size.

Conclusion

In this paper, detailed firm-level data is used to study earnings differences between male and female self-employed veterinarians. The unadjusted gender earnings gap is 44 percent. Using an earnings decomposition, this study controls for differences in firm size represented by measures of employment, total client base, and sales. By controlling for firm size, along with other observable characteristics, this study is able to explain 40 to 57 percent of gender gap in earnings, depending on the specification of the earnings decomposition. Gender differences in firm size represents, the largest contributing factor in explaining the gender gap in earnings.

Potential determinants of firm size were discussed. Results suggest female self-employed veterinarians employ fewer inputs than male veterinarians, other factors held constant. Lower levels of resource utilization may reflect the preferences of self-employed females. Alternatively, female sole-owners may face constraints: they may be constrained in acquiring capital in the credit market, or they may be constrained in revenue production by customer discrimination. Due to lack of data, these results could only offer clues as to the underlying factors, but results suggest customer discrimination remains a potential explanation for gender differences in firm size. In addition, consistent with the findings of other researchers, gender differences in preferences also serves as a likely contributor to the smaller size of female-owned firms.

Even after controlling for differences in firm size, the adjusted gender gap in earnings is reported as 23-30 percent, depending on the specification of the earnings decomposition. Possible explanations for the remaining gender gap include gender differences in entrepreneurial ability, gender differences in profit reinvestment behavior, as well as potential measurement error in the total revenue variable.[16] Regardless, the present analysis indicates that a significant portion of the gender gap in earnings may be explained by differences in firm size. Considerations of the impact of firm size should be incorporated in future studies on gender differences in self-employment outcomes.

[16]The data cast some doubt on the first two explanations: crude measures of gross profit margins can be constructed from the total revenue and expense variables reported in Table 1. Gender differences in this statistic, figured as 27 percent for males, and 24 percent for females, are not significant. In addition, summary statistics from Table 1 suggest that males and females compensate themselves out of gross profits at a similar rate (an average of 89 percent for males, and 91 percent for females).

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