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Do In-Kind Benefits Influence Pharmacists' Labor Supply Decisions?

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Abstract. This paper explores whether in-kind benefits influence the labor supply decisions of pharmacists. Particular attention is paid to decisions to supply more than thirty hours of labor per week, when in-kind benefits are usually standard. A distinction is also made between pharmacists in managerial and/or ownership positions and those in traditional staff positions. Using survey data from registered pharmacists in North Dakota, we find that the labor supply determinants for owners/managers and employees are significantly different. We also find that while in-kind benefits do not appear to influence the typical staff pharmacist's decision of how many hours to work each week, certain, but not all, types of these benefits do influence the decision of the representative owner/manager. Furthermore, the determinants of hours worked, in general, do not differ across the thirty hour per week threshold.

1. Introduction

Labor supply decisions made by health care practitioners are interesting to study for several reasons. First, health care practitioners are usually highly educated and often highly compensated for their work, and thus can be expected to make informed decisions about where they work and how much labor to supply (BLS, 2009). Second, many practitioners have the ability to establish their own practices, and thus become entrepreneurs and small business owners, or become employees of another, presumably larger organization.[1] As such, they exhibit a high degree of monopsony power in labor markets and have substantial flexibility when making labor market decisions. In some cases, they can negotiate or otherwise choose to supply, *a priori*, a set amount of labor that differs from the standard forty-hour work week. Pharmacists are one such group of health care practitioners. Traditionally, pharmacists owned their own practices (community, or "retail" pharmacies) and spent a significant proportion, if not the majority, of their time acting in the role of a business manager rather than actively providing pharmaceutical care. While independently-owned community pharmacies still exist today, many pharmacists are also employed by larger chain-based corporations, such as Walgreens and CVS, as well as in other clinical settings such as hospitals (Friesner, 2009). Regardless of the practice setting, there are few educational or experiential prerequisites, other than interest and effort, for licensed pharmacists to assume managerial and/or ownership roles (ACPE, 2006; McKesson, 2009).[2] Moreover, pharmacists display a substantial amount

[1] For example, in 2004, 38 percent of full time equivalent (FTE) pharmacists worked in chain pharmacies, 24 percent in hospital pharmacies, and 18 percent in independent pharmacies (HRSA, 2008).

[2] For nearly 15 years, the Doctor of Pharmacy (Pharm.D.) degree has been the entry level degree to practice in the field in the U.S. One of the major rationales for this change was to *ensure* that all licensed pharmacists are (at least initially) prepared to practice in *any* type of setting (hospital, community pharmacy, etc.) as well as to assume leadership, ownership and/or managerial roles (ACPE, 2006). More information regarding qualifications and advancement for pharmacists can be found in the Bureau of Labor Statistics' Occupational Outlook Handbook at www.bls.gov/oco/ocos079.htm.

of variation in hours worked per week (Doucette et al., 2006). In fact, pharmacist employment contracts are often structured such that 30 hours per week is considered "full time," at which point in-kind benefits become standard (Cline, 2003; Mott et al., 2008). As the U.S. population ages and the prevalence of chronic illnesses, most of which are treated medicinally, among its population increases, the role of pharmacists in the provision of health care is likely to grow (Cooksey et al., 2002). Thus, among health care practitioners, pharmacist labor supply decisions are uniquely interesting to study.

The literature addressing supply-side determinants for pharmacists is relatively limited. Much of it focuses on the contention that a shortage, or, more accurately, a scarcity, of pharmacists exists in most regional labor markets (Knapp and Livesey, 2002; Cline, 2003; Mader, 2003; Knapp et al., 2005; Kenreigh and Wagner, 2006; Mott et al., 2006; HRSA, 2008). Some authors address potential determinants of pharmacist labor supply (Walton and Cooksey, 2001; Cooksey et al., 2002; Mott et al., 2005; Knapp and Cultice, 2007; HRSA, 2008). One of the primary factors hypothesized to impact (positively) the number of hours worked is the wage rate (Cooksey et al., 2002; Cline, 2003; Mott et al., 2008; HRSA, 2008). It has also been suggested that female pharmacists tend to work fewer hours than their male counterparts (Walton and Cooksey, 2001; Mott et al., 2005; HRSA, 2008). In addition, the HRSA (2008) report finds a negative relationship between a typical pharmacist's age and the number of hours worked. Mott et al. (2005) report that pharmacists who are employed in independent community pharmacies work the most hours per week. The authors posit that this could be due to the fact that community pharmacy owners are included in the "independent" group. Pharmacists working in hospitals tend to work fewer hours per week than those in chain community pharmacies, supermarket-based community pharmacies, and large merchandisers (e.g., Target and WalMart).

Mott et al. (2008) extend prior work by Cline (2003) and investigate the determinants of wages and the growth in wages of pharmacists. Using a simple, graphical model of the pharmacist labor market and least squares regression, the study found that not only have pharmacist wages increased substantially over the study period (4.9 percent between 2000-2004), but also that wages vary systematically by gender, practice setting, work status (less or more than 30 hours per week), and years of experience.

Schommer et al. (2006) analyze the amount of time a typical pharmacist spends in various work activities such as dispensing medication, consulting, business management activities, and drug use management. Using logistic regressions, the authors also assess whether the time pharmacists actually spend in these activities differs significantly from the amount of time they would like to spend in each activity. The findings suggest that staff pharmacists spend significantly more time dispensing medication, consulting with patients, and managing patients' drug use than do pharmacist-owners and/or managers. Not surprisingly, the research found that the opposite is true for managerial duties. Owners and/or managers are significantly more likely to report a gap between actual and desired time spent on business management activities.

A major problem with most of these studies is that they are descriptive in nature, reporting only simple means, standard deviations, and similar metrics. As such, they fail to control for other potentially influential factors. Those studies that do employ regression analysis usually fail to base their empirical methodologies on a formal (causal) economic model, and thus must be considered as exploratory in nature. For example, Schommer et al. (2006) do not account for the effect that wages and in-kind benefits may have on the pharmacist's labor supply decisions. Other studies that do use simple models to examine the determinants of monetary wage rates often ignore other components of compensation, namely in-kind benefits (Cline, 2003; Mott et al., 2008). More importantly, all of these studies fail to account for the fact that the marginal labor supply decision of owners and/or managers may be fundamentally different than that of staff pharmacists. A comprehensive study of the relationship between the labor supply decisions of pharmacists, whether owners/managers or staff pharmacists, is consequently of paramount concern to the pharmacy profession as well as to policy-makers.

This paper explores whether wages, in-kind benefits, and other socio-economic factors influence the labor supply decisions of pharmacists. It extends the current literature by using sample selection models to control for the fact that pharmacist owners and/or managers may be fundamentally different than staff pharmacists in terms of the factors that influence their hours worked. It also assesses whether wages and in-kind benefits impact labor supply decisions across the thirty hour per week threshold when in-kind benefits are usually standard and exogenous to the decision-maker (since employment contracts have already been signed). When analyzing this threshold one must also account for the fact that the dependent variable, self-reported hours worked, is censored.

The remainder of the paper contains five sections. First, a detailed theoretical model is developed to characterize the manner in which various factors influence pharmacists' labor supply decisions. To the best of the authors' knowledge, this is something that has not been addressed in the pharmacy workforce literature. The second section describes the data used in this study. The third section describes the empirical model that is used to test the hypotheses obtained from the theory, while the fourth section discusses the results generated by the empirical model. The paper concludes by summarizing its findings, identifying its limitations, and providing some suggestions for future work in this area.

2. Model

Consider a representative pharmacist, who may be an owner and/or manager or a general staff pharmacist.[3] The pharmacist exhibits a degree of monopsony power in that he has an employment contract (or otherwise can obtain one) for a given wage, inclusive of monetary and non-monetary benefits. It is assumed that the wage is fixed as long as the pharmacist continues in the role and supplies more than a threshold number of hours per week, which the literature suggests is approximately 30 hours (Cline, 2003; Mott et al., 2008). As long as the threshold is exceeded, which we assume is the case, the pharmacist can alter hours worked to meet personal objectives.

The pharmacist derives utility from five major factors or activities: consumption of a composite good (X), leisure activity (L), in-kind benefits (B), those non-managerial duties that the pharmacist enjoys and/or derives prestige from undertaking (C), and, if a manager, time spent in managerial activities (M). The latter two activities are assumed to be proportional to total hours worked (H) in any given time frame with T total hours. That is, for any given hour of time a pharmacist practices, we assume that β percent is spent on enjoyable or prestigious tasks (C), including, but not limited to, medication therapy management, immunizations, nuclear pharmacy and specialty medication compounding.[4] Similarly, managers spend α percent of each hour practicing pharmacy and $(1 - \alpha)$ percent on managerial activities. We assume that all other activities performed in the workplace are routine tasks performed merely for the wages (and subsequent purchasing power) accruing to the pharmacist. Hence they only indirectly affect the pharmacist's objective function through the impact of hours worked (H) on the consumption of the composite good (X) and/or leisure (L).

The purpose of this paper is to further explore whether in-kind benefits impact labor supply decisions. Few studies in the economics literature have explicitly modeled this relationship, and the few that have tend to focus more on decisions made by welfare-eligible populations (Axelsen et al., 2007), where in-kind benefits are similarly fixed and labor market participation is less predictable. As such, the model presented here uses the same general framework utilized by the Axelsen et al. (2007) study, but adapts the model to the particular characteristics of the market for registered pharmacists. Given these considerations, the subsequent analysis operates on two null hypotheses:

Hypothesis 1: The training and experience of pharmacy owners/managers, and by extension the labor supply decisions of owners/managers, are not fundamentally different than those of staff pharmacists.

Hypothesis 2: In-kind benefits do not affect the marginal labor supply decisions of pharmacists (i.e., number of hours worked).

Hypothesis 1 implies that the decision problem facing the agent, whether an owner/manager or a staff pharmacist, is pre-determined, and can be characterized using a two-step process. In the first step, the pharmacist decides whether to become an owner/manager ($d = 1$) or a staff pharmacist ($d = 0$), and in step two, given the value of d realized, hours worked is determined. This is consistent with the nature of pharmacy practice in general, since no formal management training beyond completion of

[3] We consider owners and managers jointly because they typically perform similar tasks and bear similar responsibilities. As will be discussed in the data section, the sample used to test our hypotheses also requires that the owners and managers be treated as a single group. For owners, this implies that they pay themselves a wage like all other employees, including non-owner managers.

[4] We note in passing that the definitions of C and β may be defined by the practice setting (community, hospital, etc.) and/or individual-specific characteristics.

pharmacy school and fulfillment of licensure requirements is typically required to assume a managerial and/or ownership role within a pharmacy (see footnote 2). As such, most registered pharmacists with a reasonable amount of work experience can become managers and/or owners if they choose to do so. Hours worked are subsequently based on the role the pharmacist plays, in addition to other market forces and individual characteristics.

Given Hypothesis 2, which states that in-kind benefits do not affect the labor supply decisions of pharmacists on the margin, an objective function is chosen that is both parsimonious and consistent with this null. More specifically, the null hypothesis assumes that benefits are separable from the representative pharmacist's choice variables. Therefore, it is not possible for benefits to affect the number of hours worked, unless a non-separable utility or other objective function is developed.[5] The null hypothesis is set up in this manner, as opposed to being structured such that separability is being tested, in order to produce a more interpretable result in the event that the hypothesis is rejected.[6]

In the interests of parsimony, we assume that a pharmacist has a pre-determined "target" (utility-maximizing) value, denoted with an asterisk, for each of the activities mentioned above, and makes decisions, subject to time and resource constraints, that minimize a weighted average of the squared deviations between actual and target values (Rosenman and Friesner, 2004). Consistent with Hypothesis 2, the benefit levels (B) and $(B+\gamma)$ are assumed to be exogenous to the decision maker. As a result, the goal of the pharmacist can be expressed as:

$$\underset{(X,H,C,L,M)}{\text{minimize}}\ \psi_1(X-X^*)^2+\psi_2(L-L^*)^2 + \psi_3(C-C^*)^2+\psi_4(M-M^*)^2 + \psi_5\left(d(B+\gamma)+(1-d)B-B^*\right)^2$$

subject to: $T = L + H$,
$C = d\alpha\beta H + (1\text{-}d)\beta H$,
$M = d(1\text{-}\alpha)H$, and
$(1\text{-}d)wH + d(w + r)H = P_x X.$ (1)

where P_X is the price of the composite good, w is a staff pharmacist's wage rate, r is the excess (either positive or negative) difference in compensation that the market exogenously assigns to managers, and ψ_j represents the relative weight that the individual places on each factor or activity, indicating that $\psi_1+\psi_2+\psi_3+\psi_4+\psi_5=1$. Therefore, the larger the value of ψ_j, the more utility the individual receives from factor j. To simplify the analysis of the model's solutions, we assume that $\psi_5 \neq 1$; that is, the individual never places all of the objective weight on a factor outside of his control. The first constraint provides the basic allocation of T available hours. The second two constraints indicate how total working hours (H) are allocated across enjoyable, non-managerial duties (C) and managerial duties (M). The final equation depicts the decision maker's budget constraint.

Consistent with Hypothesis 1, the model is solved using backward induction. In the second stage of the game, the individual chooses H taking the value of d as given. In the first stage of the game, the individual evaluates the optimal values from the second stage at $d=1$ and $d=0$ and chooses the role that leads to greater total utility. Substituting all four constraints into the objective function to eliminate X, L, C and M from the problem, it can be expressed as:

$$\text{minimize}_{H,d}\ \Omega,$$

$$\text{where } \Omega = \psi_1((1\text{-}d)wH/P_X + d(w+r)H/P_X - X^*)^2 + \psi_2(T - H - L^*)^2 + \psi_3(d a\beta H + (1\text{-}d)\beta H - C^*)^2 + \psi_4(d(1\text{-}a)H - M^*)^2 + (1 - \psi_1 - \psi_2 - \psi_3 - \psi_4)(d(B+\gamma) + (1\text{-}d)B - B^*)^2 \quad (2)$$

[5] As Axelsen et al. (2007) note, separability prevents in-kind benefits from entering the model's first order conditions. By extension, this also precludes in-kind benefits from affecting the model's solutions and any comparative statics and/or testable hypotheses generated by those solutions. At the same time, in-kind benefits still affect the global objective (total utility or other, similar measure) of the decision-maker, since those benefits are included in the *evaluation* of the objective function at the optimal solution values.

[6] In a regression framework, regressors are included and the null hypothesis is generally based on the premise that the coefficient estimate for that regressor is not statistically different from zero. Thus, the null is one of no marginal relationship between the regressor (in this case, an in-kind benefit) and the dependent variable (hours worked), a null consistent with our assumption of separability. Moreover, if this null is rejected, the presence of that regressor in the empirical specification mitigates omitted variable bias and allows for valid inferences on the other regressors in the specification. In the context of this study, the implication is that in-kind benefits are included in the empirical specification so that, if the separability assumption is not supported by the data, other valid inferences concerning pharmacist labor supply decisions can still be made.

The first order condition for the second stage of the decision problem is:

$$\frac{d\Omega}{dH} = 2\psi_1\left(\frac{(1-d)wH}{P_X} + \frac{d(w+r)H}{P_X} - X^*\right)\left(\frac{(1-d)w}{P_X} + \frac{d(w+r)}{P_X}\right) - 2\psi_2(T-H-L^*)$$
$$+ 2\psi_3(d\alpha\beta H + (1-d)\beta H - C^*)(d\alpha\beta + (1-d)\beta) + 2\psi_4(d(1-\alpha)H - M^*)(d(1-\alpha)) = 0 \quad (3)$$

The second order sufficient condition is:

$$\frac{d^2\Omega}{dH^2} = 2\psi_1\left(\frac{(1-d)w}{P_X} + \frac{d(w+r)}{P_X}\right)^2 + 2\psi_2 + 2\psi_3(d\alpha\beta + (1-d)\beta)^2 + 2\psi_4(d(1-\alpha)^2 > 0 \quad (4)$$

which is unambiguously positive (guaranteeing a minimum solution) as long as the individual does not place all of the weight on in-kind benefits (i.e., as long as $\psi_5 \neq 1$) and/or places a positive weight on leisure time. Simplifying (3) and solving for the optimal value of *H* yields the following:

$$H^{optimal} = \frac{\psi_1\left(\frac{w+dr}{P_X}\right)X^* + \psi_2(T-L^*) + \psi_3\big(\beta(1-(1-\alpha)d)\big)C^* + \psi_4 d(1-\alpha)M^*}{\psi_1\left(\frac{w+dr}{P_X}\right)^2 + \psi_2 + \psi_3\big(\beta(1-(1-\alpha)d)\big)^2 + \psi_4 d(1-\alpha)^2} \quad (5)$$

Solutions to the other choice variables are obtained by substituting (5) into the constraints in (1):

$$L^{optimal} = T - H^{optimal} \quad (6)$$

$$C^{optimal} = \beta(1-(1-\alpha)d)H^{optimal} \quad (7)$$

$$M^{optimal} = d(1-\alpha)H^{optimal} \quad (8)$$

$$X^{optimal} = \left(\frac{w-r_d}{P_X}\right)H^{optimal} \quad (9)$$

An examination of (6) – (9) yields some standard inferences about the labor supply decisions of all pharmacists, regardless of position, which readers can verify using standard comparative statics. First, note that the optimal value for *H* is non-negative, as are the solutions for *C*, *M*, *X* and *L*. Second, higher values for *H* lead to greater values for *X*, *C* and *M* and less time spent on leisure (*L*). Similarly, hours worked is non-negatively associated with the target (or utility maximizing) values for *X*, *C*, and *M*, and non-positively associated with the target value of *L*.

Other influences on labor supply decisions are generally ambiguous. For example, consider the base wage rate *w*. The marginal effect of an increase in *w* on the optimal value for *H* is:

$$\frac{dH^{optimal}}{dw} = \frac{\psi_1\left(\frac{1}{P_X}\right)X^*}{\psi_1\left(\frac{w+dr}{P_X}\right)^2 + \psi_2 + \psi_3\big(\beta(1-(1-\alpha)d)\big)^2 + \psi_4 d(1-\alpha)^2}$$
$$- 2\psi_1\left(\frac{w+dr}{P_X^2}\right)\left(\frac{\psi_1\left(\frac{w+dr}{P_X}\right)X^* + \psi_2(T-L^*) + \psi_3\big(\beta(1-(1-\alpha)d)\big)C^* + \psi_4 d(1-\alpha)M^*}{\left(\psi_1\left(\frac{w+dr}{P_X}\right)^2 + \psi_2 + \psi_3\big(\beta(1-(1-\alpha)d)\big)^2 + \psi_4 d(1-\alpha)^2\right)^2}\right) \gtrless 0 \quad (10)$$

Increases in the wage rate lead to both income and substitution effects on H^* for both pharmacist types. The first term in (10) is generally positive, representing the increase in the opportunity cost of leisure time that comes from a wage increase, which results in the pharmacist substituting more work hours for leisure time. The second term represents the income effect; that is, as the wage rate increases, in turn increasing income, the pharmacist chooses to consume more leisure hours (assuming leisure is a normal good), thereby consuming fewer work hours. It is also straightforward to demonstrate that each of the utility weights, β and P_X, have ambiguous effects on hours worked, with similarly conflicting direct and indirect effects.

Of perhaps more importance is how our two hypotheses, whether in-kind benefits influence hours worked on the margin and whether owners and/or managers formulate labor supply decisions in a fundamentally different manner than staff pharmacists, are operationalized in the model. If the latter null is rejected, a natural extension is to investigate which managerial-specific factors contribute to that distinction.

The former hypothesis is operationalized as a natural consequence of separability, which ensures that: $\frac{dH^{optimal}}{dB} = \frac{dH^{optimal}}{d\gamma} = \frac{dH^{optimal}}{d\psi_5} = 0$. To operationalize the latter, we evaluate $H^{optimal}$ at $d=0$ and $d=1$ to see whether managers/owners unambiguously supply more or fewer hours of labor than staff pharmacists. More specifically:

$$H^{optimal}\big|_{d=0} \quad \text{versus} \quad H^{optimal}\big|_{d=1}$$

$$\frac{\psi_1\left(\frac{w}{P_X}\right)X^* + \psi_2(T-L^*) + \psi_3\beta C^*}{\psi_1\left(\frac{w}{P_X}\right)^2 + \psi_2 + \psi_3\beta^2} \quad \underset{>}{<} \quad \frac{\psi_1\left(\frac{w+r}{P_X}\right)X^* + \psi_2(T-L^*) + \psi_3\alpha\beta C^* + \psi_4(1-\alpha)M^*}{\psi_1\left(\frac{w+r}{P_X}\right)^2 + \psi_2 + \psi_3 + \psi_4(1-\alpha)^2}$$

(11a) (11b)

Because each of the manager-specific parameters is included in both the numerator and the denominator of (11a,b), there is no universal set of conditions that unambiguously guarantees that the managers/owners work more (or less) than the staff pharmacists. Instead, labor supply decisions are determined by evaluating the parameters at individual-specific values. In fact, there are only two scenarios in which (11a,b) can be unambiguously signed. The first case is when $\psi_2 = 1$, in which case all that matters is leisure. This case is a degenerate one, since it will likely induce the pharmacist to supply zero hours of labor. The second scenario is when two of the following three manager-specific parameters conditions are true: $r=0$ (no monetary reward for being a manager); $a=1$ (no time spent managing); and $\psi_5 = 0$ (objectives are unconcerned with managerial duties). But in this case the two work the same amount of hours (i.e., the two expressions are equal) since there is no reward for becoming a manager/owner. Since these special cases are unlikely, whether a staff pharmacist or a manager works more or less is a fundamentally empirical issue.

Given the optimal conditions in (11a,b), it is a straightforward process to predict how changes in any of the variables affect the pharmacist's labor supply decision and the related decision of how much of the composite good to consume. The first thing to notice is that the excess value (r) the market assigns to owners/managers via the wage rate plays a large role in determining their work hours. In most cases when $r=0$, the manager/owner will choose to work at least as many hours as the staff pharmacist. However, as r increases, there is both a substitution effect (in the numerator of (11b)) and an income effect (in the denominator) for the owner/manager. An increase in r increases the pharmacist manager's/owner's purchasing power more than it does for a staff pharmacist, which will lead to an increase in the amount of time allocated to work, assuming X is a normal good. However, as the increase in r induces the manager to work more hours, the time constraint also forces the choice of L away from its target value, and thereby increases the opportunity cost of work. This induces the individual to substitute away from work to leisure. According to the model, as r increases, ceteris paribus, the substitution effect eventually dominates and the owner/manager chooses to work less than in the case of a staff pharmacist.

The values of the non-leisure utility weights, in conjunction with the other model parameters, also have the potential to impact the inequality in (11a,b). The more utility weight staff pharmacists place on clinical patient care activities (ψ_3), the fewer hours they will choose to work. For the manager, the overall effect of an increase in ψ_3 will depend on the percentage of time allocated to practicing pharmacy (α). The closer α is to one, the more likely it is the owner/manager will also choose to work fewer hours, given a relatively large ψ_3. However, as α decreases, the individual will be more likely to increase hours worked. This is the result of the fact that for $\alpha < 1$, an owner/manager is not able to allocate as much time to this activity, eventually resulting in a dominant substitution effect. As the relative utility weight for managerial activities (ψ_4) approaches 1, the hours worked for the staff pharmacist will also decline and fall below those supplied by the manager. If being a manager is important, the staff pharmacist will leave the staff position for a managerial one. Finally, as described above, more utility weight on benefits has no effect on hours worked. That is to say, it will induce the individual to work enough to obtain benefits, as it does positively affect utility; however, the benefit levels will not influence hours worked beyond this threshold.

Increases in the owner's/manager's target value for managerial activities (M^*) have a positive impact on hours worked, but no impact on the staff pharmacist's decision. Larger values for M^* increase the likelihood that the manager/owner works more than a staff pharmacist. Greater clinical patient care activity target values (C^*) increase both staff and owner/manager work hours. This effect is larger for the staff pharmacist, most likely because the owner/manager does not get the opportunity to allocate as much time to this work, given a value of α less than one. Finally, if β increases, then the staff pharmacist has a marginal incentive to work more because it entails doing something more enjoyable; in many cases this means directly providing patient care rather than "just counting and dispensing medications." On the other hand, there is a backward bending effect because additional satisfaction is obtained from each unit of labor performed, and thus there is less incentive to work more.[7]

[7] Further details on any comparative statics are available from the lead author upon request.

3. Data

The data for this study come from a 2006 survey that was mailed to 689 registered pharmacists in the state of North Dakota. The survey is based on one which has been widely used in the pharmacy workforce literature (Doucette et al., 2006; Kreling et al., 2006; Mott et al., 2005; Mott et al., 2006; Schommer et al., 2006; Scott, 2009). The survey was approved by the North Dakota State University Institutional Review Board (IRB) prior to administration. Upon IRB approval, a mailing list of actively licensed, registered pharmacists was obtained from the North Dakota Board of Pharmacy, and the survey was administered to this group of individuals. The gross response rate for the survey was 61.8 percent (424 of the 689 pharmacists). Of those responding, 334 were currently working as registered pharmacists in licensed pharmacies.[8] Out of the 334, 254 provided a complete set of responses germane to our analysis, yielding a net response rate of 37 percent. While somewhat low, our response rate exceeds that of other published studies (for example, Mott et al., 2005).

Table 1 contains the names and definitions for all of the variables used in our analysis. The survey facilitates the construction of several variables which can be used to measure hours worked (H). The first is the pharmacist's self-reported hours worked per week in the primary place of employment (*Hrs*). As mentioned earlier, in-kind benefits often require workers to meet a threshold number of hours in order to qualify to receive such benefits. To account for this possibility, we created two additional variables. The first variable is the number of self-reported hours worked per week in excess of 30 (*Hrs30*); otherwise a value of zero is reported. The second variable is the natural logarithm difference between hours worked and 30 hours (*Hrs2b*); that is $\ln(\text{Hrs}/30) = \ln(\text{Hrs}) - \ln(30)$. The latter variable essentially characterizes an elasticity identifying the representative pharmacist's willingness to supply hours in excess of 30.

A related consideration is our null hypothesis that labor supply decisions for owners/managers are not fundamentally different than those of staff pharmacists. To address this issue, a dummy variable was created that assigns a value of one if the

[8] The two major rationales for not actively working in a licensed pharmacy were i) retirement or ii) employment in an organization that does not operate a licensed pharmacy (for example, an insurer, a university or a clinical research facility).

Table 1. Data descriptions.

Variable	Description
Ownmanage	Binary variable indicating that the pharmacist is a owner and/or manager.
Hrs	Total self-reported hours worked per week in primary place of employment.
Hrs30	Total self-reported hours >30 worked per week in primary place of employment.
Hrs2b	Natural log difference between Hrs and Hrs30.
Practice Setting	
Indep	Primary employer is a independent community pharmacy.
Chain	Primary employer is a large chain community pharmacy.
Hosp	Primary employer is a hospital.
Othtype	Primary employer is in a category other than *Indep, Chain, or Hosp*.
Wage and In-Kind Benefits	
Wage	Self-reported hourly wage.
Hifam	Binary variable indicating that the employer provides the entire family with health insurance.
Life	Binary variable indicating that the employer provides life insurance.
Dental	Binary variable indicating that the employer provides dental insurance.
Retire	Binary variable indicating that the employer contributes to retirement plan.
Malp	Binary variable indicating that the employer provides malpractice insurance.
Crest	Total number of in-kind benefits paid for by the pharmacist's employer, but not included in the above categories.
Workload & Opportunity cost	
Rwloadh	Binary variable indicating that workload rated "high" or "excessively high."
Nojobs	Binary variable indicating belief it would be "very difficult" to find an acceptable job alternative in the next year.
Fewjobs	Binary variable indicating belief it would be "difficult" to find an acceptable job alternative in the next year.
Avgjobs	Binary variable indicating belief it would be "neither difficult nor easy" to find an acceptable job alternative in the next year.
Easyjobs	Binary variable indicating belief it would be "easy" or "very easy" to find an acceptable job alternative in the next year.
Demographic	
Age	Age in years.
Gender	Binary variable equaling one if the pharmacist is male.
Exper	Years of experience as a pharmacist.
Tenure	Number of years pharmacist has worked with current, primary employer.
Ntenexp	Number of years individual has worked as a pharmacist with employer other than current, primary employer.
Phrmdb	Pharmacist holds a Pharm D., or a Pharm D. and a B.S. in pharmacy.
Single	Binary variable indicating that the pharmacist is not married.
Community	
Popu2	Primary employer in a community with a population less than 2,000.
Pop25	Primary employer in a community with a population between 2,000 and 4,999.
Pop525	Primary employer in a community with a population between 5,000 and 24,999.
Pop2550	Primary employer in a community with a population between 25,000 and 50,000.
Pop50p	Primary employer in a community with a population greater than 50,000.

respondent is an owner and/or manager (*Ownmanage)* and a value of zero otherwise.

The second hypothesis maintains that in-kind benefits have no marginal influence on pharmacists' labor supply decisions. To address this issue, the survey asks respondents to identify whether or not they receive any of 32 different in-kind benefits. We constructed indicators to control for whether or not the primary employer provides the pharmacist's entire family with health insurance (*Hifam*), life (*Life*), dental (*Dental*), and/or malpractice (*Malp*) insurance. *Retire* is a dummy variable indicating that the respondent's primary employer contributes to the pharmacist's retirement plan. To account for the remaining, less common in-kind benefits including, but not limited to, prescription discounts, expense accounts, company cars, job sharing and tuition remission, a discrete variable (*Crest*) was created which counts the total number of in-kind benefits that are not already included in one of the categories just mentioned.

In addition to the number of hours worked and in-kind benefits, it is necessary to characterize those features which empirically characterize the other model parameters. Perhaps the most important of these are the self-reported, monetary hourly wages earned by the respondents (*Wage)*. Another factor that has been consistently shown to have a significant effect on pharmacist labor supply decisions is the practice setting (Kreling et al., 2006). *Chain* is a binary variable indicating that the respondent's primary employer is a large chain community pharmacy. *Hosp* indicates that the individual's primary employer is located in a hospital, *Indep* indicates an independent community pharmacy (our base case), and *Othtype* equals one if the employment setting is something other than those just mentioned (for example, a mail order pharmacy).[9]

[9] North Dakota is somewhat unique from other U.S. states in that it has what is known as the "Pharmacy Ownership Law" (Friesner, 2009). This law requires that community pharmacies be at least 51 percent owned by pharmacists registered in the State of North Dakota. Chain community pharmacies that are majority owned by pharmacists are unaffected by the Law; however, mass merchandisers (such as Walmart and Walgreens) that are not majority owned by pharmacists are typically forced to lease space to an independent pharmacist. The ramification of the Law on this study is that a community pharmacy manager in North Dakota is also more likely to be an owner. Thus, while the total number of pharmacy owners and managers in North Dakota is similar to those nationwide, the distribution of owners and managers is not (Mott et al., 2005). Thus, we combined the two in our analysis to ensure that our results are generalizable to larger populations.

The pharmacist's perceived workload may also impact the choice of how much time to spend at work. The survey instrument asks respondents to rate their perceived workload on a 5-point scale. This scale was decomposed into a series of binary variables to more easily incorporate this information into the empirical analysis and interpret the results. *Rwloadh* is a binary variable equaling one if the individual rated his or her workload as either "high" or "excessively high" and a value of zero otherwise ("low" or "about right" or "excessively low").

Theoretically, the opportunity cost associated with the respondent's current job would also impact hours worked. To control for this, respondents were asked to rate the perceived level of difficulty in finding an acceptable job alternative within the next year. The scale used to measure these perceived opportunity costs was analogous to that used in the perceived workload question; hence a similar approach was used to code these variables. *Nojobs* and *Fewjobs* are dummy variables indicating that the respondent believed this task would be "very difficult" or "difficult," respectively. *Easyjobs* indicates that the pharmacist believed finding an acceptable job alternative would be "easy" or "very easy," and *Avgjobs* indicates that the pharmacist didn't believe it would be especially easy or difficult to find an acceptable job alternative in the next year.

Pharmacist demographics and human capital characteristics are also likely to influence labor supply decisions. The survey allows us to control for the respondent's age *(Age)*, gender *(Gender),* and marital status *(Single)*. It also provides perceived and actual human capital characteristics, including the level of education (*PharmDb)*, the total number of years (up to 2009) the respondent has worked as a pharmacist (*Exper*), the number of years (up to 2009) the individual has worked with the current, primary employer (*Tenure*), and the number of years the individual has worked as a pharmacist with employers other than the current, primary employer (*Ntenexp*).

Finally, we are able to control for the population of the community in which the pharmacist works. *Popu2* is a binary variable indicating that the individual works in a community with a population under 2,000; *Pop25* indicates the community's population is between 2,000 and 4,999; *Pop525* equals one if the population is between 5,000 and 24,999; *Pop2550* indicates the community's population is between 25,000 and 50,000; and *Pop50p*, the base case, is a binary variable for which 1 indicates the population exceeds 50,000.

Table 2. Descriptive statistics.

	All Data (n=254)		Owners/Managers (n=83)		Staff Pharmacists (n=171)	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Ownmanage	0.3268	0.47				
Hrs	38.9567	9.7328	44.9759	8.2206	36.0351	9.0612
Hrs30	10.2756	7.3652	15.3133	7.4074	7.8304	5.9883
Hrs2b	0.2207	0.3121	0.3863	0.2022	0.1403	0.3246
Practice Setting						
Indep	0.437	0.497	0.4819	0.5027	0.4152	0.4942
Chain	0.1535	0.3612	0.1807	0.3871	0.1404	0.3484
Hosp	0.3228	0.4685	0.2651	0.444	0.3509	0.4786
Othtype	0.0827	0.2759	0.0602	0.2394	0.0936	0.2921
Wage and In-Kind Benefits						
Wage	40.5831	5.9099	41.3347	7.5904	40.2182	4.8764
Hifam	0.5984	0.4912	0.5542	0.5001	0.6199	0.4868
Life	0.6142	0.4878	0.5542	0.5001	0.6433	0.4804
Dental	0.6181	0.4868	0.5542	0.5001	0.6491	0.4786
Retire	0.8976	0.3037	0.9157	0.2796	0.8889	0.3152
Malp	0.3701	0.4838	0.4699	0.5021	0.3216	0.4685
Crest	7.626	3.2592	7.6024	3.3127	7.6374	3.2427
Workload & Opportunity cost						
Rwloadh	0.5315	0.5	0.6627	0.4757	0.4678	0.5004
Nojobs	0.1024	0.3037	0.0964	0.2969	0.1053	0.3078
Fewjobs	0.2087	0.4072	0.1325	0.3411	0.2456	0.4317
Avgjobs	0.252	0.435	0.2651	0.444	0.2456	0.4317
Easyjobs	0.437	0.497	0.506	0.503	0.4035	0.492
Demographic						
Age	43.4646	10.8207	47.1325	10.3885	41.6842	10.6038
Gender	0.4567	0.4991	0.6627	0.4757	0.3567	0.4804
Exper	18.4488	11.3697	23.0301	10.8752	16.2251	10.9597
Tenure	10.2093	9.1074	14.7452	10.5537	8.0076	7.4023
Ntenexp	8.2396	9.2026	8.2849	8.7756	8.2175	9.428
Phrmdb	0.3465	0.4768	0.2048	0.406	0.4152	0.4942
Single	0.122	0.328	0.0843	0.2796	0.1404	0.3484
Community						
Popu2	0.0984	0.2985	0.2169	0.4146	0.0409	0.1987
Pop25	0.0827	0.2759	0.1446	0.3538	0.0526	0.224
Pop525	0.1811	0.3859	0.1928	0.3969	0.1754	0.3815
Pop2550	0.1339	0.3412	0.0964	0.2969	0.152	0.3601
Pop50p	0.5039	0.501	0.3494	0.4797	0.5789	0.4952

Table 2 contains summary statistics for our data. Of the 254 pharmacists in our sample, approximately 33 percent are owners or managers.[10] The average age of the pharmacists in our sample is about 43 years, almost 46 percent are male, and 12 percent were single at the time of the survey. On average, the total number of self-reported hours worked per week is approximately 39, while the average number of hours worked over 30 is approximately 10. The average total hours worked for owners/managers is 45 and the average number of hours above 30 is 15, while the average total hours for staff pharmacists is 36, with an average of 8 hours above 30.[11] In terms of practice setting, almost 44 percent of respondents worked in "independent" pharmacies, 32 percent in hospital pharmacies, 15 percent in large chains, and 8 percent in a pharmacy other than the types just listed.

The average wage rate for our sample is $40.59. Additionally, almost 60 percent have health insurance benefits provided for their entire family, 61 percent have life insurance that is provided by their primary employer, 62 percent have employer provided dental insurance, 37 percent have malpractice insurance provided, and approximately 90 percent of the respondents' primary employers contribute to their retirement plans. Furthermore, the pharmacists in our sample also receive an average of 7.6 additional types of in-kind benefits from their employers.

Regarding workload, 53 percent felt that theirs was either "high" or "excessively high." The consensus in our sample is that the opportunity cost of staying in their current position is relatively high; 44 percent felt that it would be "easy" or "very easy" to find an acceptable job alternative, compared to the 30 percent who felt that it would be "difficult" or "very difficult."

The average respondent had 18.45 years of experience as a pharmacist, roughly ten with their current employer. Almost 35 percent of the pharmacists in our sample had acquired a Pharm.D. degree, either as an initial degree or through a post-baccalaureate program. Roughly half of our respondents worked in a pharmacy located in a community with a population of more than 50,000 people. Eighteen percent worked in a community with a population between 5,000 and 24,999; 13 percent in a community with between 25,000 and 50,000 people; almost ten percent in a community with fewer than 2,000 people; and eight percent in a community with a population between 2,000 and 4,999.

4. Empirical methodology

We postulate and estimate a fully-reduced-form, linear-in-parameters-and-variables equation to explain self-reported hours worked. The model is considered as "fully" reduced form since we assume that all of the parameters in our theoretical model which are not directly observable, e.g., the objective function weights, are appropriately characterized by a linear combination of variables and their corresponding parameter estimates identified in the previous section. Our theoretical model is based on the notion that the typical pharmacist determines optimal work hours via a two step process. In the first step the pharmacist decides whether or not to become an owner or a manager, and in the second step chooses the number of work hours, conditional on job duties. If the owners/managers and staff pharmacists are fundamentally different in their decisions then we have a sample selection problem, and estimating our empirical model using traditional techniques, such as ordinary least squares regression, will result in biased estimates. Heckman (1978, 1979) suggests a two-step estimation procedure to account for sample selection. In the first step, a "selection" equation is estimated using a probit regression. In our case, the "selection" equation predicts the likelihood that an individual chooses to be an owner/manager:

$$\begin{aligned} &Prob(Ownmanage_i = 1 \mid WB, PS, WL, D, C) = \phi_0 \\ &\quad + \sum_{j=1}^{7} \phi^j WB_i^j + \sum_{j=1}^{3} \phi^{j+7} PS_i^j + \sum_{j=1}^{3} \phi^{j+10} WL_i^j \\ &\quad + \sum_{j=1}^{6} \phi^{j+13} D_i^j + \sum_{j=1}^{4} \phi^{j+19} C_i^j \end{aligned} \tag{12}$$

$$\begin{aligned} &Prob(Ownmanage_i = 0 \mid WB, PS, WL, D, C) = \\ &\quad 1 - Prob(Ownmanage_i = 1 \mid WB, PS, WL, D, C) \end{aligned} \tag{13}$$

[10] If one combines the owners and managers into a single category, the percentage of respondents that are owners/managers is very similar to that found in other published studies, for example, the 35.4 percent found by Mott et al. (2005). Similarly, if one combines the percentage of pharmacists working in all community pharmacy settings (chain or independent), the results presented here are also similar to Mott et al. (2005). Inspection of the remaining descriptive statistics yields similar consistencies with the aforementioned study.

[11] ANOVAs were performed to analyze mean differences in the hours worked across owners/managers and staff pharmacists. The F[1, 252] values for the *Hrs, Hrs30,* and *Hrs2b* variables are 57.73, 74.41, and 40.09, respectively; all have p-values < 0.0001.

where i indexes each observation, j indexes the variables and parameters, the ϕs are parameter estimates, *WB* represents a series of wage and benefit variables, *PS* represents a series of practice setting dummy variables (one is dropped to avoid multicollinearity), *WL* represents a series of worklife and opportunity cost variables, *D* represents a series of demographic variables, and *C* represents a series of community population dummy variables (again, one is dropped to avoid multicollinearity).

The results from this regression are used to calculate the inverse Mills ratio (IMR), which is then included in a regression on hours worked to control for the selection bias:

$$Prob(H_i \mid Ownmanage_i, WB, PS, WL, D, C) = \gamma_0 + \sum_{j=1}^{7} \gamma^{j} WB_i^j + \sum_{j=1}^{3} \gamma^{j+7} PS_i^j + \sum_{j=1}^{3} \gamma^{j+10} WL_i^j + \sum_{j=1}^{6} \gamma^{j+13} D_i^j + \sum_{j=1}^{4} \gamma^{j+19} C_i^j + v_i \quad (14)$$

where H represents hours worked (i.e., either *Hrs*, *Hrs30*, or *Hrs2b*); $v = \rho\sigma_\mu\lambda(K\phi)$, K being the vector of explanatory variables from the selection equation; the γs represent the parameters being estimated in that equation; ρ represents the correlation between the error term from the selection equation (μ) and the latent determinants of hours worked (ε); σ_μ represents the standard deviation of μ; and λ is the inverse Mills ratio.

In Heckman's original formulation, the first stage is estimated separately from the second step. While the first model is estimated by applying a discrete choice model (i.e., a binary probit) to all observations in the sample, the second stage regression is usually performed via ordinary least squares and is applied only to those observations for which the binary selection mechanism gives a value of one (since values for the observations are usually not observed when the selection mechanism yields a value of zero). To avoid multicollinearity with the inverse Mills ratio and to reduce the possibility of specification bias, the regressors in the second stage equation are typically limited to a strict subset of those used in the first stage regression (Wooldridge, 2000, p. 562). In the model presented above, this was accomplished by excluding one of the demographic variables which, in the authors' estimation, was least likely to cause omitted variable bias from equation (14). We excluded the pharmacist's total experience, since that information is likely jointly captured by the pharmacist's age and tenure with the current employer.

In the context of this study, all pharmacists actually practicing pharmacy should be expected to work a positive number of hours during the typical week. However, not all practicing pharmacists can be expected *a priori* to work more than 30 hours per week. As such, while the *Hrs* and *Hrs2b* variables likely adhere to general assumptions underlying ordinary least squares, the *Hrs30* variable is potentially censored, since H is only observed if H^* exceeds its censoring point of 30 hours. As such, we control for this potential bias by estimating our second step *Hrs30* regression using a Tobit model. As Greene (2000) notes, this not only requires the use of full information maximum likelihood techniques, but also necessitates that the probit and Tobit regressions be estimated jointly, rather than sequentially. [12]

To test Hypothesis 1, which states that the labor supply determinants of pharmacy owners/managers are not significantly different from those of staff pharmacists, we compare the parameter estimates across the two subsample regressions of a given model. If the signs and significance levels differ, this is an indication that sample selection is a problem and we can reject Hypothesis 1.[13]

To test Hypothesis 2, which states that in-kind benefits do not affect the number of hours worked, we test the significance of the coefficient estimates for the benefit variables in our second stage regressions. If any of these estimates are significantly different from zero, this would imply that the utility function is not separable with respect to all benefits,

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[12] Joint estimation also allows the model to exclude the lambda estimate, and thus only the rho and sigma estimates are reported (Greene, 2000). Furthermore, in the traditional Heckman model, because the probit and OLS regressions are separate, one only needs a single probit run for any number of second stage OLS regressions. However, in the censored Heckman models using FIML, the probit and Tobit regressions are estimated simultaneously; therefore, a separate probit run is required for each accompanying Tobit regression. As a side note, it is possible to apply full information maximum likelihood techniques to the traditional Heckman model as well. Greene (2000) notes that this allows for additional efficiency gains. We attempted to estimate the *Hrs* and *Hrs2b* models using maximum likelihood; however, the latter model did not converge. As a result, the results presented here use the original Heckman formulation (i.e., OLS in the second step).

[13] If we were running a single second-stage regression with all observations included, the null hypothesis that $\rho = 0$ would be analyzed to test Hypothesis 1. Furthermore, if the estimates are found to differ in terms of sign and significance across the two sub-sample regressions, this is an indication that the selection variable is interacting with the other regressors (Maddala, 1983).

and that they do impact pharmacists' labor supply decisions at the margin.[14]

5. Results and discussion

Tables 3-5 contain the results from the regressions on *Hrs, Hrs30,* and *Hrs2b,* respectively. Likelihood ratio and *F* tests indicate that all of the regressions are significant at the five percent level. According to the first-stage probit results *Age, Gender, Tenure, Popu2* and *Pop25* each have a significant impact on the probability of an individual being an owner or a manager. Surprisingly, the wage rate is only marginally significant, and thus does not appear to have much of an influence, if any, on this decision. This could be because the managerial/ownership premium is low relative to the overall wage rate received by the average staff pharmacist. In 2004, owners/managers only earned an average of about four dollars more than staff (Mott et al., 2005). In our sample, the average wage for owners/managers only exceeds that of staff pharmacists by approximately one dollar. Older individuals appear to be less likely to pursue an owner or manager position. Being a male and the number of years spent working with the current, primary employer positively impact the likelihood that the pharmacist is an owner or a manager. And relative to pharmacists working in locations with populations exceeding 50,000, those whose primary employers are located in communities with populations under 2,000 or between 2,000 and 4,999 are significantly more likely to be owners and/or managers. One possible explanation for the latter two findings is that in smaller communities the prescription volumes are insufficient to support corporate chain pharmacies. As such, these communities are more likely to support independent community pharmacies, which may be more willing to operate on lower profit margins and are also more likely to be owned and operated by a pharmacist.

Our primary focus is on Hypotheses 1 and 2, both of which are tested using results from Tables 3, 4, and 5. First of all, note that the results in Tables 3 and 4 are very similar in terms of statistical significance, signs, and magnitudes. This implies that, for the most part, the factors influencing the number of hours an individual works, including anything over 30, are the same. For owners/managers, *Gender* and *Crest,* the number of employer provided benefits other than retirement contributions and health, life, dental, and malpractice insurance, are significant determinants of total hours worked, but not of hours over 30. *Single* is statistically significant in the total-hours regression for regular staff pharmacists, but does not appear to impact the number of hours worked above 30 for this group. The coefficient estimates for the *Hrs2b* regressions in Table 5, which essentially measure the elasticity of hours worked above 30, carry the same significance levels and signs as those in the total hours regression. This further corroborates the notion that the determinants of hours worked, on a percentage change basis, generally do not vary across the 30 hour per week threshold.

Regarding Hypothesis 1, there are large differences in the significance levels, signs, and magnitudes of the coefficient estimates across the subsample regressions in each of our three models, which indicate that we can reject it. Therefore, it appears that the labor supply decisions of pharmacy owners/managers are significantly different from those of staff pharmacists. Noting the exceptions listed in the previous paragraph, several of the factors that appear to motivate pharmacists to work more are the same for owners/managers and regular staff pharmacists: feelings of a relatively large workload (*Rwloadh*), being male, and being single. Owners/managers who rate their workload as "high" or "excessively high" work approximately 5.5 more hours per week, 4.5 more above 30, than those who rate it as relatively low, while staff pharmacists with higher workloads work 4.5 hours more per work (three more above 30).[15] Overall, male pharmacists appear to be willing to work a greater number of hours during the week than female pharmacists, with owners/managers showing a stronger effect.

[14] As noted by an anonymous reviewer, if Hypothesis 1 is assumed to be correct (rather than a testable hypothesis) or (if Hypothesis 1 is correct) driven by exogenous differences between the two types of pharmacists, one can also estimate differences in wages and in-kind benefits across owner/managers and staff pharmacists using a Oaxaca-Blinder decomposition. However, because we do not know *a priori* whether or not Hypothesis 1 is correct, and because the decision to become a manager/owner versus a staff pharmacist is a choice (and not exogenously determined, as would, say, a pharmacist's race or gender) a sample selection methodology is necessary. We note in passing that we did perform a Oaxaca-Blinder decomposition analysis as a robustness test and obtained results that are generally consistent with those produced by the sample selection model.

[15] This variable was tested for endogeneity in a regression on total hours worked using the Durbin-Wu-Hausman test, and found to be exogenous to the model.

Table 3. Heckman two-step model results.

Esimation Methods:	**Probit/Maximum Likelihood**			**OLS**			**OLS**		
Dependent Variable:	**Ownmanage**			**Hrs**			**Hrs**		
Step in the Heckman Procedure:	**First**			**Second**			**Second**		
Sub-Sample	**All Observations (n = 254)**			**Owners/Managers (n=83)**			**Staff Pharmacists (n=171)**		
Variable	**Coeff.**	**t**	**P-value**	**Coeff.**	**t**	**P-value**	**Coeff.**	**t**	**P-value**
Constant	-1.865	-1.74	0.0812 *	26.909	1.74	0.0823 *	28.987	4.06	<0.0001 **
CHAIN	-0.222	-0.66	0.5074	1.320	0.50	0.6206	0.930	0.41	0.6847
HOSP	-0.192	-0.68	0.4941	1.491	0.61	0.5408	1.957	1.00	0.3175
OTHTYPE	0.072	0.18	0.8579	-1.138	-0.30	0.7664	1.063	0.42	0.6756
WAGE	0.032	1.71	0.0883 *	-0.033	-0.21	0.8369	-0.108	-0.67	0.5041
HIFAM	0.056	0.24	0.8101	5.119	2.70	0.0069 **	-0.084	-0.05	0.9590
LIFE	-0.108	-0.37	0.7117	-0.102	-0.05	0.9644	2.457	1.12	0.2645
DENTAL	-0.130	-0.47	0.6382	-6.238	-2.83	0.0046 **	-3.048	-1.42	0.1546
RETIRE	0.186	0.54	0.5913	0.343	0.10	0.9173	-0.019	-0.01	0.9935
MALP	0.310	1.42	0.1549	1.027	0.46	0.6490	0.139	0.08	0.9354
CREST	0.016	0.46	0.6480	-0.596	-2.09	0.0363 **	0.205	0.85	0.3962
NOJOBS	0.029	0.09	0.9307	1.563	0.52	0.6058	-0.930	-0.43	0.6693
EASYJOBS	0.182	0.89	0.3714	-1.037	-0.52	0.6006	-0.166	-0.12	0.9056
RWLOADH	0.303	1.49	0.1363	5.510	2.57	0.0103 **	4.485	2.88	0.0040 **
AGE	-0.047	-1.80	0.0716 *	0.138	0.97	0.3341	0.064	0.61	0.5401
GENDER	0.665	3.21	0.0013 **	7.407	2.11	0.0346 **	4.022	1.86	0.0624 *
NTENEXP	0.042	1.53	0.1260						
TENURE	0.077	2.76	0.0059 **	0.185	0.99	0.3220	-0.117	-0.76	0.4446
PHRMDB	-0.237	-0.70	0.4854	-0.254	-0.08	0.9387	5.999	2.78	0.0055 **
SINGLE	0.037	0.11	0.9102	8.063	2.72	0.0065 **	3.493	1.83	0.0670 *
POPU2	1.252	3.44	0.0006 **	2.905	0.58	0.5593	-3.715	-0.67	0.5027
POP25	1.234	3.34	0.0008 **	-0.593	-0.12	0.9082	-0.843	-0.19	0.8495
POP525	0.212	0.77	0.4437	0.164	0.06	0.9511	-0.632	-0.33	0.7454
POP2550	-0.149	-0.48	0.6295	-7.300	-2.29	0.0221 **	-1.922	-1.01	0.3104
Sample Selection Term				6.714	1.04	0.2999	-4.746	-0.74	0.4569
R^2				0.443			0.313		
Adjusted R^2				0.225			0.206		
F-statistic					2.04	0.0149 **		2.91	0.0001 **
Degrees of freedom				23, 59			23, 147		
Log likelihood function	-118.1			-253.7			-574.0		
Restricted log lik. fn.	-160.5			-292.1			-619.0		
Chi-square statistic		84.752	<0.0001 **		76.82	<0.0001 **		90.06	<0.0001 **
Degrees of freedom	23			23			23		

* and ** indicate statistical significance at the ten and five percent levels, respectively

Table 4. Selection equation results.

Esimation Methods:	**FIML, Joint Probit and Tobit**			**Probit and Tobit**		
Corresponding First/ Second Stage Eqn:	**Ownman/Hrs30**			**Hrs30**		
Tobit Sub-Sample	**Owners/Managers (n = 83)**			**Staff Pharmacists (n = 171)**		
Variable	**Coeff.**	**t**	**P-value**	**Coeff.**	**t**	**P-value**
Probit Selection Model (n = 254)						
Constant	-1.7833	-1.51	0.1322	-1.7978	-1.64	0.1015
CHAIN	-0.2326	-0.54	0.5886	-0.2159	-0.58	0.5648
HOSP	-0.2037	-0.58	0.5646	-0.1640	-0.53	0.5963
OTHTYPE	0.0947	0.19	0.8534	0.1201	0.26	0.7958
WAGE	0.0304	1.21	0.2251	0.0325	1.46	0.1434
HIFAM	0.1110	0.41	0.6790	0.0698	0.27	0.7902
LIFE	-0.1048	-0.25	0.8005	-0.1308	-0.39	0.6956
DENTAL	-0.2218	-0.66	0.5085	-0.1099	-0.37	0.7141
RETIRE	0.2173	0.54	0.5903	0.1128	0.31	0.7555
MALP	0.2869	1.06	0.2897	0.3513	1.37	0.1711
CREST	0.0220	0.50	0.6172	0.0151	0.37	0.7139
NOJOBS	0.0677	0.16	0.8750	-0.0265	-0.07	0.9417
EASYJOBS	0.2216	0.86	0.3886	0.1472	0.61	0.5450
RWLOADH	0.3092	1.29	0.1960	0.3315	1.40	0.1630
AGE	-0.0503	-1.95	0.0511 *	-0.0492	-1.94	0.0522 *
GENDER	0.6878	2.54	0.0110 **	0.6802	2.90	0.0038 **
NTENEXP	0.0451	1.56	0.1192	0.0433	1.51	0.1308
TENURE	0.0813	2.67	0.0077 **	0.0798	2.67	0.0077 **
PHRMDB	-0.2687	-0.67	0.5057	-0.2245	-0.56	0.5789
SINGLE	0.0832	0.19	0.8468	-0.0011	0.00	0.9978
POPU2	1.2240	2.93	0.0034 **	1.1907	2.99	0.0028 **
POP25	1.2137	2.67	0.0077 **	1.2608	2.92	0.0035 **
POP525	0.1389	0.39	0.6948	0.2313	0.75	0.4518
POP2550	-0.1429	-0.37	0.7124	-0.2141	-0.60	0.5468
Second Step Tobit Model						
Constant	1.8035	0.11	0.9099	1.5538	0.25	0.8061
CHAIN	0.9228	0.30	0.7654	2.0655	1.06	0.2874
HOSP	1.3916	0.42	0.6716	2.2195	1.31	0.1920
OTHTYPE	-1.3141	-0.36	0.7226	1.6619	0.60	0.5469
WAGE	-0.0311	-0.16	0.8767	-0.0924	-0.76	0.4465
HIFAM	4.7722	2.04	0.0417 **	-0.3727	-0.21	0.8326
LIFE	-0.4175	-0.16	0.8759	1.9012	0.92	0.3560
DENTAL	-5.2154	-2.17	0.0298 **	-3.2601	-1.59	0.1128
RETIRE	0.2378	0.05	0.9574	-1.0921	-0.59	0.5534
MALP	0.8086	0.30	0.7629	0.1680	0.11	0.9167
CREST	-0.6088	-1.61	0.1066	0.2198	0.98	0.3289
NOJOBS	1.2421	0.31	0.7538	1.2319	0.64	0.5242
EASYJOBS	-1.1967	-0.54	0.5868	0.5772	0.43	0.6694
RWLOADH	4.5821	2.09	0.0365 **	3.3123	2.57	0.0103 **
AGE	0.1351	0.75	0.4517	0.0481	0.49	0.6235
GENDER	6.3577	1.48	0.1401	4.5423	2.45	0.0142 **
TENURE	0.1253	0.62	0.5336	-0.1039	-0.84	0.4007
PHRMDB	-0.4128	-0.11	0.9133	4.8793	2.37	0.0177 **
SINGLE	7.7241	2.22	0.0262 **	2.9433	1.58	0.1133
POPU2	1.7905	0.43	0.6661	-0.4564	-0.11	0.9125
POP25	-1.2212	-0.24	0.8073	0.0925	0.03	0.9769
POP525	0.4367	0.12	0.9039	-0.8317	-0.50	0.6180
POP2550	-6.8391	-1.81	0.0708 *	-1.1432	-0.69	0.4888
Tobit Censoring Term	6.6579	2.72	0.0065 **	6.3786	6.93	<0.0001 **
Sample Selection Term	0.6615	1.06	0.2872	-0.5518	-1.19	0.2324
Log likelihood function	-371.5			-569.9		
Restricted log-lik. fn	-391.1			-600.9		
(Tobit sample selection model w/only intercept, censoring term and sample selection term in second step)						
Chi-square statistic		39.3	0.0130 **		61.8	<0.0001 **
Degrees of freedom	22			22		

* and ** indicate statistical significance at the ten and five percent levels, respectively

Table 5. Heckman two-step model results.

Esimation Methods:	**Probit/Maximum Likelihood**			**OLS**			**OLS**		
Dependent Variable:	**Ownmanage**			**Hrs2b**			**Hrs2b**		
Step in the Heckman Procedure:	**First**			**Second**			**Second**		
Sub-Sample	**All Observations (n = 254)**			**Owners/Managers (n = 83)**			**Staff Pharmacists (n = 171)**		
Variable	**Coeff.**	**t**	**P-value**	**Coeff.**	**t**	**P-value**	**Coeff.**	**t**	**P-value**
Constant	-1.865	-1.74	0.0812 *	-0.121	-0.29	0.7686	-0.174	-0.66	0.5085
CHAIN	-0.222	-0.66	0.5074	0.043	0.61	0.5407	0.016	0.19	0.8481
HOSP	-0.192	-0.68	0.4941	0.030	0.47	0.6390	0.063	0.88	0.3812
OTHTYPE	0.072	0.18	0.8579	-0.049	-0.49	0.6248	0.033	0.35	0.7286
WAGE	0.032	1.71	0.0883 *	-0.001	-0.14	0.8877	-0.003	-0.42	0.6722
HIFAM	0.056	0.24	0.8101	0.118	2.36	0.0181 **	0.008	0.13	0.9003
LIFE	-0.108	-0.37	0.7117	0.025	0.42	0.6782	0.098	1.21	0.2259
DENTAL	-0.130	-0.47	0.6382	-0.157	-2.68	0.0074 **	-0.092	-1.16	0.2456
RETIRE	0.186	0.54	0.5913	0.014	0.16	0.8767	0.045	0.53	0.5968
MALP	0.310	1.42	0.1549	0.018	0.31	0.7596	0.005	0.07	0.9427
CREST	0.016	0.46	0.6480	-0.014	-1.80	0.0721 *	0.004	0.44	0.6576
NOJOBS	0.029	0.09	0.9307	0.038	0.47	0.6366	-0.101	-1.26	0.2091
EASYJOBS	0.182	0.89	0.3714	-0.020	-0.39	0.6981	-0.017	-0.33	0.7408
RWLOADH	0.303	1.49	0.1363	0.150	2.64	0.0082 **	0.150	2.61	0.0090 **
AGE	-0.047	-1.80	0.0716 *	0.003	0.74	0.4566	0.002	0.54	0.5918
GENDER	0.665	3.21	0.0013 **	0.189	2.08	0.0379 **	0.097	1.22	0.2217
NTENEXP	0.042	1.53	0.1260						
TENURE	0.077	2.76	0.0059 **	0.005	1.02	0.3102	-0.002	-0.42	0.6769
PHRMDB	-0.237	-0.70	0.4854	0.007	0.08	0.9385	0.211	2.65	0.0080 **
SINGLE	0.037	0.11	0.9102	0.170	2.19	0.0285 **	0.117	1.66	0.0967 *
POPU2	1.252	3.44	0.0006 **	0.102	0.78	0.4377	-0.231	-1.13	0.2579
POP25	1.234	3.34	0.0008 **	0.004	0.03	0.9786	-0.010	-0.06	0.9513
POP525	0.212	0.77	0.4437	0.007	0.09	0.9260	-0.010	-0.14	0.8860
POP2550	-0.149	-0.48	0.6295	-0.164	-1.99	0.0466 **	-0.056	-0.81	0.4208
Sample Selection Term				0.203	1.20	0.2319	-0.180	-0.77	0.4427
R^2				0.414			0.277		
Adjusted R^2				0.185			0.164		
F-statistic					1.81	0.0353 **		2.44	0.0007 **
Degrees of freedom				23, 59			23, 147		
Log likelihood function	-118.1			51.7			-9.1		
Restricted log-lik. fn.	-160.5			15.4			-49.7		
Chi-square statistic		84.8	<0.0001 **		72.6	<0.0001 **		81.2492	<0.0001 **
Degrees of freedom	23			23			23		

* and ** indicate statistical significance at the ten and five percent levels, respectively

This is in line with the existing literature, which states that female pharmacists tend to work relatively fewer hours (Walton and Cooksey, 2001; Mott et al., 2005; HRSA, 2008). The typical non-married pharmacist's opportunity cost of working longer hours does appear to be lower. Single owner/manager pharmacists are willing to work approximately eight more hours per week than the typical married pharmacist, and single staff pharmacists work about three more hours than their married counterparts.

Having a Pharm.D. Degree (*Phrmdb*) has a positive impact on the hours worked for staff pharmacists, but no effect for the owner/manager group. Conversely, the effect of employer-provided family health insurance is positive and significant for owners/managers but not for staff pharmacists. The factors that have a negative impact on hours worked for owners/managers, but not for staff pharmacists, are having dental insurance provided, *Crest*, and working in a community with a population between 25 and 50 thousand (as opposed to working in a community with a population greater than 50 thousand).

Based on the results just discussed, we are unable to reject Hypothesis 2 for regular staff pharmacists; that is, in-kind benefits do not appear to influence the number of hours worked on the margin for this group. It may be that the hours of regular staff pharmacists are fairly constant from one week to the next. This, in addition to the fact that the hours and benefit levels are likely known at the time the individual accepts the position, may result in benefits affecting the likelihood that an individual accepts a position, but not the number of hours worked after the fact. However, this does not appear to be the case for owners/managers, who may have more say in the number of hours worked per week. We are able to reject Hypothesis 2 with regard to some benefits but not others for this group. Employer-provided health insurance for the family, dental insurance, and the benefits included in *Crest* appear to significantly impact the number of hours worked on the margin for owners/managers. The provision of family health insurance prompts owners/managers to work approximately five more hours per week on average, almost a 13 percent increase in total hours. The fact that the extra hours associated with this benefit appear to come after 30 is indicative of a 30 hour per week threshold required to obtain these benefits. Since it is generally much cheaper and/or easier to obtain health insurance coverage in the workplace than in the individual market, individuals who place a positive value on this good may feel that the opportunity cost of not working enough hours to reach the benefit threshold is relatively high. Axelsen, Friesner, Rosenman and Snarr (2007) also find that employer provided health insurance positively impacts hours worked. Interestingly enough, dental insurance and the benefits included in *Crest* appear to negatively impact the number of hours worked for this group. The individual may simply view these types of benefits as increases in earnings, which result in a dominant income effect. Employer contributions to retirement[16] and employer provided life and malpractice insurance are highly insignificant across the three model specifications. Therefore, it appears that the utility function of the typical pharmacist owner/manager is non-separable with regard to certain types of in-kind benefits and separable with regard to others, while the representative staff pharmacist's is completely separable in benefits.

Contrary to the predictions from our model, neither the wage rate, nor the practice setting has an effect on hours worked. The individual's opportunity cost of staying in the current position, i.e. the individual's belief of how easy it would be to find an acceptable alternative position in the next year, is also insignificant. Furthermore, we find that age does not play a significant role in determining hours worked. This finding contradicts the HRSA (2008) report, which indicates that older pharmacists tend to work relatively fewer hours.

6. Conclusions

Two important findings arise from our study. First, the determining factors in the labor supply decisions of pharmacy owners/managers do appear to differ from those of staff pharmacists. Secondly, while it seems that the typical staff pharmacist's utility function is separable with regard to in-kind benefits, this only appears to be partially true for the utility function of the representative owner/manager. Furthermore, our results indicate that different types

[16] The high mean values for the retirement variable (see Table 1) suggest that this binary variable exhibits very little variation (i.e., most observations take values of unity) which may create substantial multicollinearity in the coefficient estimates, especially among estimates for other binary variables whose observations have high frequencies of ones. We checked for multicollinearity by eliminating the retirement variable and subsequently looking for significant reductions in standard errors and increases in test statistics. Somewhat surprisingly, we found virtually no changes in the standard errors and test statistic values, implying very little evidence of multicollinearity.

of in-kind benefits produce different effects on the latter group's marginal labor supply decisions.

The fact that in-kind benefits appear to influence the number of hours worked on the margin for owners/managers but not staff pharmacists may be due to the relative flexibility of the former's schedule. That is, the typical staff pharmacist may accept a position with a known number of hours per week and corresponding benefit package. Therefore, though benefits may influence whether or not the pharmacist accepts the job, they most likely would not affect the number of hours worked in a given week. However, the ability of owners/ managers to alter their own work schedules may result in certain benefits influencing the marginal labor decision. For example, we find that employer-provided health insurance for the entire family has a positive impact on hours worked for owners/managers, most specifically on hours worked above 30. This may be the result of the relatively low price of, and the comparative ease of obtaining, employer-provided health insurance coverage when compared to the individual market. That is to say, the opportunity cost of not working enough hours to obtain benefits is quite high. On the other hand, employer provided dental insurance and the number of in-kind benefits paid for by the pharmacist's employer, excluding contributions to retirement and health, life, dental or malpractice insurance, negatively influence the number of hours worked. It is possible that individuals with these benefits feel that the cost of obtaining them outside of the workplace is relatively low. As a result, they may view these types of benefits as a simple increase in earnings, which in turn has a dominant income effect, thereby decreasing hours worked. In-kind benefits such as contributions to retirement, malpractice insurance and life insurance did not appear to significantly impact the typical employee's decision of how many hours to work.

It is somewhat surprising that wage, the pharmacy practice setting, age, and experience do not influence hours worked. We postulate that the lack of significance is due to two factors: the general scarcity of pharmacists and the fact that pharmacists are, if they retain their knowledge and skills, trained to work in a variety of practice settings. This would lead to not only high wages in general, but also wage compression, since pharmacists could either exercise job market mobility or use the threat of mobility to garner wages similar to those of their higher-paid co-workers. However, it is not surprising that non-married pharmacists are willing to work more due to their higher opportunity cost. In fact, single owners/managers are willing to work an average of roughly eight hours more than married pharmacists, and single staff pharmacists are willing to work roughly three more hours than their counterparts on average. This is a rather large increase considering the average number of hours worked per week in our sample is 45 for owners/managers and 36 for staff pharmacists, meaning the single pharmacists work 18% and 8% more, respectively, within the two groups.

It is also interesting that the factors influencing the decision of how many hours to work per week on average, versus how many hours are worked in excess of 30, do not differ for the most part. Again, this could be the result of the scarcity of pharmacists. If a pharmacy is open for a set number of hours per week and there is little relief pharmacist coverage, then a pharmacist would be more likely to work a greater number of hours regardless of wages or benefits offered. Those hours would also likely be known at the time a pharmacist accepts employment and would likely be very constant in nature.

While our study provides some interesting insights into the labor supply decisions of pharmacists, it is not exhaustive and suffers from several limitations. Perhaps most importantly, the empirical analysis relies on self-reported survey information from practicing pharmacists. This raises the possibility that pharmacists might overstate or understate hours worked. While our empirical results are consistent regardless of the threshold chosen for hours worked, future work that either used actual work hours or econometrically adjusted for any potential response bias in self-reported work hours would provide a valuable extension of our work.

Another limitation is that our data are drawn from North Dakota, which is a relatively rural state with a unique regulatory structure (i.e., the Pharmacy Ownership Law, which mandates that pharmacists be majority owners of community pharmacies). This potentially biases our results in favor of independent community pharmacies and may limit the study's generalizability to larger, urban areas of the U.S. Future studies that use nationwide samples and/or that replicate our study's in other, more populous states would provide a valuable contribution to the pharmacy workforce literature.

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