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Theories of Firm Behavior in the Nonprofit Sector
A Synthesis and Empirical Evaluation

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Much economic activity occurs in the not-for-profit (NFP) sector of the U.S. economy. Not-for-profit firms—defined primarily by their exemption from certain forms of taxation and by the requirement that the surplus of revenues over expenses not be distributed to the firm's owner or patron (the so-called nondistribution constraint)—are estimated to produce one-fifth of all American research and development, most of the economy's human capital that is not produced by on-the-job training, many important cultural products and services, and most health care services. Within the NFP sector, production is dominated by health care providers, which account for about one-half of NFP employment. Education and research make up the second largest component of NFP employment, at about 20 percent, followed by social services, such as child care and job training, at about 15 percent.

Given the importance of the NFP sector for economic activity, a large body of theoretical and empirical work has emerged to describe and document how NFP firms behave, focusing in particular on how they behave differently than for-profit (FP) firms. (In light of the large share of NFP production accounted for by health care providers, much of this work was developed with the health care industry in mind.) While this literature is extensive, it is not coordinated. There is no accepted theory of NFP behavior, and little of the empirical work is connected to—let alone compares—

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existing theories. The purpose of this paper is to begin to fill the gap. This paper attempts to synthesize a few of the dominant theories of NFP firms into a common framework, and to connect existing empirical literature on NFPs to this common theoretical framework. We retain the focus on health care. The goal will be to answer two sets of questions:

1. Do existing theories generate different predictions for NFP behavior with respect to a common set of observable outcomes (e.g., factor demand curves, firm size, response to demand or supply shocks) such that empirical work can determine which theory best describes NFP behavior? In short, what is the empirical content of existing theories of NFP firms?
2. Does empirical work exist that examines the behavior of NFP firms with respect to outcomes on which the different theories of NFP firms generate different predictions? In other words, does the existing empirical literature allow one to discriminate among the different theories of NFP firms?

The paper can be outlined as follows. Section 6.1 synthesizes existing theories of NFP behavior into a common empirical framework. The goal is to generate, for each theory, predictions regarding a common set of observable outcomes. The common framework insures that predictions for a given outcome from two different theories are mainly the product of the theories' assumptions regarding NFP firms, and not differences in modeling technology, demand, or the marketplace. A shortcoming of existing theories of NFP behavior is that the predictions of their authors have focused on NFP behavior almost exclusively at the firm level as opposed to at the industry (i.e., equilibrium) level. Section 6.1 concludes with an analysis of such predictions.

Section 6.2 extends existing theories by generating predictions about industry-level behavior in equilibrium under perfect competition. The approach is similar to that in Lakdawalla and Philipson (1998, 2002). Focusing on industry-level predictions is important because most empirical work that compares NFP and FP firms examines the behavior of these firms in equilibrium with mixed production. Section 6.2 concludes that there are few observable outcomes at the industry level with respect to which the different theories of NFPs generate different predictions.

Section 6.3 examines a large number of the existing empirical studies of NFP firms to determine the extent to which they provide evidence comparing the behavior of NFP and FP firms on outcomes with regard to which existing theories generate different predictions. Generally, we find that very few studies examine such outcomes and thus permit us to distinguish theories based on their empirical performance. Producing evidence regarding measures that permit such distinction appears to be a fertile ground for future research.

Section 6.4 concludes that, if forced to choose among existing theories, we would select theories which argue that the distinctive behavior of NFP firms can be explained by the altruistic motives of these firms' principals as

most consistent with available evidence. This conclusion is subject to numerous caveats in addition to the limited value of the existing empirical studies to distinguish among existing theories. The most notable is that, because we were interested primarily in theories seeking to explain firm behavior (as opposed to employee or government behavior), the paper does not cover all possible theories of the NFP sector, including those that may potentially perform better from an empirical perspective. For example, Weisbrod (1975) considers the creation of NFP services as a product of imperfect Lindahl pricing of public goods. Another caveat is that our review of the empirical literature focuses exclusively on the health care sector. Our vision is limited in this way because NFP behavior in the health care sector is better studied than NFP behavior in other sectors, because health care providers dominate the NFP sector and because, unlike (say) the education industry, the health care industry is largely characterized by mixed NFP and FP production, which allows direct comparisons of NFP and FP behavior in equilibrium.

This paper relates to and complements existing reviews of the NFP literature (see, e.g., Pauly 1987, Rose-Ackerman 1996, and Sloan 2000). The main difference between this review and others lies in its objectives of attempting to draw out explicitly the differing, testable predictions of existing formal theories and of attempting to point out where the existing empirical evidence allows us to distinguish between those predictions. Although there are many existing surveys of the NFP sector, none of them to our knowledge appear to focus in an explicit and formal way on this objective.

6.1 Firm Behavior in the Nonprofit Sector: A Synthesis

This section presents a baseline model of the firm that can, with certain parameter restrictions, capture the essential features of the more dominant formalized theories of NFP firm behavior. The model starts with the standard neoclassical model of the firm, which has the advantage of being familiar to most readers, and adds three features. The firm is assumed to have an owner who may have preferences over the firm attributes other than profits. There may be restrictions on the income that the owner can draw from the firm (nondistribution constraint) and on the output decisions of the firm (implied, e.g., by fiduciary duties imposed by state law). Finally, government tax policies may cause the cost function and after-tax profits of NFP firms to deviate from those of FP firms. Careful specification of these three features permits the baseline model to mimic the essential features of existing theories of NFP firms. Incorporating each of the theories into a common theoretical framework in this manner has a number of advantages. First, it permits us to generate predictions regarding firm behavior that we can be sure are driven by the key assumptions each theory makes about how NFP firms operate, and not by differences in the

way nonessential features of the theory (e.g., technology) are modeled. Second, the neoclassical model permits easy derivation of predictions regarding industry-level behavior in equilibrium, a feature that, surprisingly, is missing from most existing theories. Moreover, the formal modeling of a firm's owner allows us to make the choice of organizational form endogenous, also a feature missing in many existing models. This is important, not only because it introduces a dose of realism, but also because it may affect equilibrium dynamics, such as whether each model can sustain an equilibrium with mixed FP and NFP production as is observed in the health care and child care sectors.

This section proceeds in three parts. First, it sets forth the baseline model. Then it demonstrates how the baseline model can capture the essence of the three major theories of NFP firm behavior. One theory is explicitly based on the altruistic preferences of owners; another posits that the NFP firm is operated like a producer cooperative; and the final one is based on the view that NFP firms exist because they mitigate the incentives of firms to take advantage of consumers in market where important product attributes are noncontractible. The third part of this section presents a series of firm-level predictions implied by each theory. The predictions are generated from the baseline model employing the restrictions required to replicate the results of each theory. In many cases these predictions are new and therefore extensions of existing theories. We focus on predictions for a small set of outcomes that are measurable. The goal is to not just to develop testable predictions, but to focus on a common set of outcomes where the theories generate different predictions so that empirical observation can determine which theory performs better than the rest.

6.1.1 General Model

Consider a firm that has access to a production technology F and whose owner or patron derives utility u from consumption z, a vector of inputs $\boldsymbol{x}$, output y of the firm, and quality q of the firm's output.[1] The firm's type is indicated by the index i, where $i = f$ indicates a FP firm, and $i = n$ indicates an NFP firm. Whether the firm is FP or NFP, the firm's profits are given by

$$\pi^i(y, q) = p^i(y, q) \cdot y - c^i(y, q) + A^i, \tag{1}$$

where $p^i(y, q)$ is the inverse demand function, $c^i(y, q)$ is the cost function for quantity and quality of output,[2] and A^i is donations from any source. We assume that the owner seeks to maximize her utility $u(z, y, \boldsymbol{x}, q)$ subject

1. It is useful to think of the agent making decisions in an FP firm as the owner of the firm and in an NFP firm as the charitable donor or patron of the firm or as the head of the board that governs the firm. We assume there is no division between ownership (or patronage) and control.

2. The cost function $c^i(y, q)$ can equivalently be written as $\boldsymbol{w}\boldsymbol{x}^i(y, q)$, where $\boldsymbol{w}$ is a vector of input prices and $\boldsymbol{x}^i$ is the input demand function a firm of form i faces. This alternative formulation permits easy analysis of cases where firms get independent utility (or disutility) from the use of inputs. We will use c^i and $\boldsymbol{w}\boldsymbol{x}^i$ interchangeably throughout.

to the constraint that her consumption z must be covered by income I from the firm as allowed by the government.

If the firm is FP, that income is simply total profits. Thus the owner's/patron's budget constraint is

$$z \leq I^f = \pi^f = p^f \cdot y - \boldsymbol{w}\boldsymbol{x} + A^f, \tag{2}$$

where $\boldsymbol{w}$ is a vector of input prices. (We shall omit the arguments $[y, q]$ of p, c, and π to simplify our exposition, wherever the omission should cause no confusion.)

If the firm is NFP, cash income is constrained to be zero. This is known as the nondistribution constraint. The owner/patron can, however, draw noncash income in the form of perquisites such as a nice office and a company car. We can formalize this regulation of NFP income in the budget constraint.[3]

$$z \leq I^n = d(\pi^n) = d(p^n \cdot y - \boldsymbol{w}\boldsymbol{x}) \tag{3}$$

We assume $d(m) \leq m$, reflecting the fact that the utility from cash is at least as high as the utility from perks because all perks can be purchased with cash.[4] Think of $d(m)$ as the income that would provide the same level of utility as m dollars spent on perks. The function $d(m)$ is decreasing in the owner's/patron's relative distaste for perks versus cash and in the legal constraints the state imposes on the sorts of perks NFP firms can purchase for its patrons. In addition to the nondistribution constraint, NFPs may be subject to regulations requiring that they serve (e.g., a religious, charitable, scientific, or educational purpose; see Internal Revenue Code §501[c][3]) or that they satisfy certain fiduciary duties to the putative beneficiaries of the NFP firm. These constraints can be formalized by requiring $(y, q) \in N$, where N represents the set of outputs satisfying this second type of NFP regulation. The benefit of NFP status is that NFP firms get tax breaks from the government that reduce their costs and that, under certain conditions, may be able to command higher prices in equilibrium based on consumer preferences for products produced by NFP firms. Formally, we can write the cost and price benefits of NFP status as

$$c^n(y, q) \leq c^f(y, q), \qquad c^n_y(y, q) \leq c^f_y(y, q), \qquad c^n_q(y, q) \leq c^f_q(y, q), \tag{4a}$$

$$p^n(y, q) \geq p^f(y, q). \tag{4b}$$

3. In both the NFP and FP cases, the owner/patron gets a cash wage for his labor. Because the NFP wage is constrained by law to be competitive and because the owner/patron is likely to be paid a salary rather than an hourly wage, we assume that the cash wage drawn from an NFP firm is the same as that from an FP firm and thus that wage can be omitted from the income statements in equations (2) and (3). Of course, if the owner's/patron's cash wage is proportional to output, then we may not be able to make this assumption because the two types of firms may produce different levels of output.

4. We ignore the discount on perks afforded by the tax code, which permits firms to treat perks as deductible business expenses because NFP firms need not pay corporate income taxes.

The owner of the FP firm has the induced utility function $v(\pi^f(y, q), y, \boldsymbol{x}, q) = u(\pi^f(y, q), y, \boldsymbol{x}, q)$ with income $I^f = \pi^f$, and the owner of the NFP firm has the induced utility function $v(d(\pi^n(y, q)), y, \boldsymbol{x}, q) = u(d(\pi^n(y, q)), y, \boldsymbol{x}, q)$ with income $I^n = d(\pi^n)$ and (y, q) constrained to belong to N. Let y^{i*}, q^{i*} be the optimal output and quality choices of an owner a firm of form i with preferences v.

The nice feature of this baseline model is that it permits us to treat as endogenous the choice of organizational form. Thus, before entering a market, the owner/patron can choose whether to organize the firm as FP or NFP. The choice of organizational form requires a balancing of the costs and benefits of FP and NFP status given the owner's preferences. The costs of NFP status are the nondistribution constraint and the NFP regulations embodied in the constraint that $(y, q) \in N$; the benefits are the tax and price advantages. The owner/patron will choose NFP status for the firm if

$$(5) \qquad v[d(\pi^n(y^{n*}, q^{n*})), y^{n*}, x(y^{n*}, q^{n*}), q^{n*}] < v[\pi^f(y^{f*}, q^{f*}), y^{f*}, x(y^{f*}, q^{f*}), q^{f*}].$$

6.1.2 Altruism Models

The oldest and most common formal models of NFP institutions emphasize the role of altruistic intentions of NFP managers. This altruism is captured by including quantity and quality of output in the objective function of the firm.[5] The first paper to do this is Newhouse (1970).[6] That paper models NFP hospitals as maximizing utility over quantity and qual-

5. Including quantity or quality in a firm's utility function does not perfectly capture altruism. If a firm were truly altruistic, it would not care whether it supplied the market or another firm did. The only issue would be whether consumers were satisfied. Indeed, Friedman (1970) has criticized the literature for failing to explain why an altruistic firm would not simply take FP status, use its profits to purchase output from the most efficient firm on the market, and distributing this output to the needy.

One can justify the impure-preference assumptions of altruism models, however, in two ways. First, perhaps firms are not truly altruistic. Rather, they may seek the warm glow they get from actually serving the needy directly. Second, perhaps there are logistical problems with Friedman's solution. In markets characterized by information asymmetry between producers and purchasers, simply purchasing output and redistributing it will not insure that the needy get quality products. Or there may be search costs to finding the needy and those search costs may be lower for producers. Preston (1988) makes a similar point in response to the question why workers donate their time to socially beneficial organizations rather than work longer at their regular jobs and donate their wages, a donation which would be tax deductible.

Frank and Salkever (1991) have a model that includes total industry output in the utility function of firms. However, that model does not contrast NFP and FP firms. Rather, it is designed to explain the response of altruistic hospitals to increases in government production of health care.

6. See also Feldstein (1971) and Hansmann (1981). Long (1964) discusses a similar theory about the motivations of NFP firms, but does not formalize his model. Baumol and Bowen (1965) do the same, again without formalization. Baumol (1959) has a theory of a revenue-maximizing firm, but Baumol does not apply his theory to the NFP sector.

ity—but not profits—subject to a budget constraint.[7] The primary prediction of the Newhouse model is that NFP firms will have a bias toward producing in higher-quality markets. The return to the owner's/patron's producing greater quantity of higher-quality products is greater than the return from producing more and lower-quality products.

Lakdawalla and Philipson (1998, 2002) generalize Newhouse's model by including profits in the firm's objective function. Their paper also examines the behavior of NFP firms in equilibrium. As such the paper yields predictions regarding which owners/patrons choose NFP status for their firms, when we should expect to see mixed production versus just NFP or FP production, and for how markets with mixed production respond to demand and supply shocks. Only owners with output or quality preferences choose NFP status. The benefits of NFP status (access to donations) do not provide any advantages to owners/patrons interested only in income. Owners/patrons interested in quantity and perhaps quality start NFP firms only in product markets where there are donations to finance them. If able to secure donations, these owners'/patrons' preference for quantity produces the same equilibrium behavior from NFP firms as a FP firm interested only in profits but in possession of a technology that lowers the marginal costs of producing quantity. Thus FP firms will be the marginal firms in product markets with NFP production. For-profit firms will produce only where donations—assumed to be scarce—cannot sustain enough NFP firms to satisfy total market demand.

Lakdawalla and Philipson note that the response of markets with mixed production to demand and supply shocks depends on whether owners/patrons of NFP firms have, in addition to a preference for profits, a preference for quantity or a preference for both quantity and quality. If quantity only, an increase in demand will induce entry by FP firms (NFP firms are constrained by a limited supply of donations) and thus raise the FP share of output. If firms have heterogeneous costs, price will rise. Supply shocks, such as a reduction in NFP costs due to expanded tax breaks, will increase the share of NFP output. Conversely, an increase in public production, which has the same effect as reducing market demand for private production, trades off one-for-one with FP output. If NFP firms have a preference for quality as well, the results above hold for any given level of quality.

Capturing the altruism models in our general model is straightforward. The objective functions are virtually identical. Lakdawalla and Philipson's model contemplates the introduction of inputs into the owner's/patron's preferences. Because the authors do not explore this avenue, it can be assumed that (like in the Newhouse model) v_x is zero. The main constraint imposed by a status of NFP in Lakdawalla and Philipson is that $N =$

7. The analysis is primarily graphical, but Phelps (1997) provides a mathematical formalization.

$\{(y, q) \mid \pi^n(y, q) = 0\}$. As a legal matter this is an unrealistic restriction: NFP firms can earn rents, they just cannot distribute them to owners. Under perfect competition, however, profits are driven to zero and thus the constraint of N does not bind. There are no perks in the altruism models. Both the Lakdawalla and Philipson and the Newhouse models ignore the tax benefits of NFP status[8] and assume that consumers have no preference for products produced by NFPs.

6.1.3 Physician Cooperative Model

Pauly and Redisch (1973) propose an alternative to the altruism theory that models the NFP hospital as a physician cooperative. The theory can be justified in the following manner. Because doctors have superior medical knowledge, they have the potential to control resource allocation in the hospital. In an FP hospital there is an outside investor who, due to her claim on residual earnings, has an incentive to acquire the knowledge required to compete with doctors for control over resource decisions within the hospital.[9] Thus the doctors in an FP hospital do not make input and output decisions. In the NFP hospital, however, there is no residual claimant, so no party competes with the medical staff for control. Thus the doctors on the medical staff in an NFP hospital can perfect their authority over the hospital. These doctors treat the medical staff as a partnership and make input and output decisions to maximize the joint income of the medical staff.[10]

Pauly and Redisch analyze long-run equilibrium when all hospitals are NFP but there are three possible forms of organization for the medical staff.[11] The most interesting is the closed medical staff, which restricts staffing privileges (i.e., staff size) and pays each doctor on the staff

8. The absence of tax breaks for NFPs makes the choice of regulatory form trivial in Lakdawalla and Philipson's theory. Without tax advantages to NFP status, there is no reason an owner interested solely in profits would take NFP, even if perks were allowed. Exploring the baseline model with tax breaks and perks reveals a weakness with the Lakdawalla and Philipson model. The baseline model with purely profit-maximizing owners, tax breaks, and perks can yield the same equilibrium predictions as the Lakdawalla and Philipson model. The only difference is that NFP firms rather than FP firms would be the higher-cost firms. Another weakness in the Lakdawalla and Philipson theory is that it assumes NFP market share is financed by donations. Yet, in the hospital market, which is perhaps the largest sector with mixed production, donations make up a tiny fraction of revenue but NFPs dominate market share. Rose-Ackerman (1996, 705). It is hard to imagine that it is the small amount of donations to NFP hospitals that enables such hospitals to dominate the market.

9. In most FP hospitals, the outside investor is herself a physician (Gray 1993). This makes it easier for the outside investor to wrest control over resources from the medical staff.

10. Pauly and Redisch justify their model solely on the grounds that physicians, by virtue of their superior knowledge, have de facto control over hospital resources. They do not attempt to explain, for example, why physicians in a FP facility do not enjoy the same level of control as physicians in a NFP facility. Thus, the story we tell in this paragraph is an attempt to rationalize, as best we can, Pauly and Redisch's treatment of a NFP hospital, but not a FP hospital, as a physician cooperative.

11. Shalit (1977) constructs a model that is related to Pauly and Redisch's. His goal is to describe the equilibrium behavior of what he calls doctor-hospital cartels. The profit function

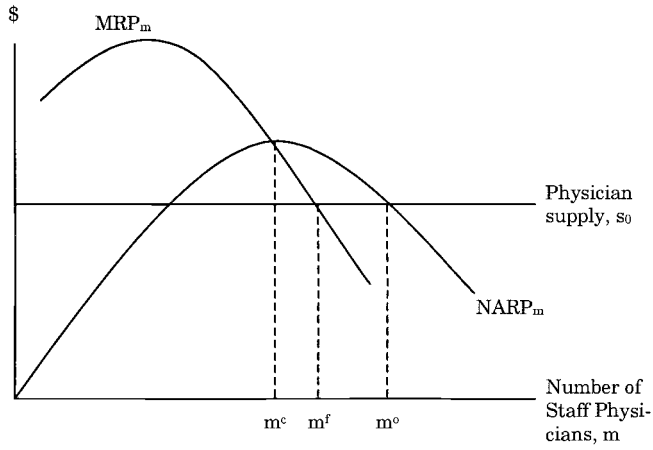

Fig. 6.1 Long-run equilibrium in the physician cooperative model

equally.[12] This staff sets the marginal revenue product (MRP) of the physician labor to the net average revenue product (NARP) of the physician. If p is the total price for health care (including the hospital and physician charges), m is physician labor, k is physical capital (with rental price r), and l is nonphysician labor (with wage w), then the equilibrium condition is

$$(6) \qquad MRP_m = (p + y \cdot p_y) \cdot y_m = \frac{p \cdot y - r \cdot k - w \cdot l}{m} = NARP_m$$

and m^c in figure 6.1 is the closed staff's choice for the size of the physician staff.[13]

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of these cartels is the same as that of the labor-managed firms of Pauly and Redisch, with doctors as the labor input and hospitals as the capital input. Shalit, however, does not describe or distinguish NFP hospitals as doctor-managed (or cartel) firms and FP hospitals as noncartels. In his model, doctors manage all health care firms, regardless of whether they are associated with NFP for FP hospital inputs.

12. The second type of staff is the open staff. Here the staff is not restricted and any physician who wishes to may join. Each doctor is still paid equally. In this case the staff is a common pool and physicians join until the net average revenue product of physician labor is equal to the marginal or opportunity cost of physician labor. If s_0 is the long-run physician supply curve, the result is a staff size of $m^o > m^c$.

The third form of organization for the medical staff is premised on insight that closed medical staffs can increase the rents that they earn if they can add doctors to the medical staff, but treat them as hired or associate physicians and pay them the marginal product of their labor, rather than as partners, who must be paid a pro rata share of residual earnings. (This may fit the division between the medical staff and residents at hospitals.) This sort of medical staff is called the discriminatory sharing staff. This staff will have the same number of partners m^c as a closed staff and retain $m^f - m^c$ physicians as hired staff. The total size of the medical staff will be the same as in the FP hospital, which expands the medical staff until the MRP of the last physician is just equal to the market wage of physicians.

13. Pauly and Redisch also discuss a variant of the closed staff: the closed staff with imperfect cooperation. The doctors control the amount of hospital output (physical capital and

The purpose of Pauly and Redisch's (1973) paper is not so much to produce a model with testable predictions as to provide a model that might explain stylized facts from the hospital market.[14] For example, they claim their closed medical staff model explains why NFP firms tend to use more physical capital inputs and nonphysician labor than FP firms. They also note that with closed staffs one finds hospitals that are too small, as measured by their physician labor inputs. Physicians who are refused entry in existing staffs open new hospitals with their own closed staffs where they can earn more money than if they joined existing open staffs. This, Pauly and Redisch claim, explains both why hospitals are below their cost-minimizing size and why there is duplication of facilities in the hospital industry. Finally, they claim their model explains the positive relationship between hospital insurance coverage and hospital unit prices observed by Feldstein (1971). If cost-based insurance covers part of each patient's hospital bill, the factor prices of hospital inputs (capital and nonphysician labor) that medical staffs face are reduced. This produces an increase in the usage of hospital inputs relative to physician inputs, which in turn raises hospital unit prices.

Pauly and Redisch's closed staff model of NFP hospitals fits neatly into our general model when owners/patrons (physicians) are assumed to care only about income (i.e., $v_y = v_q = 0$); but the NFP form permits owners/patrons to take only a pro rata share of profits home as income (i.e., $I = d[\pi] = \pi/x_0$, where x_0 is the total number of owners/patrons [physicians] employed at the firm). This constraint is not imposed by the nondistribution constraint so much as the politics of rent-seeking in a firm without a clear residual claimant. Pauly and Redisch do not discuss the constraints imposed by governmental NFP regulations or the benefits conferred on NFPs by government tax policies. Thus we can assume that N is unconstrained and that there are no cost or price advantages associated with NFP status.[15]

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non-physician labor). The hospital charges doctors for output such that the hospital just breaks even. So doctors are charged only the average cost of output, which they pass on to patients. Physicians then separately charge patients for their own labor costs plus any rents the hospital foregoes by billing doctors at average cost. Physicians respond by shifting their mix of inputs to favor physical capital and non-physician labor, up to where the marginal revenue product of these inputs equals their average cost.

14. Thus, the Pauly and Redisch model suffers from the limitation that the authors do not derive equilibrium implications from their model in the presence of competition with mixed production.

15. It should be noted that, because the physician's cooperative theory of hospitals is analogous to earlier cooperative firm theories, such as Ward (1958), Vanec (1970), Meade (1972), and Domar (1966), the theory shares some of the troublesome implications of those prior theories, implications for which there seem to be little empirical support. For example, an upward shift in the demand curve for hospital output could result in higher prices, lower output, and smaller medical staffs. An increase in factor prices may lead to an increase in the medical staff, while a lump sum subsidy may decrease output and staff size.

6.1.4 Noncontractible Quality Model

The next class of models rests on the view that consumers in many markets cannot contract on product quality. Hansmann (1980, 1996) hypothesizes that NFP firms exist because they can overcome this problem. Easley and O'Hara (1983)[16] and Glaeser and Shleifer (2001) present formal models that use the assumption of noncontractible quality to motivate the existence of NFP firms.[17] The logic of these models is that, when consumers cannot contract on product quality, FP firms have an incentive to shirk on quality because this will lower their costs and increase their unit profits without loss of sales. The nondistribution constraint on NFP firms mitigates this incentive because it limits the ability of NFP firms to distribute profits to the owner/patron. Therefore, consumers of products characterized by noncontractible quality prefer to purchase from NFP firms. In effect, NFP status serves as a signal of noncontractible quality. The signal falls in value if the government does not enforce the nondistribution constraint, allowing FP firms to cloak themselves in NFP status but still operate as FP firms—what Weisbrod (1988) calls "for-profits-in-disguise."

Our analysis of the noncontractible quality theory for explaining NFP production focuses on Glaeser and Shleifer's (2001) model because it is the most streamlined formal version of the theory. Glaeser and Shleifer's model has three periods. In period 1, a consumer agrees to purchase one unit of product at price p. In period 2, the firm's owner/patron engages in cost-cutting effort e, which reduces costs by $k(e)$, where k is positive and concave. Total costs are $c(q) - k(e)$, where c is the cost of producing a unit of observable quality q. Cost cutting reduces unobservable quality according to $-me$, where m is a constant. The firm delivers a unit of the good with observable quality q in period 3. The consumer's willingness to pay, and hence the price, is $q - mE[e]$ and the firm's profits are $\pi = p - c(q) + k(e)$.

In period 0, before any market transactions, the firm's owner/patron decides whether to organize the firm as an NFP or an FP. The owner/patron has preferences over income I and effort e such that $v(I, e) = I - e$. If the owner/patron organizes the firm as an FP, her income is simply profits, $I = \pi$. If she organizes as an NFP, she cannot take profits home as cash. She must consume profits through perks. Hence her utility is the cash value of these perks minus the cost of effort. We can think of this restriction as im-

16. Easley and O'Hara (1983) model the NFP firm as the sometimes-optimal solution to the principal-agent problem in which consumers are principals and producers are agents. They find that NFP status dominates FP status as a solution in very rare cases. Therefore, the model is not empirically very relevant.

17. Hirth (1999) extends the analysis by showing the equilibrium relationship between, on the one hand, NFP status as a signal of unobservable quality (measured by the price premium such firms may command) and, on the other hand, the share of the population that cannot observe quality and how well the nondistribution constraint on NFPs is enforced.

posing a discount on the cash value of the entrepreneur's profits: $I = d\pi$. The firm will choose NFP status if

$$d[q - mE(e^n) - c(q) + k(e^n)] - e^n > q - mE(e^f) - c(q) + k(e^f) - e^f,$$

where e^n and e^f indicate choices of effort by NFP and FP firms, respectively. These are chosen to maximize the left- and right-hand sides, respectively, of the previous inequality.

This model yields a number of predictions. First, NFP firms invest less effort in cost-cutting effort because the returns to such investment are lower: $dk(e^n)$ versus $k(e^f)$. Hence NFP firms produce higher levels of unobservable quality: $-me$. Second, NFP firms should dominate markets where consumers value noncontractible quality. This is a direct implication of $e^n < e^f$. Third, NFP status becomes less desirable as the profitability of the industry rises because the utility forgone from consumption of profits through perks is linear in profits: $(1 - d)\pi$. If consumers have heterogeneous tastes for unobservable quality and firms have heterogeneous costs, then we might have mixed production, with NFP firms tending to produce higher levels of noncontractible quality and FP firms tending to have lower costs.[18] If one were to add a taste for (noncontractible) quality to the preferences of entrepreneurs, the model, not surprisingly, yields the conclusion that the greater the entrepreneur's preference for quality, the more likely she is to choose NFP status and the higher is the (noncontractible) quality that NFP firms produce, relative to FPs.

While all these predictions are intuitively pleasing, they are generally difficult to test. (The exception is that low-cost firms choose FP status.) We can, however, mimic the equilibrium behavior of Glaeser and Shleifer's (2001) model with our general theory of NFP firms and use that theory to generate testable predictions. Toward this end, assume that owners/patrons have preferences only over income and cost-cutting effort, e, such that $v(I, e) = v(I - e)$. Second, assume owners/patrons of NFP firms can take profits home only as perks, $I = d(\pi)$. Third, assume cost-cutting effort reduces cost, i.e., that $c_e(y, q, e) < 0$, $c_{ee} > 0$, where q is contractible quality, but at the expense of noncontractible quality at a rate of m. Since consumers value contractible and noncontractible quality equally, price is proportional to $q - mE(e \mid i)$, where i is the regulatory form of the firm. Consumers cannot contract on effort, but can contract on regulatory form. They offer NFP firms high prices given contractible quality because they know such firms have less incentive to cut costs in ways that reduce noncontractible quality. Finally, assume no regulatory constraints on the out-

18. While Glaeser and Shleifer explain situations in which mixed production is possible, they do not derive any predictions regarding the behavior of NFP firms in a competitive equilibrium with mixed production.

Table 6.1 **Parameters Implied by the Three Major Models of NFP Firm Behavior**

	Altruism	Physician Cooperative	Noncontractible Quality
Induced utility	Preference for (y, q) permitted: $v(I, y, q)$	No preference for (y, q): $v(I)$	Preference for effort: $v(I, e)$
Output (N)	Zero profits: $N = \{y \mid \pi(y) = 0\}$	No restriction	No restriction
Income	No perks: $I = d(\pi) = 0$	Pro rata distribution: $I = d(\pi) = \pi / x_0$	Perks: $I = d(\pi) < \pi$
Price	$p^n = p^f$	$p^n = p^f$	$p(y, q - mE[e \mid i])$ Higher price conditional on contractible quality: $p^n(q) > p^f(q)$
Costs	No tax breaks: $E(c^n) = E(c^f)$, etc.	No tax breaks (so equal factor prices): $w^n = w^f$	$c(y, q, e)$ No tax breaks: $E(c^n) = E(c^f)$, etc.

put of NFP firms (N unrestricted) and that there are no tax subsidies for NFPs, so $E(c^n) = E(c^f)$.

6.1.5 Firm-Level Predictions of Existing Theories

In this section we derive implications of each of the three theories of NFP behavior just described for firm-level behavior. We focus on the differences in behavior between FP and NFP firms along a limited range of observable outcomes. For reference, the constraints on the baseline model implied by the three theories discussed in sections 6.1.2–6.1.4 are summarized in table 6.1. Table 6.2 summarizes our predictions. Implications of the altruism theory are developed assuming owners/patrons have a preference only for income, quantity, and perhaps quality. Our analysis of the physician cooperative theory examines only closed staff hospitals. The exposition is organized by outcome; with respect to each outcome we derive predictions for the altruism, physician cooperative, and noncontractible quality models, in that order. The discussion focuses on the intuition behind each prediction. The results can easily be derived in a more formal manner.[19]

Shape of Firm Supply Curve

In the altruism model, the supply curves are upward sloping. The supply curve for an FP firm is standard: the marginal cost (MC) curve in the relevant range (upward-sloping section above intersection with the average

19. Readers interested in more formal demonstration should refer to Lakdawalla and Philipson (1998, 2002), which works through the baseline model (albeit only under the assumptions implied by the altruism theory of NFP firms).

Table 6.2 **Predictions of Firm-Level Behavior on NFPs Under the Three Major Models of NFP Firm Behavior**

	Altruism	Physician Cooperative	Noncontractible Quality
Shape of firm supply curve	NFPs supply more elastic than FPs supply	Supply may be backward-bending for NFP firms	No strongly predicted difference
Conditional factor demand	Identical as long as no input preferences	Labor demand smaller for NFPs than FPs	NFPs have higher conditional factor demands
Unconditional factor demand	Larger for NFPs than FPs	Labor demand smaller for NFPs than FPs	No predicted difference
Firm size	Controlling for quality, total output of NFPs larger than that of FPs	Smaller number of staff physicians, controlling for capital inputs	No prediction possible without information on interaction between production of quantity and quality
Quality	NFPs produce higher quality than FPs	NFPs have lower quality as measured by labor-capital ratio; no predicted difference on other measures of quality	NFPs produce higher unobserved quality than FPs
Average cost	NFP firms have higher average costs controlling for quality	NFP firms have higher average costs controlling for quantity	NFP firms have higher average costs controlling for quantity and contractible quality

cost [AC] curve). The supply curve for the NFP firm, however, is given by the AC curve above the intersection between the AC and MC curves. This is because of the nondistribution constraint or of NFP regulations that are assumed to constrain NFP firms to have zero profits ($N = \{(y, q) \mid \pi(y, q) = 0\}$). Because the AC curve lies below and has a smaller slope than the MC curve in the relevant range, the supply curve for individual NFP firms is more elastic than that for FP firms.

In the physician cooperative model, the supply curve for individual firms may be backward bending under common conditions such as diminishing returns to scale (see Meade 1972). The reason is that an increase in the price of output raises both the marginal product of physician labor and the average product of physician labor. However, the marginal product of labor rises less than the average product of labor when there are diminishing returns. This means that average earnings could be further raised if physicians were dismissed from the medical staff.[20] This in turn reduces output.

In the noncontractible quality model, all firms will have identical upward-sloping supply functions. Without more information on the economies between production of quantity and quality, one supposes that the supply curves for quantity are the same. In the case of an increase in the price of quality, however, the reaction of NFP firms is expected to be stronger as such firms are constrained by the nondistribution constraint from distributing rents as cash profits. (NFPs can pay rents only as perks.)

Factor Demand Behavior

Although there may be great differences between the output behavior of firms run by owners/patrons with traditional income-maximizing preferences and those run by owners/patrons with nonstandard preferences, the differences in owners'/patrons' preferences over output may not affect input demands. In general, the predictions of cost minimization for the FP firm apply to a firm run by an owner/patron with preferences over the quantity and quality of output as long as we are talking about conditional factor demand, that is, demand for inputs for a given level of output. The unconditional factor demand is simply the conditional factor demand at the optimal level of output. This implies that output predictions translate into factor demand predictions whenever the conditional factor demand behavior, as implied by cost minimization, is identical for both types of firm. In the altruism model the NFP firm produces along the AC curve,

20. In the discriminatory sharing case described in note 12, the total number of physicians in the hospital will increase as output price increase, but the mix of "member" to "hired" physician would change (lower number of members and higher number of hired physicians). This result coincides with the analysis presented by Ben-Ner (1984), who shows that as long as the income per member is higher than the competitive wage, the labor-managed firm would gradually replace its members with perfectly substitutable non-member labor. By so doing, that the labor-managed firm will become a competitive firm (with one member as the owner).

which is always further out than the MC curve; therefore all factor demand curves of NFPs are further out. It is unclear whether there is a difference in shape.

In the physician cooperative model, NFPs are inelastic to changes in physician wages. We can see this in figure 6.1. The closed staff hospital chooses output based on the intersection between the hospital's MRP and NARP. That choice does not depend on the market wage, which is given by the intersection of the MRP curve and the physician supply curve, s_0. Contrast this to the FP hospital, which clearly reduces demand for physician labor as s_0 slides up. The marginal conditions for capital and nonphysician labor in the closed staff NFP are same as in FP firms (e.g., choose capital such that the marginal product of capital equals the rental price). Hence, conditional on quantity and physician-labor input, factor demands for other inputs are identical to FP firms. Conditional only on quantity, however, demand for capital and nonphysician labor may be higher in NFP firms depending on the economies between physician labor and other inputs. The NFP firm produces less quantity than FP firms, so unconditional demand for physician labor is lower. Unconditional demand for other factors depends on the firm's technology.

In the noncontractible quality model, NFP firms produce higher levels of quality. Because higher quality requires more inputs and because the cost functions of FP firms are at least as low as those of NFP firms after owners/patrons select organizational form, NFP firms have higher conditional factor demands. No prediction can be generated regarding unconditional factor demand without knowing more about the exact nature of the firm's technology for joint production of quantity and quality.

Firm Size

In the altruism model, since owners/patrons of NFPs draw direct utility from quantity, NFPs are bigger controlling for quality. If we do not control for quality, we might get larger FP firms as owners/patrons of NFPs with preferences for quality substitute quality for quantity. This is more likely the stronger is the NFP owner's/patron's preference for quality relative to quantity.

In the physician cooperative model, NFP hospitals have smaller labor forces than FP hospitals, controlling for capital inputs. It is evident from figure 6.1 that with a closed staff, size is given by intersection of the MRP and the NARP of physician labor curves. With FP hospitals, size is given by intersection of the MRP curve and the physician supply curve. That suggests that closed staff NFPs should be smaller than FPs, as measured by their physician labor forces.[21]

21. We may observe this result even if the physician cooperative model does not accurately describe reality. NFP hospitals get tax breaks on capital inputs (e.g., property tax breaks).

In the noncontractible quality model the NFP firm is expected to deliver higher quality; in this sense size or production should be measured in levels of quality produced and not in (for example) patients' days. The noncontractible quality model does not supply any insight into the physical level of production. For a given volume of patient, the quality of service per patient is higher in NFP hospitals, yet the volume of patients might be higher or lower depending on the relative attractiveness of NFP versus FP hospitals to patients and the duration of high- versus low-quality treatment (i.e., if patients receiving high-quality treatment have longer hospitalization periods, controlling for the size of the hospital, a high-quality hospital would treat fewer patients).

Quality

In the altruism model, NFP market shares at each level of quality depend on the total demand for that level of quality. Not-for-profit firms, due to donations, satisfy initial demand at each level of quality. Because a limited number of owners/patrons prefer quality of output or a limited amount of donations finance the preferences of such owners/patrons, once NFP output rises to the level where the average costs of such hospitals exceeds the minimum average costs of FP hospitals, the latter will begin to enter. Due to the scarcity of altruism, FP firms are the marginal firms at each level of quality.

In the physician cooperative model, there is no difference between NFP and FP firms because quality considerations are omitted from the analysis. Still, one commonly used measure of quality is the number of physicians per bed. This measure is closely related to the physician-to-capital ratio, which the model predicts would be lower in NFP hospitals because physician cooperatives use less physician labor at each level of output.

In the noncontractible quality model, NFPs produce higher levels of noncontractible quality because they have less incentive (rents distributed as perks rather than cash) to exert effort to cut costs by reducing such quality.

Average Cost

In the altruism model, NFP firms have higher average costs controlling for quality. They produce where the market price equals average cost due to the inability of owners/patrons to take profits home as income (or due to the restriction that profits must be zero). For-profit firms produce where market price equals marginal cost. Since the AC curve lies below the MC

Therefore, these hospitals choose an input mix that favors capital, controlling for the level of output. To test whether the smaller size of NFP physician labor demand is due to the cooperative model or simple profit maximization in the face of tax subsidies for capital inputs, one ought to regress labor force size on an indicator for organizational form, total capital inputs, and the state property tax rate.

curve, this implies lower-quantity output and thus average costs for the FP firms.

In the physician cooperative model, because profit distribution encourages inefficiently high use of capital for every given level of output, average costs are higher for NFP firms, conditional on output. One cannot make a clear unconditional prediction because NFP firms tend to produce less than FP firms. With efficient capital-labor ratios, average costs rise with output in the region to the right of the intersection of the AC and MC curves. Therefore, it is possible that a lower-output but inefficient NFP firm has lower average costs than a higher-output, efficient FP firm.

In the contractible quality model, NFP firms have higher costs controlling for quantity and noncontractible quality because they exert less cost-cutting effort (and thus produce more noncontractible quality). Without controlling for quantity and contractible quality, it is hard to predict relative average costs. Higher noncontractible quality may be associated with higher levels of quantity or lower levels of quantity, and thus higher average costs or perhaps lower average costs even taking into account the additional noncontractible quality produced.

6.2 Industry-Level Predictions of Existing Theories

In this section we derive predictions concerning industry-level behavior of NFP firms in markets with mixed production under the assumptions of each of the three primary models described in section 6.1. Table 6.3 summarizes our findings. The first row examines whether each of the theories supports an equilibrium with both NFP and FP production. The remainder of the table examines relative NFP behavior in response to four shocks (to demand, to labor supply, to tax rates, and to public production) and with respect to one outcome variable (quality-adjusted price).

Is Mixed Production Possible?

In perfect competition under the altruism model, mixed production is possible if altruism is scarce either because donations are limited or there is a limited number of owners/patrons with preferences for quantity or quality in addition to profits. If total demand cannot be satisfied by firms run by output-preferring owners/patrons (who are aided by donations) at a cost lower than the minimum average cost of FP firms (which are not aided by donations) then FP firms will enter the market.

The physician cooperative model does not rule out mixed production as long as there is a market for "memberships" in closed medical staffs. For mixed production to exist, the income per member, in equilibrium, should be at least equal to the market wage. If it is below the market wage, all physicians would prefer to work for FP hospitals. If it exceeds the market wage, all physicians would want to work for NFP firms. However, if there

Table 6.3 **Derived and Conjectured Predictions of Industry-Level Behavior in Equilibrium under the Three Major Models of NFP Firm Behavior**

	Altruism	Physician Cooperative	Noncontractible Quality
Is mixed production possible?	Yes, if altruism is scarce and demand is sufficiently large	Yes, if cost of membership in closed staff varies across physician population	Yes, if heterogeneous costs of production or heterogeneous tastes for noncontractible quality
Response to a positive demand shock	Higher FP share of production	Assuming NFPs exist, higher FP share	Higher FP share
Response to a negative (labor) supply shock	Lower FP share	Lower FP share (but perhaps exit of all NFP firms)	Lower FP share
Response to an increase in the tax rate (on FP firms)	Lower FP share	Effect on FP share ambiguous; should reduce size of medical staff in NFPs	Lower FP share
Response to a reduction in government production	Higher FP share	Higher FP share	Higher FP share
Prices	Equal across FPs and NFPs, controlling for quality	No reason prices would differ	NFP price larger than FP price, controlling for contractible quality

are costs to membership in a closed staff (e.g., limited mobility in the market for the "member" as opposed to the "hired" worker) and these costs vary across physicians, mixed production is possible. Doctors who face high costs of membership will prefer FP hospitals. Doctors who earn greater profits from membership, even after deducting the costs of membership, will choose to join NFP hospitals.

For the remainder of this section, we will assume that the conditions for mixed production under each of the three theories are satisfied and that firms are in a mixed-production equilibrium.

Response to a Positive Demand Shock

In the altruism model a positive demand shock would induce entry by FP firms, which we explained above are the marginal firms. One should see a higher FP share of total market production as a result. In the physician cooperative model, assuming NFP firms exist, the reaction of NFP firms to positive demand shocks is contraction of output. (Recall that the cooperative's supply function is backward bending if there are diminishing returns to scale.) Thus, demand shocks are met by entry or expansion of FP firms. In the noncontractible quality model a positive demand shock will increase profitability. Since higher profitability increases the cost of taking NFP status, the share of FP production will rise.

Response to a Negative (labor) Supply Shock

In the altruism model a positive labor supply shock (positive shock to wages) increases production costs. Since FP firms are the marginal firms, such a supply shock would lower FP share of production because FP firms would exit. In the physician cooperative model FP firms reduce their labor forces in response to supply shocks. Not-for-profits do not, however, because they are indifferent to increases in physician wage. Thus NFP share would rise after a supply shock. Note, this prediction holds only if there is mixed production. If the shock is severe enough, the market wage will exceed the optimal income per member, and all firms should convert to FP form.[22] In the noncontractible quality model a positive supply shock will decrease profitability, so the cost of taking NFP status decreases. Due to the selection of owners/patrons into organizational form, a supply shock will result in a lower FP share.

Response To an Increase in the Tax Rate (on FP firms)

In the altruism model an increase in the tax rate increases the production costs. Since FP firms are the marginal firms, this would lower FP share of production, as FP firms would exit. In the physician cooperative model,

22. In the open staff model (see note 12) you may get the opposite result, depending on the relative elasticities of the NARP and MRP functions. The NARP is flatter than the MRP, so an inward (or upward) shift of the physician supply function causes the size of the open staff at the NFP to fall more than the size of the staff in a FP hospital.

the effect of a hike in the tax rate on NFP share is ambiguous. There are two countervailing effects. Initially FP firms will exit the market as their costs rise. As supply falls, price will rise. This in turn may induce NFP firms to cut their labor forces. This will result in an increase in the scale or entry of FP firms (which negates, at least in part, the initial exit of FP firms). In the noncontractible quality model an increase in the tax rate will decrease profitability, so the relative cost of taking NFP status decreases. This will result in the selection of more owners/patrons into the NFP form, resulting in a lower FP share.

Response To a Reduction in Government Production

In the altruism model, since the FP firm is the marginal firm this would increase the share of production in FP firms. Not-for-profit production is unaltered. In the physician cooperative model a reduction in output by public hospitals resembles a decrease in supply. For-profit firms are likely to enter as they face higher residual demand. In the noncontractible quality model, exit of government firms would decrease supply and hence increase the new equilibrium price for any given level of observable quality. The higher profitability would result in a higher cost of taking NFP status. This would result in a higher FP share.

Prices

In the altruism model, prices are determined by the marginal firm, which is FP. The NFP firms charge the same prices but use excess revenues to fund the production—actually consumption from the perspective of the owner/patron—of greater quantity and perhaps quality. In the physician cooperative model, there is no reason for the cooperative to charge a higher price than the FP hospital. From the consumer's perspective, both types of firm produce the same level of quality. In the noncontractible quality model, because consumers expect that NFP firms will provide higher level of noncontractible quality, consumers are willing to pay more for NFP output.

Summary

The main lesson to draw from the analysis in this section is that there are few equilibrium-level outcomes regarding which the three theories of NFP behavior discussed in this paper generate differing predictions. This limits our ability to use empirical evidence to discriminate among the theories. From a methodological perspective, this reduces the value of the different theories, ceteris paribus. Indeed, the analysis suggests that the noncontractible quality model generates virtually the same predictions as a variant of the altruism model, which supposes that some owners/patrons have a preference for the production of noncontractible quality. The only outcomes along which the noncontractible quality story might generate different predictions than this modified altruism model are the effect of a reduction in donations (which we do not study in this paper), the shape of firms'

supply curves, and unconditional factor demand. If donations dried up, the noncontractible quality model would predict that NFP firms might still exist as signals of noncontractible quality. The altruism model would predict that there would be no NFP firms in equilibrium because there would be nothing to finance their owners'/patrons' consumption of quantity or quality. With respect to the shape of firms' supply curves and unconditional factor demand, the noncontractible quality model has no strong predictions, whereas a modified altruism model would predict the same outcomes as the altruism model with output- or quality-preferring owners/patrons.

6.3 Empirical Evidence

In this section we address two questions: whether there exist empirical studies that permit us to discriminate among different theories of NFP firm behavior, and what such studies actually suggest about the relative performance of different theories. Superior performance is defined by the ability to generate predictions on a set of common outcomes that are more consistent with the data than the predictions generated by competing theories. The main lesson of this section is that more empirical work is required comparing NFP and FP firms on those outcome measures for which the different theories generate different predictions. Our focus here is on the health care sector in the United States, although we suspect our conclusion about the state of the empirical literature would be the same if we examined other sectors of the economy that have mixed production. This section develops in two parts. The first examines evidence on firm-level behavior of NFPs and FPs. The second examines evidence on industry-level or equilibrium behavior.

6.3.1 Firm-Level Comparisons

Table 6.4 summarizes the empirical evidence on the six firm-level outcome variables. These variables (output supply, conditional and unconditional factor demand, firm size, quality, and average cost) are the same ones for which table 6.2 listed the predictions of the three NFP theories examined in section 6.1. The stub column lists the outcome; the first column then indicates which of the three theories generate differing predictions regarding that outcome; the second summarizes the empirical evidence we have on that outcome; and the third reconciles the empirical evidence and the predictions of each theory.

Shape of Firm Supply Curve

Altruism models predict that NFP supply is upward sloping but more elastic than FP supply. The physician cooperative model, however, predicts that the supply curve may be backward bending. Unfortunately, we are not aware of any studies that attempt to compare the output supply curves of NFP and FP firms.

Table 6.4 Empirical Evidence on Firm-Level Predictions

Outcome	Theories Generate Different Predictions?	Summary of Empirical Evidence	Conclusion
Shape of firm supply curve	Yes	No data	None
Conditional factor demand	Yes	NFPs have higher conditional factor demand for nonphysician labor	Data tend to support the non-contractible quality model
Unconditional factor demand	Yes	NFPs have larger labor forces	Data supports the altruism model and rejects physician cooperative model
Firm size	Yes	NFP hospitals generally larger; NFP nursing homes may be smaller	Data are inconclusive
Quality	Yes	Uncertain whether NFPs produce higher or lower quality	Data are inconclusive
Average cost	No	Uncertain whether NPFs have higher or lower costs	Data are inconclusive

Conditional Factor Demand

While altruism models predict identical conditional factor demands regardless of ownership status, the physician cooperative model predicts that conditional demand for physicians will be smaller in NFP firms and the noncontractible quality model predicts that conditional factor demand for inputs generally will be larger in NFP firms. Available studies suggest that NFP health care providers have higher conditional demand for labor. Philipson and Lakdawalla (2000) examined data from the 1995 National Nursing Home Survey and found that FP homes employed fewer registered nurses, aides, and total employees than FP homes, holding total beds (for example) constant. They also found that NFP homes also used fewer doctors, but that result was not statistically significant. This result is consistent with that of Sloan and Steinwald (1980), who examined much older data (from 1969 to 1975) and found that NFP hospitals employ more registered nurses and non-nurse employees than FP hospitals. These studies, for obvious reasons, cast some doubt on the altruism theories (unless some sort of labor-input preference on the part of owners/patrons is assumed).[23]

23. This inference requires a caveat. Philipson and Lakdawalla (2000) control for price and output. In the altruism models, FP firms produce the same output and price as NFP firms only if they are more efficient than NFP firms. In such circumstances, it is possible that FPs use fewer labor inputs because of technology, not owner preferences. The predictions in Table 2 assume identical technology. Thus the findings of Philipson and Lakdawalla (2000) can be squared with the altruism models if owners have heterogeneous production technology.

Philipson and Lakdawalla (2000) indirectly casts doubt on the physician cooperative theory because it does not find that conditional demand for physicians is significantly smaller in NFP homes.

Unconditional Factor Demand

The altruism models predict that unconditional factor demand will be larger in NFP firms, while the physician cooperative model predicts that that unconditional demand for physician labor will be smaller at NFP hospitals. Because the noncontractible quality model makes no prediction about quantity of output, it has no prediction for unconditional factor demands. The available evidence suggests that NFP hospitals have larger unconditional demand for labor.

Existing studies indicate that NFP hospitals and NFP nursing homes have larger labor forces than their FP counterparts. For example, Gentry and Penrod (2000) examined nearly 5,000 short-term hospitals from the Health Care Financing Agency's (HCFA's) 1995 Medicare Cost Reports and observe that the median NFP hospital has more employees than the median FP hospitals (see also Rose-Ackerman 1996). Philipson (2000) studied the National Nursing Home Surveys from 1989 to 1994. He found that the FP homes tend to have 86 to 91 percent as many full-time equivalent employees as NFP homes.

These data support the altruism models and reject the predictions of the physician cooperative model. There is one caveat, however. Predictions regarding conditional and unconditional factor demand are generated holding quality constant, but the existing data on conditional and unconditional factor demand do not control for quality. This fact also reduces the ability of existing empirical studies to discriminate among theories of NFP firms based on their prediction regarding firm size.

Firm Size

The predictions of the three theories of NFP behavior regarding firm size, as measured by quantity output, mirror the theories' predictions regarding unconditional factor demand because the latter predictions are based on quantity output. Altruism-based theories predict that NFP will be larger; the physician cooperative model predicts they will be smaller; and the noncontractible quality model has no prediction.

The empirical data on firm size are, however, a bit more complicated than data on unconditional factor demand. Numerous studies demonstrate that NFP hospitals have more beds, admissions, and discharges than FP hospitals (see Frank and Salkever 2000 and Gentry and Penrod 2000). The former examines American Hospital Association (AHA) data on all hospitals from 1970 to 1995. David (2001) examined the same data from 1960 to 1999, however, and found that NFP and FP hospitals are converging in hospital size. For example, the ratio of average NFP to FP beds has

gone from around 3.0 in 1960 to around 1.5 in 1999. The same can be said regarding average admissions. David reports that this convergence is due to the growth in the average size of FP hospitals.[24] To complicate matters further, Philipson (2000) reported that, between 1989 and 1994, FP nursing homes tended to be more than 10 percent larger than NFP homes, as measured by average number of beds or patient days.

Thus data from hospitals tend to support the altruism theories (although less and less each year), but data from nursing homes tend to support the physician cooperative theory. It should be noted that the data from each of the studies discussed in the last paragraph were presented in summary statistic form; they were not subject to rigorous analysis.

Quality

Ironically, the two firm-level outcomes—quality and average cost—on which there is the least difference in predictions across the three theories of NFP behavior are those on which there has been the most (and the most rigorous) empirical work. With respect to quality, the altruism models predict that NFP firms will produce high quality if owners/patrons who chose the NFP form have a preference for quality, and the noncontractible quality models predict that NFP firms will produce higher noncontractible quality because the nondistribution constraint softens incentives to shirk on such quality. The difference between these predictions—the noncontractible quality model predicts only higher noncontractible quality—may not be amenable to testing because whether any measure of quality observable to an econometrician is truly noncontractible for consumers is questionable. The physician cooperative model also generates a prediction for quality, but it is no different than its prediction for conditional factor demand for labor: NFP firms have lower physician-capital ratios. This is a prediction about quality only if physician-capital ratios are a measure of quality.

The empirical literature comparing the quality output of NFP and FP health care providers can roughly be divided into three classes based on how they measure quality. One class focuses on health outcomes; a second on third-party assessments, such as regulatory violations and accreditation; and the third on intensity of use of certain quality-correlated inputs, such as physician labor. The most widely accepted measure of quality is health outcomes, so we focus more on this class of empirical studies.

Studies of outcomes do not provide a decisive answer to the question of whether NFP's provide higher quality of care. Early studies were limited because they employed cross-sectional data and lacked great controls for

24. David hypothesizes that the convergence might have been induced by the creation of the Medicare and Medicaid programs in 1966. These programs may have made previously unprofitable patients profitable to FP hospitals, encouraging their growth.

unobserved severity (see, e.g., Shortell and Hughes 1989 and Hartz et al. 1988). If patients select higher-quality hospitals when they have more severe illnesses and this severity is not observable by the econometrician, then estimates of the quality of high-quality hospitals will be biased downward. Keeler et al. (1992) tried to address this problem by gathering extensive clinical data on patients in their sample. Their study looked at elderly Medicare patients diagnosed with congestive heart failure, acute myocardial infarction (AMI), stroke, or hip fracture at 297 hospitals in 1981–82 and 1985–86. They found no difference in health outcomes between NFP and FP hospitals on average, but noted that FP hospitals appeared to have better outcomes on average than NFP nonteaching hospitals. The problem with Keeler et al.'s approach is that, because gathering detailed data is so expensive, their sample size is quite small.

Gowrisankaran and Town (1999) tried to address the patient selection problem by using a patient's distance to the hospital as an instrumental variable. Looking at data from Southern California between 1989 and 1994, they found that elderly patients admitted for pneumonia at NFP hospitals have 10 percent lower mortality than those admitted to FP hospitals. However, when Geweke, Gowrisankaran, and Town (2001) returned to the sample—actually a subsample of 78,000 Medicare patients admitted to Los Angeles County hospitals for pneumonia between 1989 and 1992—with more sophisticated estimation methods and separated NFP into teaching and nonteaching hospitals, they reached a different conclusion. While they found teaching hospitals were better than nonteaching hospitals, they also found no statistical difference between FP and nonteaching NFP hospitals. This distinction between teaching and nonteaching NFP hospitals is important because it is unclear whether NFP status or teaching status induces hospitals to provide higher quality in the samples.

McClellan and Staiger (2000) tried a different method to control for patient selection. They restricted their sample to patients hospitalized for AMI or ischemic heart disease. Such ailments progress rapidly, requiring patients to go to the nearest hospital. Looking at a sample of 550,000 patients at 4,000 hospitals, they initially find that, on average, FP hospitals have higher ninety-day mortality rates. However, the authors note that, just as estimates of quality differences may be biased by patient selection, they may also be biased by hospital selection (e.g., the choice by hospitals of where to locate). To control for this, they looked in detail at three counties with mixed production. This analysis reveals that, if anything, FP hospitals perform better than NFP hospitals. They also note that the small difference between NFP and FP hospitals masks huge variation within these types of hospitals. Shen (2002) tried to extend McClellan and Staiger by looking not just at a few markets but at the entire United States and by grouping NFP and FP hospitals for comparison, based on (for example) a distance-matching scheme. She found that FP hospitals have at least 3 per-

cent higher AMI mortality or complication rates than NFP hospitals. Her analysis did not, however, draw a distinction between NFP teaching and nonteaching hospitals.

The mixed conclusions of the health outcome studies can also be found in studies that examine patient complaints, violations of government quality-control regulations, and accreditation. Compare, for example, Mark (1996; NFP psychiatric hospitals experience fewer complaints or violations), Weisbrod and Schlesinger (1986; NFP nursing homes experience fewer complaints but the same level of violations), and Herzlinger and Krasker (1987; no difference in hospital accreditation). A further problem with these studies is that they have small sample sizes and violations and complaints are infrequent, suggesting a low signal-to-noise ratio.

Studies that examine input intensity—in particular, physician-labor-to-output ratios—are no more helpful. Although they find that NFP providers have higher conditional demand for physician labor (as discussed above), it is unclear why a high labor-to-capital or labor-to-output ratio indicates higher quality. It seems a superior approach would be to look at outcomes directly, rather than to make implicit assumptions about the production function for quality.

Overall, it does not appear that the literature on quality differences between NFP and FP health care providers offers much support to any of the three theories of NFP behavior.

Average Cost

All three theories of NFP firm behavior predict that NFP firms will have higher average costs than FP firms. Therefore, empirical work on the difference in costs of NFP and FP health care providers theoretically cannot be used to discriminate among the three theories, although it can be used to reject all three theories. Work to date, however, cannot do even the latter. The empirical literature on cost, like that on quality, can be sorted into three groups. Earlier work focused on paired comparisons of NFP and FP hospitals. This literature yielded conflicting results and the data may be too old to have relevance in today's changed marketplace. Compare Lewin, Derzon, and Marguiles (1981) and Pattison and Katz (1983) with Sloan and Vraciu (1983) and Herzlinger and Krasker (1987). The former studies found that FP providers are more costly than NFP providers. The latter studies found that FP providers are no different or less costly than NFP providers. Later studies employed regression analysis. They controlled for case mix, for example, but did not yield clear conclusions. For instance, Becker and Sloan (1985) found that FP hospitals have higher costs per patient day, but lower costs adjusted for admission. The third major group of cost studies used linear programming techniques to estimate frontier production functions. The inefficiency of a given hospital is measured by its distance from (outside) the frontier. The frontier analysis studies used

more recent data but still produced mixed results. For example, Wilson and Jadlow (1982) found FP hospitals more efficient; Koop, Osiewalski, and Steel (1997) found them less efficient; and Vitaliano and Toren (1996) and Zuckerman, Hadley, and Iezzoni (1994) found no difference between FPs and NFPs. Moreover, few studies of costs, regardless of the methodology, have serious controls for quality (see Newhouse 1994) or account for changes in payment schemes (i.e., the shift from fee-for-service insurance to managed health care) and the effects these changes have on cost-minimizing behavior.

6.3.2 Industry-Level Comparisons

Table 6.5 summarizes the existing empirical evidence on the differences in response to an increase in demand, an increase in labor costs, an increase in tax rates, and a decrease in public production; and the evidence on difference in prices. As in table 6.4, the stub column lists the outcome, the first column then indicates which theories generate different predictions regarding that outcome, the second column summarizes the empirical evidence on that outcome; and the third reconciles the empirical evidence and the predictions of each theory.

Response To a Positive Demand Shock

All the theories of NFP behavior examined in this paper predict that an FP's share of market production will rise in response to a positive demand shock. This is roughly consistent with the empirical literature that has explored the question. In an early study, Steinwald and Neuhauser (1970) found that, during 1960s, statewide population growth appeared to drive growth in the market share of FP hospitals. Relman (1980) provided evidence that the 1966 enactment of Medicare and Medicaid subsidizing in-

Table 6.5 Empirical Evidence on Firm-Level Predictions

Outcome	Theories Generate Different Predictions?	Summary of Empirical Evidence	Conclusion
Response to a positive demand shock	No	Probably increases FP share	Data do not discriminate between theories
Response to a negative (labor) supply shock	No	No data	Data do not discriminate between theories
Response to an increase in the tax rate	Yes	Probably reduces NFP share	Data do not discriminate between theories
Response to a reduction in government production	No	Increases FP share	Data do not discriminate between theories
Prices	Yes	No evident difference in prices	Data tend to support altruism model

duced significant growth in the market share of FP hospitals. Finally, Gulley and Santerre (1993) found that government regulation aimed at constraining price depressed FP market share.

The evidence on this issue is not, however, unanimous in its support of the predictions of the three theories. For example, Steinwald and Neuhauser (1970) also found that growth in per capita income is negatively correlated with growth in the FP market share. Moreover, Lakdawalla and Philipson (1998) find that the positive effect of Medicaid subsidies on FP share in the nursing home market is not statistically significant.

Response To a Negative (labor) Supply Shock

There are no studies we are aware of that examine the effect of such a shock. However, even if there were, they would not permit us to discriminate among theories of NFP behavior because all three that we examine predict an increase in FP share of production in response to an increase in physician wage.

Response To an Increase in the Tax Rate

The altruism model and the noncontractible quality model predict that an increase in the tax rate on FP firms should reduce FP market share. The physician cooperative model suggests that the effect on FP market share of a hike in the tax rate is ambiguous. However, that model does predict that the size of medical staffs in NFP hospitals should fall after a tax hike.

The empirical literature on NFP behavior generally supports the predictions of the altruism and noncontractible quality models. Using a twenty-year panel of U.S. states, Gulley and Santerre (1993) found in a state-fixed-effects regression that corporate and property tax increases raise the market share of NFP hospitals. Moreover, in a national cross section of several NFP industries by city and by state, Hansmann (1987) finds corporate and property taxes to be jointly significant in raising NFP market share (although their separate significance is not robust). Finally, although Chang and Tuckman (1990) found in a cross section of Tennessee counties that increases in property taxes do not significantly increase the market share of NFP hospitals, their study suffers from problems of small-sample size.

The empirical literature does not permit comment on the physician cooperative model. There are no studies that examine the effect of changes in commercial-enterprise tax rates on the size of medical staffs at NFP hospitals.

Response To a Reduction in Government Production

All three theories of NFP behavior predict that a reduction of government production should increase the FP share of health care production. This prediction finds strong support in the empirical literature. Gulley and

Santerre (1993) found that, from 1967 to 1987, the aggregate market share of FP hospitals (measured by beds) rose by 5.5 percent, while the aggregate market share of public hospitals fell by 5.3 percent. Lefgren and Philipson (1999) documented the continuation of this trend through the early 1990s and, furthermore, found that the aggregate share of FP hospitals has risen almost entirely at the expense of the aggregate share of public hospitals. Finally, Ettner (1999) found that FP psychiatric hospitals have replaced the output lost to the departure of many public psychiatric hospitals over the last few decades.

Prices

Neither the altruism nor the physician cooperative model predicts any difference in price across ownership form, controlling for contractible quality. The noncontractible quality model predicts, however, that NFP hospitals can charge higher prices controlling for such quality because they provide greater noncontractible quality. The data provide little support for this prediction. The only study to investigate the existence of a price premium is Philipson (2000).[25] Using firm-level data from the 1985 and 1995 National Nursing Home Surveys, Philipson estimated a hedonic demand function for nursing homes. He regressed private price per day on a dummy for ownership type, output, input, and quality controls (with quality measured by whether a home is certified) by the amount of services provided and by location in a city. His estimates suggest that NFP homes received about a 5 percent premium in 1985 and no premium in 1995, but neither figure is statistically significant. It should be acknowledged that there are problems with Philipson's study. For example, in order for Philipson's regressions to reveal the hedonic demand function for nursing home care, he must assume that the nursing home market is characterized by perfect competition where all firms are in the same market and there is no heterogeneity among consumers (see Vogt 2000). However, certificate-of-need laws impose barriers to entry into the nursing home market. This lack of competition diminishes the substitution between NFP and FP care.[26] These problems suggest further research is warranted.

Summary

Our review of the empirical literature suggests some obvious empirical projects worth an investment of resources by scholars interested in NFP

25. There is a large literature that attempts to answer the question, do NFP hospitals exploit market power as FP hospitals do? It is not immediately clear to us how the answer to this question might permit use to distinguish the theories we examine here based on their predictions regarding pricing behavior.

26. Moreover, it is unclear how informative a home's private price is about the price a home would charge in absence of regulations. Finally, Philipson must assume there are no differences between NFP and FP firms that are observable to consumers, but not to the investigator. This is questionable given the limited controls for quality he employs.

behavior. First, there is a need for data on the differences between the supply curves of NFP and FP firms. The three dominant, formalized theories of NFP firm behavior generate different predictions regarding the shapes of these curves, but to our knowledge there is no analysis of data on this outcome. Second, there is a need for better empirical analysis of the quantity and quality of output decisions of NFP versus FP firms. Again, the three theories generate conflicting predictions, but existing empirical studies have not arrived at a consensus on the difference, if any, between NFP and FP firms with respect to these outcomes.

6.4 Concluding Remarks

If forced to choose among the three theories of NFP behavior, we would weakly prefer the altruism theory. It enjoys the most empirical successes and fewest empirical defeats, but only barely. The noncontractible quality model is inconsistent with existing data on prices and on unconditional factor demand for labor. The altruism model is inconsistent only with existing data on conditional factor demand for labor, and studies that examine factor demand (conditional and unconditional) do not control for quality. Data on other firm-level outcomes are inconclusive and both theories generate similar predictions on industry-level equilibrium outcomes. Perhaps the better conclusion is that the physician cooperative model is not empirically relevant. It enjoys no empirical successes over its competitors and it is inconsistent with the data on unconditional factor demand.

It should be stressed, however, that a preference for the altruism theory or a rejection of the physician cooperative theory rests on weak data. Indeed, any attempt to elevate one theory of NFP behavior over others based on the analysis in this paper would be subject to a number of caveats, in addition to the obvious problem of decision making with imperfect empirical data. Obviously we focus only on the health care sector and on a small interval in time, typically the last two decades of the twentieth century. It may be, for example, that the physician cooperative model would enjoy more empirical success if imposed upon data from the first half of this century (Starr 1982). More importantly, this paper examines only a limited array of theories of NFP behavior. We focus on those that attempt to explain NFP firm behavior by examining the preferences of and constraints on the owners/patrons of such firms. There are theories that focus instead on the objectives of the government, of employees, or of donors (see, e.g., Francois 2001). They may generate predictions more consistent with the data.

The real purpose of this paper is to make a simple methodological point. In order to determine why NFP firms exist and behave as they do, scholars should focus on generating equilibrium predictions from competing theories with regard to a common set of measurable outcomes and then gather

the data on these outcomes in order to discriminate among theories based on their predictions.

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