NONPROFIT PRODUCTION AND COMPETITION

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ABSTRACT

Industries in which private nonprofit production is present and significant, such as health care and education, account for more than one-fifth of US economic activity. This paper argues that previous analysis of nonprofits has not separated profit-deviating preferences from the state-defined regulatory status of nonprofit production. We argue that this separation is crucial in providing predictions about the underlying forces which allow the coexistence of nonprofit and for-profit production in an industry, and consequently predictions about such fundamental matters as the share of nonprofit activity. By separating choice of nonprofit status from profit-deviating preferences, the paper provides predictions about the forces which determine the share of nonprofit production in an industry. Among other things, we argue that this share falls with the share of the demand that is publicly subsidized, rises with the total number of firms in the industry, and rises with growth in the pace or extent of cost-reductions resulting from learning-by-doing. These predictions stem from a basic aspect of regulatory nonprofit choice which links the degree of competition in a market with the share of nonprofits: the availability of economic profits under for-profit status raises the cost of choosing nonprofit status when such a status is associated with a distribution constraint. Empirical evidence using panel data on US states in the long-term care industry from 1989 to 1994 suggests the presence of the discussed predictions in this industry.

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1. INTRODUCTION

The nonprofit sector accounts for a large amount of economic activity, particularly relative to the amount of economic research spent exploring the workings of nonprofit firm behavior. In the US, estimates suggest that this sector produces one-fifth of research and development, a vast amount of human capital outside of on-the-job-training, as well as the majority of health care production, which alone comprises about one-sixth of US economic activity.[1] About one-fifth of all US firms are incorporated under nonprofit status. Health care is by far the dominant industry in the nonprofit sector; about half of the total employment in the nonprofit sector is in health care, concentrated in hospitals where eighty-five percent of employment is nonprofit. Education and research make up the second largest component of nonprofit employment with about twenty percent, followed by social services, such as child-care and job-training, with about fifteen percent. Few nonprofits in the US can cover their costs of production through sales; on average about half their production costs are covered by free capital and labor through donations and volunteer time, from both the private and public sector.

Nonprofit status is publicly defined by differences in regulatory and tax treatment. If a firm chooses to be nonprofit, it often faces lower costs of production through tax breaks or lower costs of capital and labor through donations and volunteer time. In the US, nonprofit firms receive federal tax breaks through corporate income tax exemption, tax-deductibility for donors, and tax-free debt. State and local governments often complement these tax-differentials through exemption from their income and property taxes. However, these benefits come at a price. Nonprofits are barred from raising capital through equity financing, and they face non-distribution constraints which limit the economic profits they can keep.

Many industries lack nonprofit firms altogether, because the state allows firms in only a few industries to apply for nonprofit status. In the US, for instance, nonprofit status is available primarily to firms which engage in charitable, religious, or educational activities.[2] At the opposite extreme, where the nonprofit share is close to unity, lies US education. Most industries with nonprofit production, including US health care industries, occupy the middle ground in which both types of production prevail. Within health care, regular short-term care by hospitals is predominantly nonprofit but long-term care in nursing homes is predominantly for-profit.

In this paper, we ask what differences between and within these industries give rise to their different shares of nonprofit production? We wish to explain, in any given industry, the share of firms which are nonprofit, and the share of output ac-

[1] For a discussion of aggregate statistics on the US nonprofit sector, see Rudney (1987).

[2] See the American Bar Association's (ABA) *Nonprofit Statute Model*, which has been adopted by many state governments as a model for regulating nonprofits.

counted for by nonprofit firms. We take an exclusively positive focus in this paper, because we believe it necessary to understand what accounts for the degree of nonprofit production before offering recommendations for altering it. Our implications are generated by the basic and simple trade-off between the benefits of unconstrained profit-making, allowed under for-profit status, and the benefits of tax breaks, allowed under nonprofit status. As the profits to be had under for-profit status rise, the profits foregone by firms choosing nonprofit status rise as well, and the share of firms choosing nonprofit status must thus fall. This central trade-off provides an important link between the degree of competition present in an industry and the share of output undertaken in its nonprofit sector. More competitive industries are more nonprofit, because the disadvantage of a distribution constraint in the nonprofit sector falls as competition drives profits to zero.

The paper may be outlined as follows. Section 2 first discusses the implications of motives besides profit-making often argued to be important for firms in the nonprofit sector. For example, in social services and health care, investment in firms which cannot cover their costs with sales are hard to explain without producers who like to 'do good' beyond monetary profits. We refer to such producers as *profit-deviators.* Such a firm may be seen more generally as any organization, public or private, which does not aim to maximize the monetary gain to its owners. However, as opposed to previous analysis, we separate preferences of the firm, which are given, from the profit status of the firm, which is chosen. Profit-deviating preferences do not imply the choice of nonprofit status: we find that some firms with profit-deviating preferences may prefer to be for-profit, while some profit-maximizers may prefer to be nonprofit. Therefore, to better understand how the public regulations defining the nonprofit sector affect the status chosen by firms, we first study the short- and long-run price and quantity predictions under profit-deviation in an *unregulated* market without any nonprofit sector. We obtain several new implications about profit-deviating preferences inconsistent with previous qualitative discussions, which equated such preferences with the choice of nonprofit status. For example, we predict that: firms with profit-deviating preferences may drive out, through competition, profit-maximizers in an unregulated market; quantity-preferring producers do not necessarily have larger output in the long-run; competition raises the amount of equilibrium donations to firms with negative economic profits; and efficient long-run market outcomes may involve prices below or above both average and marginal costs.

Section 3 discusses the effects of regulatory nonprofit choice and offers our implications regarding the factors determining the share of production taking place in either sector. In making the choice of organizational form, we assume that producers face a demand side which treats for-profit and nonprofit output as perfect substitutes; all other things equal, the consumer does not care about the regulatory status of the producer. Under perfect competition, we find that perfect substitutability coupled with traditional free entry assumptions cannot generate mixed production, since the cheaper sector gets the entire market. Therefore, we investigate the role of scarce altruism in generating positive rents (but not positive profits) available only to altruistic firms; the heterogeneity in rents between altruistic and profit-maximizing firms then allows mixed production.

We next consider the impact of a noncompetitive market structure on the share of output and firms under either regulatory status. Mixed industries often are heavily protected through entry barriers such as Certificate of Need (CON) Laws in US health care markets. We discuss an important positive link between the degree of competition and the non-profit share of an industry. As equilibrium profits fall, the costs of nonprofit status in the form of foregone profits falls as well. This simple relationship between profits and mixed production has many direct consequences. First, the share of nonprofit output and producers fall with the total number of firms in the market, if increasing the number of firms lowers profits and by implication the price a firm pays to be nonprofit. Second, the share of nonprofit production falls with the availability and the level of public demand subsidies. Public demand subsidies, which cover the bulk of demand in most health care markets in developed countries, also raise the level of profits foregone by a firm which chooses nonprofit status.

Section 4 considers dynamic aspects of mixed production and the stability of nonprofit shares over time. We assume that producers become more efficient as they gain more experience at producing. This "learning-by-doing" increases the profits older and more experienced firms forego when they choose nonprofit status. As learning-by-doing increases in extent and speed, therefore, the share of for-profit production increases as well. This prediction is again subsumed under the more general claim that nonprofit shares are negatively related to the availability of economic profits. Our theory of sectoral choice over time offers three predictions. First, the presence of learning-by-doing can generate mixed production by introducing heterogeneity in costs across firms, as a result of which, firms with larger foregone profits choose for-profit status. Second, learning-by-doing induces firms to convert only in one direction, from nonprofit to for-profit, and not *vice-versa*. Third, steady-state analysis predicts that the stability of nonprofit shares over time must imply that the for-profit sector is a net-receiver of conversions, and also that the nonprofit sector has higher rates of entry.

Section 5 provides evidence on the relation between the degree of nonprofit production and the extent of available profits using panel data across US states in the long-term care industry, from 1989 to 1994. We find a remarkable degree of consistency between our predicted relations and the cross-sectional patterns of correlation in these data. More highly Medicaid-subsidized and less competitive states, as measured by the strictness of their Certificate of Need (CON) Laws, are associated with lower shares of nonprofit production. We thus find a strong negative association between profitability and nonprofit shares within these data. Furthermore, as our steady-state analysis suggests, it appears though that most of the change over time in these data set is not systematic in nature, as the share of for-profit firms appears to be holding steady over time. Of course, since our models of entry apply to the long-run, perhaps we should not expect to see much systematic variation over time for the short 5-year horizon of these data. However, concentration is found to be negatively related to nonprofit shares in the 5-year longitudinal analysis within US states.

The paper relates to a large literature on the positive behavior and normative role of nonprofit institutions in economic activity.[3] We depart from previous analysis of nonprofits by separating the impacts of profit-deviating preferences from the publicly defined status of nonprofit production. Without this distinction, previous analysis has been unable to offer predictions about: the shares of mixed production; the way in which profit-deviating behavior affects these shares; the reasons for the coexistence of the two regulatory forms under perfect demand-side substitutability between sectors. Our approach also offers a methodology by which we can analyze nonprofit behavior using standard neoclassical firm analysis, without having to impose any 'budget constraints' on firms. Significantly, previous work focusing only on a *single* aspect of nonprofits, for instance either on their non-distribution constraint or on their tax breaks, cannot explain the shares and coexistence we often observe. No firm would want to constrain itself without rewards and no firm would forego tax breaks without constraints. With neither an explicit theory of the forces contributing to the relative sizes of the two sectors, nor an understanding of how those sizes are affected by profit-deviation, it seems difficult to attempt to explain the differences in nonprofit shares across industries and regions. Our departure is necessary to provide predictions about both the underlying forces which permit the coexistence of nonprofit and for-profit production in an industry, and such fundamental matters as the share of nonprofit and for-profit activity in an industry.

[3]Becker's (1958) analysis of the effects of racial discrimination on input markets is an early formal discussion of non-income motives of suppliers. For a general discussion of the non-profit sector see, *e.g.,* Clotfelter (1992), Weisbrod (1977, 1987, 1988), Hansmann (1980), Powell (1987), Rose-Ackerman (1986,1996) and the references contained therein. For discussions of non-profit behavior in health care see e.g. Newhouse (1970), Pauly and Redisch (1973), Harris(1977), Becker and Sloan (1982), Dranove(1988), Gertler (1989), Gertler and Waldman (1992), and Sloan (1997).

2. UNREGULATED PRODUCTION UNDER PROFIT-DEVIATING PREFERENCES

This section discusses the short- and long-run implications for output and price of production carried out by producers who do not necessarily aim to maximize profits. We refer to such preferences as *profit-deviating* preferences, but we emphasize a methodology by which a neoclassical framework can explain the behavior of firms with such preferences. The discussion here is concerned with unregulated markets. Later, we examine the effects of public policies which offer firms a choice between producing subject to higher taxes as a for-profit firm and producing subject to profit constraints as a nonprofit firm.

2.1. Short-Run Predictions under Profit-Deviating Preferences. For a given level of output y, let $\pi(y)$ denote profits given by revenues less costs as in

$$\pi(y) \equiv p(y)y - c(y)$$

We have the inverse demand function $p(y)$, constant under perfect competition, and the cost function $c(y)$, for which marginal costs are assumed to rise. Consider the case in which the preferences of firms are affected by profits *and* the amount of output delivered to the consumer.

Specifically, we define a firm as the holding of a single owner or residual claimant, who operates the firm according to his objectives, and who receives the firm's profits when positive, but covers the firm's losses when negative. The firm's owner derives utility from his own consumption, z, as well as the output of the firm, so her preferences may be characterized by the utility function $u(z, y)$, where u is concave, and increasing in consumption. If we do not yet incorporate the non-distributional constraints faced by nonprofit firms, the firm thus solves the problem[4]

$$\max_{y \geq 0} u(z_0 + \pi(y), y)$$

where endowment of wealth is represented by z_0. We can rewrite the utility function for the firm as $v(y, \pi(y))$, where v is increasing in π, concave, and where v_1 has the same sign as u_2. If $v_1 > 0$, the owner derives utility from output; we will call the firm of such an owner an "output-preferring" firm. If $v_1 < 0$, perhaps as a result of racial or other prejudice against consumers or stigma associated with providing certain outputs, the owner dislikes output; we will call this firm an "output-averse" firm. If the owner does not value output, however, $v_1 = 0$, which reduces the objective to profit-maximization. If $v_1 \neq 0$, we will call the firm a *profit-deviator*, a concept we will keep separate from the nonprofit firm.

[4]This utility represents the full consumer problem solved when maximizing $u(z, y)$ subject to the budget constraint $z + c(y) \leq z_0 + py$, in which the overall wealth of the owner does not impose a binding constraint.

We should emphasize that in this framework, all the implications about the levels of equilibrium profits translate into implications about the level of donations, or the amount of free inputs given to cover negative profits. This unifies the concepts of investor and donor, previously separated in the nonprofit literature. In our model, if the firm has negative profits, the owner covers the loss out of her consumption. An owner may, for instance, wish to donate money to the cause of increasing output by accepting negative economic profits—donors could presumably make money on the capital they donate, if they invested it differently. A donor is simply an investor who chooses to contribute to the cause of producing output by accepting negative economic profits.

If the firm maximizes $v(y, \pi(y))$, the supply of output y necessarily satisfies the first order condition:

$$\frac{v_y}{v_\pi} = -\pi_y$$

The marginal rate of substitution between the profits and output of the producer must equal the marginal rate of transformation between profits and output. The more output is valued *per se* (regardless of whether the valuation is positive or negative),[5] the lower will be optimal profits. The condition may be rewritten as

$$p_y y + p = c_y - \frac{v_y}{v_\pi} \tag{1}$$

We can think of this expression as equating marginal revenue (on the left-hand side) with "total marginal cost" (on the right-hand side) which includes both monetary cost and the cost or benefit of providing output. In the special case of profit-maximization, in which $v_y = 0$ and $v_\pi = 1$, the above condition sets marginal revenue equal to marginal monetary costs c_y. The more the producer values output relative to profits, the larger is the marginal rate of substitution $\frac{v_y}{v_\pi}$, the smaller is the total marginal cost, and so the higher is output.

An interesting, and possibly empirically relevant, possibility raised by the first order condition in 1 is that of a downward sloping supply curve. In the competitive, profit-maximizing case, when the price rises, marginal cost must rise as well in equilibrium. This implies that output must rise. With profit-deviation, it remains true that "marginal cost" must rise as a result of the price increase, but now c_y need not rise, since the marginal rate of substitution $-\frac{v_y}{v_\pi}$ (or, equivalently, the marginal value of output in monetary terms) could rise instead. Since v is concave, when y rises, there is an upward pressure on the marginal rate of substitution, as the marginal utility of output must fall. However, if the cross-partial $v_{y\pi}$ has the opposite sign of

[5]When $v_y > 0$, marginal cost exceeds marginal revenue, so output is higher and profits are lower than at the profit-maximizing point. Similarly, when $v_y < 0$, marginal revenue exceeds marginal cost, so output is lower and profits are lower than at the profit-maximizing point.

v_y, a rise in output can also exert a negative effect on the marginal rate of substitution. If this effect is strong enough, total marginal cost may be falling in output. If a rise in output sufficiently devalues the marginal utility of profit, the marginal value of output in dollar terms may rise in spite of the concavity of the firm's utility function. This rise in the dollar marginal value of output may be sufficient to overwhelm the rise in marginal cost which results from an increase in output.[6] This may be a real phenomenon for nonprofit firms with positive donations. If profits rise, donors may derive less benefit from rises in output; donors may value the output of a highly profitable institution much less than that of a less profitable one.

In spite of this unusual property, many of the usual predictions about profit-maximizers may be translated into predictions about profit-deviators. The value placed on output in itself may be seen simply as shifting the marginal cost function from $c_y(y)$ to $c_y(y|v) = c_y(y) - \frac{v_y}{v_\pi}(y)$. To illustrate, consider a profit-deviator in a competitive output market with a linear utility function

$$v = \alpha_y y + \alpha_\pi \pi \tag{2}$$

It behaves exactly as a profit maximizer with the adjusted cost function:

$$c(y|v) = c(y) - \frac{\alpha_y}{\alpha_\pi} \cdot y$$

The relative value placed on output compared to profits shifts the cost function up or down depending on whether the producer likes or dislikes output *per se.* The first order condition becomes

$$p = c_y - \frac{\alpha_y}{\alpha_\pi}$$

Equilibrium output is rising in the relative value of output. Instead of the usual marginal monetary cost curve, the short-run supply function now becomes the total marginal cost curve $c_y(y|v)$, which also reflects the costs imposed by the firm's output preferences.

[6]Formally, comparative statics on the competitive version of 1 yields the relation:

$$\frac{dy}{dp} = \frac{v_\pi^2 + v_\pi v_{y\pi} y - v_y v_{\pi\pi} y}{c_{yy} v_\pi^2 - v_\pi v_{yy} + 2 v_y v_{y\pi} + (\frac{v_y}{v_\pi})^2 (-\frac{v_{\pi\pi}}{v_\pi})}$$

A pair of sufficient conditions for this expression to be negative are:

$$sign(v_y) = -sign(v_{y\pi})$$

$$y(v_{y\pi} - \frac{v_y}{v_\pi} v_{\pi\pi}) < -v_\pi$$

By reinterpreting the cost function, we make a simple and important methodological point: we can analyze and explain the behavior of profit-deviators using standard theories about profit-maximizing firms, without imposing any budget constraints on firms. In particular, if producers have a net output preference in the aggregate,[7] this corresponds to a downward shift in marginal costs relative to profit-maximizers, so the short-run supply curve shifts outward and the short-run price falls relative to the standard case. On the other hand, if producers have a net output aversion in the aggregate, this shifts the short-run supply curve inward and raises the short-run price. This simple reinterpretation of cost-functions allows for standard competitive neoclassical analysis of profit-deviating firm behavior.

2.2. Competitive Long-Run Predictions under Profit-Deviating Preferences. When we consider competitive long-run behavior, we will continue to find that the equilibrium long-run price is lower when producers prefer output *per se* and higher when they are averse to output. This directly implies that the *aggregate* output rises with output preferences. If altruistic firms are scarce, output per-firm also rises with output preferences, but the effect on firm size may be indeterminate if such firms exist in infinite supply. In this case, price-competition will move the optimal scale toward the point of minimum average cost, and the location of this point relative to the scale of a profit-maximizer is ambiguous.

Given free entry and exit in a competitive market, profit-deviating producers will operate on their "break-even curve" in the long-run. This curve is defined by the output and price combinations (y, p) at which a producer is indifferent between entry and exit:

$$v(y, py - c(y)) = v(0,0)$$

In the special case of competitive profit-maximization, these combinations reduce to the average cost-curve $p = c(y)/y$. Throughout the paper, we make the assumption that this curve is U-shaped with a unique minimum. Figure 1 depicts the relation both for a profit-maximizing firm, and a profit-deviating firm that prefers output *per se*. The top curve is the usual long-run average cost function along which profit-maximizing firms are indifferent between entry and exit. The curve below is defined by the break-even relation for the profit-deviating firm in the case when output is valued *per se*. Since a profit-deviating firm values output in itself, profits along the break-even curve are always negative. If output is valued *per se*, so $v_y > 0$, we know that $v(y,0) > v(0,0)$. Therefore, along the break-even curve, a firm which prefers output has *negative* profits, while a firm averse to output has positive profits . Along the break-even curve of a profit-deviating firm which values output, average monetary costs are *above* price, or $c(y)/y > p$; for a firm which is averse to output,

[7] We can aggregate firm supply curves through summation in the usual way.

they are below price; for a profit-maximizer, they of course are equal to price. This illustrates a distinction between economic rent and economic profit, given profit-deviating preferences: the existence of economic rents under such preferences neither implies nor is implied by the existence of economic profits.

If there were an infinite number of potential suppliers of each type v, then in the long-run, price would move to its lowest point along the break-even curve of *all* types. In the case of two firm types, as in Figure 1, this reduces to a choice between p_1 for the profit-maximizing firms and p_0 for the output-preferring firms. The break-even curve for profit-deviating firms lies uniformly below that of the profit-maximizers when output is valued and uniformly above it when output is disliked; therefore, the long-run price is lower for a producer that prefers output, as in Figure 1, and higher for one that is averse to it.

Since we are considering the competitive case, suppose that there exists an infinite number of profit-maximizing firms who could enter the industry in the long-run. As a result, we need not consider any output-averse firms, since their long-run price lies above that of a profit-maximizer. While free competition entails an infinite pool of profit-maximizers, it need not entail an infinite pool of output-preferring firms. We will consider first the case in which output-preferrers are scarce, when altruism is limited, and then the limiting case in which they are in infinite supply.

To investigate the first case, suppose altruistic firm preferences v can be indexed by some parameter $\alpha \in [0, 1]$. Firm α has the utility function $v(\pi, y|\alpha)$, where $\alpha = 0$ represents profit-maximizers, so that $v_2(\pi, y|0) = 0$, and $v_2(\pi, y|\alpha)$ increases in α. There exists an infinite supply of profit maximizing firms with $\alpha = 0$, but we assume that the distribution of $\alpha \in (0, 1]$ is described by a relation $\mu(\alpha)$, which gives the (finite) number of type α firms. In this case, the long-run number of firms and the firm scale are determined by the lowest level of altruism at which firms cease to become scarce.

Recall from our discussion of Figure 1 that instead of viewing these firms as heterogeneous in preferences, we may view them all as profit-maximizers with reinterpreted cost functions $C(y|\alpha)$, where $C_y(y|\alpha)$ falls in α.[8] By implication then, average cost falls in α as well. As a result, profit-maximizing firms represent the firms with the highest average cost. Assuming demand is large enough to support any such firms, profit-maximizing firms will be the marginal firms in the competitive case. In the short- and long-run, every firm has the supply function $y(p|\alpha)$ implicitly defined by

[8] Formally, given the standard cost function $c(y)$, the reinterpreted cost function $C(y|\alpha)$ satisfies:

$$C(y|\alpha) = \int [c_y(y) - \frac{v_y(\pi, y|\alpha)}{v_\pi(\pi, y|\alpha)}] dy$$

This implies, as assumed throughout, that $C_y(y|\alpha)$ falls in α.

it reinterpreted marginal cost function:

$$p = C_y(y(p|\alpha)|\alpha)$$

Clearly, the long-run price cannot lie strictly above minimum average cost for the profit-maximizing firms, henceforth denoted by m_π, since there would then be infinite equilibrium supply.

It could, however, lie strictly below m_π, but only if there exist "enough" altruistic firms to satisfy market demand at such a price. Given a demand function $D(p)$, this condition requires a price $p < m_\pi$ at which altruistic production weakly exceeds market demand:

$$D(p) \leq \int y(p|\alpha)d\mu(\alpha) \tag{3}$$

If this condition obtains for some $p < m_\pi$, all firms will be altruists, because the altruists can satisfy market demand, and every altruist has lower cost than a profit-maximizer. At this price, there will be a marginal altruistic firm $\underline{\alpha}$, for whom rents, although not profits, are zero:

$$py(p|\underline{\alpha}) = C(y(p|\underline{\alpha}))$$

Only firms with enough altruism produce; that is, only firms with $\alpha \geq \underline{\alpha}$ are in the market. Since price equals the reinterpreted average cost only for the marginal firm, all inframarginal firms will earn rents, because we do not have "free entry" for altruistic firms. Even without entry barriers, the scarcity of altruistic firms generates rents.

If no price satisfies the relation in 3, the long-run price will be the standard minimum average cost (which is the reinterpreted minimum average cost for the profit-maximizer); $p = m_\pi$. In this case, profit-maximizers enter until excess demand is eliminated, and the scarce altruistic firms earn rents. There exists a market return to altruism, given by $m_\pi y(m_\pi|\alpha) - C(y(m_\pi|\alpha))$. Even though altruists have higher rents, since $y(p|\alpha)$ rises in α, altruistic firms have a higher long-run scale than profit-maximizers.

We may now discuss the impact of altruism on the market. Suppose we shift μ in a first-order sense, so that μ contains more mass at higher levels of altruism, and suppose that the total number of altruistic firms does not fall.[9] Since firm-level output rises in α, output per-firm rises as more weight is placed on the higher output firms. Market output, however, rises only if the increase in altruism suffices to drive the price lower. The price falls if we begin with no profit-maximizing firms, or if the increase in altruism boosts the output of altruistic firms enough to satisfy

[9] We assume only that no altruistic firms are lost, and the measure μ increases in a first-order sense, so for any weakly decreasing function $g(\alpha)$, $\int g(\alpha)d\mu(\alpha)$ rises.

market demand without the entrance of any profit-maximizing firms. In either case, the price is then determined by the minimum average cost of the marginal altruistic firm. Hidden by the adjustment of the cost function in this analysis has been the movement of economic profits. About these we can say that the higher the altruism of the marginal firm, the lower are profits for all altruistic firms. Given the emergence of more altruistic firms, the marginal firm will have a higher level of altruism and market price declines, so profits for all altruistic firms fall. By implication, since altruistic firms have negative economic profits, donations rise with the emergence of more altruistic firms. A decrease in the scarcity of altruistic owners implies an increase in donations. To summarize, an increase in firm altruism: always increases output per-firm; weakly decreases the long-run price; weakly increases long-run market output; weakly increases donations to altruistic firms.

If there exists an infinite supply of altruistic firms at all levels, however, the prediction concerning output per-firm will fail to hold. In such a case, the industry becomes dominated by the most altruistic firm-type, which has the lowest average cost curve. Clearly, an increase in the highest available level of altruism lowers long-run market price (and thus market output), by lowering minimum average cost. However, the impact on firm scale depends on the shape of the firm's utility function and will be ambiguous.

To illustrate this, consider the case of separable, but possibly nonlinear preferences indexed by a single-dimensional parameter α:

$$v(y, \pi) = \alpha u(y) + (1 - \alpha)\pi$$

The function $u(y)$ reflects the value placed on output in itself. In this case, we have the adjusted cost function:

$$C^u(y|\alpha) = c(y) - \frac{\alpha}{1 - \alpha}u(y)$$

Competition would force producers, regardless of their preferences, towards the scale y_v which minimizes $\frac{C^u(y|\alpha)}{y}$. The output that minimizes this reinterpreted cost-function satisfies

$$C^u_y(y_v|\alpha) = 0 \Longleftrightarrow c_y(y_v)y_v - c(y_v) = (\frac{\alpha}{1 - \alpha})(u_y(y_v)y_v - u(y_v))$$

When u is increasing and proportional to output, then $u_y(y)y - u = 0$ and the long-run scale is *unchanged* by altruism. Alternatively, if output is valued and u is convex, long-run scale is *increased* by altruism.[10] Although industry output is larger when

[10]Depending on the rate at which utility rises or falls with output, the scale may change in different directions. Convexity implies $u'(y)y > u(y)$, and concavity implies $u'(y)y < u(y)$. Thus, if u is convex and increasing, long-run output is increased by altruism; if u is concave and increasing, long-run output is decreased by altruism. Analogous arguments hold when u is decreasing, and the producer is averse to output.

profit-deviators value output, the firms are not necessarily larger.

This simple analysis has several positive implications which differ from the conclusions of previous discussions. First, it often argued qualitatively that since profit-maximizers are driven to please their customers, in a competitive market they will be more successful than profit-deviators. If profit-maximizers price at minimum average costs, the argument goes, producers with profit-deviating preferences cannot compete effectively, or respond to market signals.[11] However, the analysis above implies that an output preference causes, *ceteris paribus*, profit-deviators to charge a lower long-run price in competitive markets. Thus, *with neither market power nor a cost advantage introduced by regulation*, producers with such profit-deviating preferences will drive out the profit-maximizers.[12] Second, it is often argued that a profit-deviator will produce more long-run output than a profit-maximizer. The analysis indicates that this holds only under certain assumptions: either that altruism is scarce, or that altruism is not scarce and profit-deviators value output at an increasing rate. Third, it is common to argue that regardless of producer preferences, cost-minimization is implied so that input demand predictions are not altered. This is true for *conditional* input demand behavior at a given level of output. However, as we have shown, the scale of operation may change under profit-deviation so that *unconditional* input demands may differ. Lastly, it is commonly argued that profit-deviating producers must have market power in order to make different decisions than profit-maximizers. The argument given above shows in fact that *under competition* they charge lower prices. Competitive pressure itself causes output-preferring profit-deviators to drive out profit-maximizers.

3. REGULATION AND THE SHARE OF NONPROFIT FIRMS

The previous section discussed unregulated production when producers had preferences that did not necessarily aim to maximize profits. This has to be separated from *public* regulation of production which defines all nonprofit production. To compensate for the tax breaks given to a nonprofit firm, nonprofit production takes place under a distribution constraint. Although the distinction has not been made clear in previous analyses, under such public regulation, nonprofit status is an observable *choice*, as opposed to profit-deviation which is a set of unobservable *preferences*, used to explain the pattern of nonprofit status chosen by firms. This section discusses the choice of regulatory status under perfect competition when profit-maximizers earn zero profits, so the distribution constraint for nonprofit status (assumed to be set at

[11] See James and Rose-Ackerman (1986, page 59).

[12] It is often claimed that because nonprofits spend donations on their own goals, rather than the goals of donors, nonprofit firms survive only when they possess market power. (James and Rose-Ackerman (1986), page 50) We have shown that, even in the presence of donation, under competition the firm's goals are compatible with the donor's goals.

zero profits) fails to bind. Throughout this section, we will assume that goods produced by a nonprofit firm and a for-profit firm are perfect substitutes to consumers, who do not care about the regulatory status of firms. We will investigate determinants of the share of publicly defined nonprofit production first under competitive conditions, and then under non-competitive conditions.

3.1. Competitive Production. Let d indicate the regulatory choice of the firm, where $d = 1$ when a firm chooses to be for-profit and $d = 0$ when it decides to be nonprofit. We denote by $d(\alpha, p)$ the preferred status of a producer with preferences α when the price is p. The nonprofit sector is defined by a non-distribution constraint and lower costs. As a result, we first assume that under nonprofit status, the firm is constrained to have economic profits below a certain regulated level $\pi \leq \pi_R$ (we take $\pi_R = 0$, so this implies the abolition of rents), but under for-profit status, profits are unconstrained. Second, we assume that cost functions differ across status: denoting by $c^d(y)$ the cost function in status d, suppose that $c^0(y) \leq c^1(y)$ and $c^0_y(y) \leq c^1_y(y)$; holding output fixed, both total and marginal costs are lower in the nonprofit sector. This difference in costs represents the tax breaks which favor nonprofit firms: for instance, nonprofits have lower corporate income, property, and benefit taxes. If nonprofits were to have *higher* costs than for-profit firms then no firm would choose to be nonprofit. In such a case, a firm could always do better with the lower costs and unconstrained profits of the for-profit sector. Therefore, mixed production must reveal that nonprofit costs are lower.

As in the analysis of long-run entry in the section on unregulated production, we assume an infinite pool of profit-maximizing entrants, so we may once again disregard output-averters. The entry analysis will be identical to that in the previous argument, so if altruistic firms are in infinite supply, only altruistic firms exist. The marginal altruistic firm will have zero economic rents, and negative economic profit. Since profits fall in altruism, all firms have negative economic profits. Therefore, the lower marginal cost afforded by nonprofit status causes all altruistic firms to be nonprofit. In this case, we have an exclusively nonprofit industry.

Now suppose that altruistic firms are scarce as discussed before. As before, we index firm preferences by $\alpha \in [0, 1]$, where $\alpha = 0$ for profit-maximizers, and α is distributed over $(0, 1]$ according to μ. Altruists always choose nonprofit status, but since profit-maximizers are marginal in this industry, their equilibrium profits are always zero. This makes them indifferent across status.[13] Given a price p, nonprofit output supplied by an altruistic firm, $y^0(p|\alpha)$, is defined implicitly by:

$$p = c^0_y(y^0(p|\alpha)) - \frac{v_y(y^0(p|\alpha), \pi(y^0(p|\alpha)))}{v_\pi(y^0(p|\alpha), \pi(y^0(p|\alpha)))}$$

[13] We obtain the result of mixed production only if these indifferent firms choose for-profit status.

For-profit output, always supplied by a profit-maximizer, $y^1(p|0)$, is of course defined by the standard condition

$$p = c_y^1(y^1(p|\alpha))$$

Denote by m_π^1 the minimum average cost of the profit-maximizer under for-profit status. Once again, if demand is covered by altruists, $D(m_\pi^1) \leq \int y^0(p|\alpha)d\mu(\alpha)$, and no profit-maximizers will be able to enter. We will have exclusive nonprofit production by profit-deviators. If not, then some profit-maximizers enter, and the long-run price is given by m_π^1 with the number of profit-maximizing/for-profit entrants N^1 given by

$$y^1(m_\pi^1|0)N^1 = D(m_\pi^1) - \int y^0(m_\pi^1|\alpha)d\mu(\alpha)$$

Given these expressions, we can make the following predictions about the two sectors. First, since output increases in altruism, and since it increases for nonprofit firms holding altruism constant, the average scale of the nonprofit sector must be higher than that of the for-profit sector. This result obtains even though output is perfectly substitutable across sectors. Second, since altruists always have negative price-cost margins, average price-cost margins will always be lower in the nonprofit sector: $E_\alpha[p - c_y^0(y^0(p|\alpha))] < p - c_y^1(y(p|0))$. Third, since long-run supply price is determined entirely by the technology of the profit-maximizer in this competitive case, when demand increases, the average scale in both sectors remains fixed at $E_\alpha[y^0(m_\pi^1|\alpha)]$ and $y^1(m_\pi^1|0)$. However, more profit-maximizers enter the for-profit sector from outside the industry in order to meet the increase in demand. This leads to the following important result, which we will revisit several times over the course of this paper: *under competitive mixed production, an increase in demand always increases the relative share of for-profit firms, and the relative share of for-profit output.*

In sum, under competition, mixed production obtains only when altruism is scarce, and when some profit-maximizing firms have entered the industry. If mixed production is observed, we know that in the long-run, the average firm scale in each sector and the average price-cost margins in each sector will be invariant to increases in demand. Moreover, average scale will be higher in the nonprofit sector, while average price-cost margin will be lower in the nonprofit sector. Finally, changes in demand will induce entry by new firms into for-profit status, and this entry will raise the share of firms and of output accounted for by the for-profit sector.

3.2. Non-Competitive Production. If an industry fails to display perfect competition, we can have mixed production without introducing dependence between marginal cost and sector size. For instance, an industry which bars free entry may have firms earning rents. This seems quite possible in several important contexts: many markets involving nonprofits are highly protected through entry barriers or other means, *e.g.*, *Certificate of Need* (CON) Laws in US health care regulating both entry and investments. This section analyzes the determination of output share in the two sectors under non-competitive conditions. When we relax the assumption of competition and allow firms to earn rents, we arrive at the simple but useful implication that the higher the rents available under for-profit status, the less nonprofit production we will observe.

Nonprofit Production by Profit-Maximizers. Suppose that we have an industry with restricted entry (or with any other feature resulting in market power) in which there exists the option to operate as either a nonprofit firm or a for-profit firm. As before, nonprofit firms face lower marginal costs, but they are also subject to a regulatory non-distribution constraint $\pi \leq \pi_R$. In our model, rents in concentrated markets will raise the share of producers which engage in for-profit production. Any underlying parameters thought to increase rents will thus also increase the share of for-profit production.[14]

If we assume that rents vary inversely with the number of firms, we will have the corollary that the share of nonprofits is rising with the number of firms in the marketplace. Among N firms , let f be the share of for-profit firms and let (y^0, y^1) be the firm-level outputs of the two sectors. The total output of both sectors, Y , satisfies

$$Y = N[(1-f)y^0 + fy^1]$$

Our interest here is in the fraction of firms and output, denoted f and f_Y, which are for-profit given the total number of producers N.

Unlike for-profit firms, nonprofits may have their profits constrained by the non-distribution constraint, so we can write the profit functions for the two sectors as:

$$\pi^0 = min\{\pi_R, p(Y)y^0 - c^0(y^0)\}$$

$$\pi^1 = p(Y)y^1 - c^1(y^1)$$

Note that perfect substitutability between output from either sector implies that the inverse demand curve is common across sectors. It does not depend on the share of firms in either sector or the choice of status of an individual firm, although it will depend inversely on the number of firms in the industry.

If a firm chooses to be for-profit it earns as much rent as the market structure allows. Since inverse demand depends on the number of firms N, denote by $\pi^d(N, f)$ the equilibrium profits of a firm choosing regulatory status d, when the marketplace is composed of N total firms and fN for-profit firms. If N is such that $\pi^1(N, 1) > \pi_R$, there will be no nonprofit production; nonprofit status becomes possible only when

[14]While many argue that nonprofits cannot survive absent market power, we predict that market power reduces the share of nonprofit producers.

profits fall to the level of π_R. Define N_R as the number of for-profit firms needed to drive profits down to π_R when for-profit production dominates: $\pi(N_R, 1) = \pi_R$. It follows directly that if there are fewer than N_R firms, nonprofit production will be absent because its maximum level of profit is strictly dominated by for-profit status.

When there are enough producers to induce nonprofit production, the first-order conditions equating marginal revenue to marginal costs in the two sectors are:

$$p(Y)[1 + \eta(\frac{y^0}{Y})] = c_y^0$$

$$p(Y)[1 + \eta(\frac{y^1}{Y})] = c_y^1$$

Therefore under any market structure (N, f), the short-run output of nonprofit firms will always be higher than that of for-profit firms due to their lower costs, so $y^0 > y^1$. Given entry barriers which fix the number of firms at N in the long-run, this prediction also holds in the long-run. At a given level of output, total revenues per firm will be equal across sectors; total costs per firm, however, will be lower for nonprofits, because they have lower marginal cost for all y. The maximal level of profit under nonprofit status must then be higher than that under for-profit status (recall that this analysis presupposed that profits under for-profit status fall below π_R). If this were not the case, it would pay nonprofit firms to cut output to for-profit levels. It must then be that $\pi^0(y^0) \geq \pi^1(y^1)$. As a result, all profit-maximizers will choose to be nonprofit firms. We will not see mixed production in this setting: when rents lie above π_R, we see only for-profit production, but when they do not, we see only nonprofit production. More precisely, when $N \leq N_R$, $f(N) = 1$ and when $N \geq N_R$, $f(N) = 0$. More weakly, *the share of for-profit production falls with the number of firms.*

We can now examine the impact of an increase in demand. Suppose the inverse demand function $p(Y|\theta)$ may be shifted by some parameter θ. Given a fixed number of firms, when the inverse demand rises, all firms increase output and enjoy increases in profits. Since profits under for-profit status rise, the share of for-profit firms must rise also. In this simple setting, of course, the share must be zero or one, so it rises weakly with the increase in demand, and by implication the share of output accounted for by for-profit firms rises weakly as well. This corresponds to the result we had in the competitive case, and demonstrates that once again, *increasing demand weakly increases the share of for-profit firms and the share of for-profit production.*

Many industries which enjoy the option of nonprofit status also enjoy significant government subsidization. By the strength of our general result about increases in demand, we will argue that *any subsidy scheme which raises demand also increases the* *share of for-profit firms and for-profit production.*[15] Clearly, if the government decides to subsidize all consumption in this industry, the inverse demand $p(Y|\theta)$ shifts up. The situation becomes a bit more complicated if the government subsidizes a share s of the price for certain eligible consumers of relative size ρ. When the market is composed of eligible consumers (with demand $D^E(p|\rho, s)$) and ineligible consumers (with demand $D^N(p|\rho, s)$), market demand is given by

$$D(p|\rho, s) = D^E(p(1-s)|\rho, s) + D^N(p|\rho, s)$$

D will continue to increase in (ρ, s) as long as composition effects do not dominate.[16] In a noncompetitive market with profit-maximizers, when demand strictly rises in either the level or availability of the subsidy, increases in level or availability weakly increase the share of for-profit firms and for-profit output.

Nonprofit Production by Profit-Deviating Firms. In the previous discussion, we were unable to explain the existence of mixed production: our model predicted that an industry should be either entirely for-profit or entirely nonprofit. This extreme result followed from the homogeneity of preferences among firms: all firms had the same optimal response to a given level of equilibrium profit. In this section, we will extend the model to predict a mixed industry by introducing profit-deviating with heterogeneous preferences for output. In the interests of tractability, we discuss heterogeneity[17] in preferences across producers for the linear case:[18]

$$v = \alpha \cdot y + (1 - |\alpha|) \cdot \pi \tag{4}$$

with the preference parameter α, the marginal rate of substitution between profits and output, distributed over a support $[-1, 1]$. The distribution $F(\alpha)$ gives the proportion of firms (recall that the number of firms remains fixed in this noncompetitive case) with preferences α. We continue to assume the existence of barriers to entry, so that both the maximum profit attainable under for-profit status and the maximum profit attainable under nonprofit status lie strictly above π_R, which we take to represent zero economic profit.

For pedagogical purposes, first consider the case in which there are no cost differences between the two sectors, so $c_0 = c_1$. In this case, the nonprofit choice weakly

[15] Schlesinger (1984) documented evidence of this prediction. Specifically, sharp rises in for-profit activity were found to follow the implementation of several public programs.

[16] A previous version of the paper, available from the authors on request, discussed this in more detail.

[17] There are of course other forms of heterogeneity that may imply mixed production as well, such as cost-differences or locational quality attributes.

[18] This specializes the utility function specified in 2 by stipulating that $\alpha_\pi = 1 - |\alpha_y|$. This sacrifices no generality, since this specification allows the relative valuation of output, $\frac{\alpha}{1-|\alpha|}$ to take on any real value.

dominates the for-profit choice, since the nonprofit choice involves a distribution constraint. If the distribution constraint fails to bind, so the equilibrium level of profit under for-profit status falls below π_R , firms will be indifferent between for-profit and nonprofit status, because such status involves no loss of foregone profits. If the distribution constraint does bind, firms will strictly prefer for-profit status, as there are no cost-differences in this initial case.

These equilibrium profit levels will differ with the preferences of the firm in the sense that a stronger absolute preference for output lowers profits,[19] so $\frac{\partial \pi}{\partial |\alpha|} < 0$. For firms who value output, $\alpha > 0$; as firms value output more, they accept lower profits to boost this output. Conversely, for firms who dislike output, $\alpha < 0$; as they dislike output more they accept lower profits in order to cut back output.

These effects of preferences on equilibrium profits imply that in order to characterize the choice of status when there are no cost-differences, we need only derive conditions under which equilibrium profits rise past the level π_R set by the regulatory distribution constraint; firms whose equilibrium profits lie above this point choose to be for-profit, while those whose profits lie below choose nonprofit status. To predict a non-degenerate mixed industry, the maximal level of profit must exceed π_R and the minimal level of profit must fall below π_R. In this case, there must be intermediate values of positive and negative output preference $\alpha_H \in (0,1)$ and $\alpha_L \in (-1,0)$ such that the firms with such preferences are indifferent across regulatory choice: $\pi(\alpha_L) = \pi_R = \pi(\alpha_H)$. Since profits are decreasing in the absolute strength of output preference $|\alpha|$, all firms with more extreme tastes for output than these marginal firms choose equilibrium profits lower than the constrained level. That is to say, $\pi(\alpha) \leq \pi_R$ when $\alpha \leq \alpha_L$ or $\alpha \geq \alpha_H$. Conversely, all firms with less extreme tastes for output than the marginal firms choose equilibrium profits higher than the constrained level. Formally, $\alpha \in (\alpha_L, \alpha_H)$ implies $\pi(\alpha) > \pi_R$, so the firm prefers a for-profit status. The share of for-profit producers f is thus given by $f = F(\alpha_H) - F(\alpha_L)$, with the remaining share $1-f$ in the nonprofit sector. This solution is illustrated in Figure 2.

Now consider the more relevant case in which costs vary across status. We will confine our analysis to the case of output preference, in which $\alpha > 0$, since the analysis

[19]Formally, begin with the first order condition obtained by maximizing the utility function in 4:

$$\pi'(y) = \frac{-\alpha}{1-|\alpha|}$$

Comparative statics on this expression yields:

$$\frac{dy}{d\alpha} = -\frac{1}{(1-|\alpha|)^2 \pi''(y)} > 0$$

Since $\frac{d\pi}{d\alpha} = \pi'(y)\frac{dy}{d\alpha} = -\frac{\alpha}{1-|\alpha|}\frac{dy}{d\alpha}$, profits fall as the absolute value of α rises.

for the other case is entirely symmetric. Now profit functions are sector-specific, with $\pi^1(y)$ for the for-profit sector, and $\pi^0(y)$ for the nonprofit sector. Under nonprofit production, the level of profit π_R is feasible for two different levels of output $\underline{y} < \bar{y}$:

$$\pi_0(\underline{y}) = \pi_0(\bar{y}) = \pi_R$$

Under output preference, the firm always prefers the pair $(\pi_R, \bar{y})$ to $(\pi_R, \underline{y})$, because holding profits constant, it prefers more output to less. When costs were homogeneous, we had only to search for points at which profits under for-profit status rose above π_R to find the region in which for-profit production dominates. This condition no longer suffices, because firms value output and the lower cost of nonprofit production allows firms higher output at a given level of profit. However, we can still find points (α_L, α_H) analogous to those in the simple case. Suppose we find a point on π^1, (π^1, y) (where $y < \bar{y}$, and $\pi^1 > \pi_R$) which represents the best choice under for-profit production for some firm α_H, and suppose that α_H remains indifferent between this choice and $(\pi_R, \bar{y})$. Unconstrained nonprofit production allows a firm higher profits for a given level of output, so the best choice (disregarding the profit constraint) under nonprofit production for α_H must involve a level of profit higher than π_R. Therefore, the best *feasible* nonprofit choice for α_H must be $(\pi_R, \bar{y})$. This implies that α_H remains indifferent between his best for-profit choice and his best feasible nonprofit choice. That is, for this firm, the cost in foregone output of being a for-profit firm just balances the cost in foregone profit of being a nonprofit firm. Any firm α, with $\alpha > \alpha_H$ must strictly prefer $(\pi_R, \bar{y})$ to its best for-profit choice, because such a firm places a higher relative weight on output than α_H does. This argument is illustrated in Figure 3.

To understand this argument formally, observe that y must be the optimal for-profit output choice, and that the firm must be indifferent between this choice and $(\pi_R, \bar{y})$. This results in the following two equations in the two unknowns (α_H, y):

$$\begin{aligned} \alpha_H y + (1 - \alpha_H)\pi^1(y) &= \alpha_H \bar{y} + (1 - \alpha_H)\pi_R \\ \pi^1_y(y) &= -\frac{\alpha_H}{1 - \alpha_H} \end{aligned}$$

These equations imply that the marginal rate of substitution between profits and output exactly equals the ratio of profits foregone to output gained by choosing nonprofit status:

$$-\frac{\alpha_H}{1 - \alpha_H} = \frac{\pi_R - \pi^1(y)}{\bar{y} - y}$$

As α increases, firms substitute output for profit, so the optimal y under for-profit status rises, and the associated optimal profit level falls. For $\alpha > \alpha_H$, therefore, the marginal rate of substitution (the left-hand term) falls, while the ratio of profits foregone to output gained (the right-hand term) rises. An examination of Figure 3 reveals this fact. On the margin, firm α will pay $\frac{\alpha}{1-\alpha}$ in foregone profits for every unit of extra output, but if it switches to nonprofit status, it only needs to pay $\frac{\pi^1(y)-\pi_R}{\bar{y}-y}$ for every unit of extra output. Every firm $\alpha > \alpha_H$ will thus choose nonprofit status. Analogously, there exists some $\alpha_L < 0$ for which every firm with $\alpha < \alpha_L$ will choose to be nonprofit.[20] In this case, firms choose nonprofit status, because it affords a lower level of output for a given level of profit. The firms with $\alpha < \alpha_L$ choose nonprofit status, because their willingness to pay for less output exceeds what they need to pay in terms of foregone profit if they switch to nonprofit status. In sum, the implied fraction of producers in the for-profit sector is once again given by $f = F(\alpha_H) - F(\alpha_L)$, with the remaining fraction in the nonprofit sector.

While this appears to be the same result as in the case without cost differences, there are two crucial differences. First, observe that changes in relative profits will shift the proportion of firms in each sector. If, for example, the function π^1 gets shifted up relative to π^1, α_H must increase and α_L must decrease. This implies our now familiar result that increases in market demand raise the share of for-profit firms. Second, observe that some producers whose equilibrium profit as a for-profit firm lies above π_R will actually choose to be nonprofit, because they value the extra output they could produce given the lower marginal costs of nonprofit status (if $\alpha > 0$), or because they wish to produce as little output as possible at a given level of profit (if $\alpha < 0$). Previously, nonprofit status only offered a disadvantage, namely the possibility of a binding constraint on profits. Now we have introduced a counterweight: the nonprofit sector allows higher output to be produced for any given level of profit, and higher profit at a given level of output, so firms now have something to gain as nonprofit producers. Of course, as always, the benefits of higher profits are weighed against the cost of output changes.

However, there is one important similarity between the cases with and without cost differences: output-preferring producers who choose to be nonprofit have uniformly higher values of α than producers who choose to be for-profit; similarly, output-averse producers who choose to be nonprofit have uniformly lower values of α. That is to say, if α^1 represents the value of α for some producer who chooses to be for-profit, and if α^0 represents the value of α for some producer who chooses to be nonprofit, it is certain that $|\alpha^0| \geq |\alpha^1|$, where equality holds only if both producers are indifferent

[20]Specifically, α_L satisfies (for some y):

$$\begin{aligned} \alpha_L y + (1-\alpha_L)\pi_1(y) &= \alpha_L y_L + (1-\alpha_L)\pi_R \\ \pi_1'(y) &= -\frac{\alpha_L}{1-\alpha_L} \end{aligned}$$

across status. This generates the prediction that every nonprofit producer places more weight on output (either positively or negatively) than every for-profit producer.

Differences in preference for output provide one possible explanation for the existence of mixed production. However, its implications depend crucially on the degree of competition. Earlier, we saw that with the free entry of profit-maximizers, all output-averse firms were driven out, and all output-preferring firms strictly preferred nonprofit status, because free entry erased the rents available under for-profit status. In this section, we have seen that in the absence of free entry, firms trade-off the benefits of output changes against the costs of rents foregone under for-profit status. As a result, the share of production in the two sectors varies with the availability of rents, whose existence hinges entirely on the degree of competition.

4. DYNAMIC BEHAVIOR OF NONPROFIT SHARES

This section analyzes what determines the stability of nonprofit shares over time by considering our problem in a dynamic setting. We focus on the implications of "learning-by-doing," so that heterogeneity among standard profit-maximizing firms is generated by differences in accumulated knowledge. In this section, we will explain when and why firms choose to convert status (or privatize if between the public and private sector) and determine the factors which influence net flows between for-profit and nonprofit status. Our theory will predict the existence of mixed production, as well as the movement over time of the shares of nonprofit production.

4.1. Individual Conversion Behavior. In this section, we will show that if a firm experiencing learning-by-doing ever finds it optimal to switch status, that switch will be from nonprofit status to for-profit status.[21] We will see switches in the other direction only in an industry facing steep declines in supply price. If supply price remains constant or rising, and if the underlying parameters permit conversion at some point, there will be a unique time τ at which the firm switches from nonprofit to for-profit status. Therefore, mixed production may obtain in an industry with firms which possess identical preferences and technologies, but which are of different ages.

We will suppose that every firm, competitive and profit-maximizing, faces an infinite horizon problem with rising marginal costs and constant supply price (we will relax this assumption later). We will also view decisions as occurring in continuous time, since this simplifies our problem considerably. As before, nonprofit firms face a ceiling on their profits, π_R, and all other things equal, nonprofit status brings lower total and marginal costs than for-profit status. We now stipulate, however, that

[21] This line of argument, coupled with a life-cycle theory of labor, also suggests an asymmetric turnover pattern for managers. Those with less experience should remain in nonprofits until they accumulate enough productive skills to switch to for-profit firms.

both nonprofit and for-profit firms become more efficient the more output they have produced in the past: their total cost and marginal cost is falling in accumulated output. This introduces "learning-by-doing" into our problem.

Denote a firm's total past output at time t as $Z(t)$ and current period output as $y(t)$. Current output represents the rate of change in total past output: $\dot{Z}(t) = y(t)$. We will extend our previous notation to incorporate rising marginal cost and say that a nonprofit firm has the cost function $c^0(Z, y)$, and a for-profit firm has the cost function $c^1(Z, y)$. For both cost functions, we will say that costs are convex, and that total and marginal costs are falling in accumulated output, so $c_1 < 0$ and $c_{12} < 0$. Holding knowledge constant, nonprofit status brings lower total and marginal cost, so for all (Z, y), $c^1(Z, y) > c^0(Z, y)$, and $c_2^1(Z, y) > c_2^0(Z, y)$.

If we restrict the firm to paths which involve a countable number of conversion points $\tau = \{\tau_{1,}\tau_2, ..\}$, it solves the problem :

$$\max_{y(t),\tau} \sum_{i=1}^{\infty} \int_{\tau_i}^{\tau_{i+1}} e^{-rt} \min(\pi_R, py(t) - c^0(Z(t), y(t)))dt + \int_{\tau_{i+1}}^{\tau_{i+2}} e^{-rt}[py(t) - c^1(Z(t), y(t))]dt \tag{5}$$

$$s.t.\ \dot{Z}(t) = y(t)$$

$$\tau_1 = 0$$

The firm maximizes total discounted profits over its entire life-span; it does so by choosing an output path $y(t)$ and points at which it switches status. Note the assumption that the firm starts up as a nonprofit: we assume that initial profits under the time zero state are lower than π_R. The Appendix contains a formal characterization of the solution to this problem, but sacrificing only a few details we can explain the firm's behavior quite well using more informal methods. The key result for our purposes is that profits are rising over time for the for-profit firm and the nonprofit firm (if the profit constraint does not bind). Given rising profits, we can sharply characterize the conversion decision. We will for the moment exclude from our analysis the case in which the firm chooses nonprofit status and faces a binding constraint on profits, because in that case the path of profits is clear: profits must be constant.

First observe that the stock of output or 'knowledge' Z functions as an asset, the possession of which lowers total and marginal costs; the firm will pay for this asset by foregoing a certain amount of profits. Denote by $\lambda(t)$ the shadow value of a unit of Z at time t, discounted to time zero: the discounted stream of returns given by a unit of Z. As time elapses, the value of this stream must fall, because there is less time over which the asset may be used. At any time t, and under either profit status, a unit of Z yields an instantaneous return of $-e^{-rt}c_1(Z, y)$, the marginal cost savings induced by an additional unit of knowledge Z. As time passes, the shadow value of the asset decreases by the value of this instantaneous return: $\dot{\lambda}(t) = e^{-rt}c_1(Z, y)$. As we approach the infinite horizon, the asset becomes valueless, because no time remains for its use: $\lim_{t\to\infty} \lambda(t) = 0$. Since the shadow value is always decreasing and ends up at zero, it must always be positive;[22] as claimed, knowledge has positive value for the firm. An important equilibrium condition is obtained by recognizing that this shadow value of capital $\lambda(t)$ must be equated with the marginal rate of transformation between time zero profits and the time t investment good $y(t)$, where

$$MRT \equiv -\frac{d\pi_0}{d\pi_t}\frac{d\pi_t}{dy_t} = e^{-rt}(c_2(Z(t), y(t)) - p)$$

Since the shadow value λ is always positive, the firm always produces where marginal cost lies above price, just as a firm which values output in itself.

In fact, the shadow value of capital λ functions exactly like the marginal rate of substitution for the profit-deviating firm: in both cases, the marginal rate of transformation between profit and output is equated with the relevant shadow value of output. Holding time t and knowledge Z constant, as the shadow value of knowledge falls, the firm adjusts by decreasing MRT, which corresponds to a rise in profit and a fall in investment. As the value of the capital good falls, investment falls and profits rise. If we view profits over time as a function of the shadow value of Z and the level of Z,[23] we have shown that $\frac{\partial \pi}{\partial \lambda} < 0$, and that $\frac{\partial \pi}{\partial \lambda}\dot{\lambda}(t) > 0$; holding the stock of knowledge fixed, profits will be rising over time for both firm types, because the falling shadow value of knowledge causes firms to substitute profit for knowledge.

Holding λ fixed and allowing Z to increase has two countervailing effects on profit: the increase in knowledge lowers total costs directly, because $c_1 < 0$, but since $c_{12} < 0$, marginal cost also falls; the ensuing increase in output may be enough to push total costs higher if the shadow value of capital is high enough.[24] We wish to exclude this case, since it only occurs when λ is quite high, and requires a rather strong relation between knowledge and marginal cost. We will impose a restriction on our cost functions, so that when Z rises and the marginal rate of transformation remains fixed, total costs fall. Figure 4 illustrates this property. The lines L_0 and L_1 have equal slope, and total outputs satisfy $Z_1 > Z_0$. Our assumption implies that given these conditions, $c_0 > c_1$. Total cost falls when knowledge rises and the marginal rate of transformation is fixed (since the supply price is constant, a fixed MRT is equivalent to a fixed marginal cost).

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[22] We implicitly use the fact (from the Pontryagin Maximum Principle) that the shadow value will be a *continuous* function of time.

[23] These two variables are sufficient to determine the firm's time t output choice.

[24] A single period profit-maximizer (who has a shadow value of knowledge equal to zero) will never increase output enough to raise total costs, because that strategy cannot raise single period profits when price equals marginal cost.

Holding the marginal rate of transformation (and λ) fixed, when Z increases, total costs fall, so profits must increase. As a result, we must have $\frac{\partial \pi}{\partial Z} > 0$. Since Z increases over time, $\frac{\partial \pi}{\partial Z}\dot{Z}(t) > 0$. As knowledge increases and the shadow value of knowledge remains fixed, total costs fall and profits rise. Using our previous results, we can now write a total differential for profits over time:

$$\dot{\pi}(t) = \frac{\partial \pi}{\partial Z}\dot{Z}(t) + \frac{\partial \pi}{\partial \lambda}\dot{\lambda}(t) > 0$$

This analysis applies to both the for-profit firm, and the nonprofit firm which does not face a binding ceiling on profits: profits rise over time for both.

Since profits rise over time, we can now fully characterize conversion behavior. If a firm finds it optimal to convert at time τ, it must be indifferent across status that period: each status choice must yield the same flow of profit at τ. Since firms strictly prefer unconstrained nonprofit status, the firm can only be indifferent between constrained nonprofit status and for-profit status. Therefore, at τ, as at any conversion point, the firm must have profits π_R. Once it converts to for-profit status, however, its profits rise over time and can never return to π_R, so it can never convert back.

We thus have three possible paths for the choice of status: the firm starts as a for-profit concern, because time zero profits under that status lie above π_R, and since profits are increasing over time, it never switches to nonprofit status; the firm starts as a nonprofit concern, and never converts to for-profit status, which never yields profits above π_R (due to the configuration of parameters); the firm starts as a nonprofit concern, converts to for-profit status at a unique time τ (at which its single-period profits are π_R) and never converts back. In sum, we have the general proposition: *given a stable price, the firm will convert status at most once, and any conversion must be from nonprofit status to for-profit status, and not vice-versa.*

This conversion result applies directly to any weakly increasing price path, along which profits are rising over time. Given this result, our model predicts that an industry with stable or rising equilibrium price would be dominated by conversions from nonprofit to for-profit. However, we can characterize the results in the case of falling supply price, and in the case of a price differential across status. First, suppose that supply price is falling in an industry. If any for-profit firm finds that this causes its equilibrium profit level to fall below π_R, it will then choose to switch back to nonprofit status. The change in price must, however, exceed the reduction in cost achieved by the firm through learning over time. Therefore, the steeper the decline in demand over time, the more conversions we would expect to see from for-profit status to nonprofit status. We have the following implication: changes in price should covary negatively with the relative share of conversions from for-profit to nonprofit status. Zero or positive price changes should be accompanied by nonprofit to for-profit conversions almost exclusively, and *vice-versa.*

Second, suppose that price differs across the two sectors. If the price of nonprofit product falls relative to the price of for-profit product, unconstrained nonprofit production need not strictly dominate for-profit production. The benefits of higher price may make it optimal to become for-profit before the profit ceiling binds. The optimal switching path might even involve switching to for-profit, then back to nonprofit, and so on, depending on the movement in relative prices over time. We can continue to say with certainty, however, that once the equilibrium profits of for-profit status rise above π_R, the firm switches to for-profit status and stays there. The price differential introduces the possibility of "premature" switches to for-profit status which could occur before the ceiling on profits binds for nonprofit firms. There should be weakly more for-profit firms when the relative price of nonprofit product falls: in addition to the for-profit firms with equilibrium profits above π_R, some firms might switch to for-profit status before the profit ceiling binds.

Finally, we can characterize the movement of the switching point τ in response to shifts in the underlying parameters. τ will covary negatively with (for-profit) price p, since higher price means that equilibrium profits pass the level of π_R more quickly. More generally, τ covaries negatively with any shift which increases the profitability of for-profit firms, including falls in total cost and so on. From this observation, we can see that τ will covary positively with the ceiling on profits π_R; the higher the ceiling, the longer the firm finds it optimal to remain in nonprofit status.

4.2. Determination of Steady-State Shares. Often we see stability over time in the share of for-profit firms in an industry.[25] We will show our model to be consistent with this finding, because a steady-state requires asymmetric conversion rates in equilibrium. Using the assumption of a steady-state in the number of for-profit and nonprofit firms, we will discuss how equilibrium firm shares are determined, and how they might be affected by changes in the underlying parameters of our model.

Let (N^0, N^1) denote the number of firms in the two sectors for which we will consider the determination of their total and relative size: $N \equiv N^0 + N^1$; $f \equiv \frac{N^1}{N}$. Define the conditional transition rates between sectors as:

$$q \equiv (q_{00}, q_{01}, q_{10}, q_{11})$$

The element $q_{ij} \equiv P(d = j | d = i)$ denotes the probability of choosing status j given a current status of i. Furthermore, let $\kappa^0(N)$ and $\kappa^1(N)$ be the *net*-entry rates of firms into the two sectors; note that these rates depend on the number of firms in the industry. Net-entry into a sector is defined as the number of firms who start up in

[25] Despite the recent rise in for-profit conversions in the US health care markets, there is a remarkable stability in the fraction of firms that are in either regulatory status. For regular short-term care in hospitals, the steady-state for share of nonprofit firms stands at about 70 percent, while for long-term care the share stands at about 20 percent.

that sector minus the number of firms who go bankrupt in that sector; conversions out of a sector do not appear in our gross-exits. The market structure changes over time according to:

$$N^{0'} = N^0 q_{00} + N^1 q_{10} + \kappa^0(N)N^0 \tag{6}$$

$$N^{1'} = N^0 q_{01} + N^1 q_{11} + \kappa^1(N)N^1 \tag{7}$$

The number of nonprofit firms next period ($N^{0'}$) consists of nonprofits not converting this period, for-profits converting this period, and net-entrants this period. An analogous interpretation holds for the second equation, which describes the movement of for-profit firms.

In a steady-state, net entries must balance conversions, implying that one sector will be a net-receiver of conversions. Assuming $N^{0'} = N^0$ and $N^{1'} = N^1$, equations 6 and 7 become:

$$N^0 q_{01} - N^1 q_{10} = \kappa^0(N)N^0 \tag{8}$$

$$N^1 q_{10} - N^0 q_{01} = \kappa^1(N)N^1 \tag{9}$$

The left-hand side of the first equation represents net-conversions *into* nonprofit status. In a steady-state, this must be equal to the right-hand side, which represents net-entry into the nonprofit sector. An analogous interpretation holds for the second equation. net-conversions out of nonprofit status are given by $(N^0 q_{01} - N^1 q_{10})$, and net-conversions out of for-profit status are given by $-(N^0 q_{01} - N^1 q_{10})$. If conversion occurs at all in the steady-state, one sector must indeed be a net-receiver of conversions. Given a steady-state price, our model predicts that the for-profit sector will be a net-receiver of conversions, with the nonprofit sector having larger entry rates.

Since the three transition rates are so closely linked in this steady-state, we can infer net-conversion and net-entry into both sectors from just one of those three numbers. This obtains, because the net-conversion from one regulatory state is simply the negative of the net-conversion from the other. For example, if the nonprofit sector loses 100 firms each period through conversion, the for-profit sector must gain those 100 firms in a steady-state. Equations 8 and 9 are thus linearly dependent. To illustrate, suppose we know that each year a nonprofit firms go bankrupt and $a + 100$ firms start up as nonprofits, so there is yearly net entry into nonprofit status of 100. In a steady-state, there must be 100 net-conversions from nonprofit status to for-profit status every year, and 100 net-exits out of for-profit status (through start-up or bankruptcy, but not through conversion). Thus, from the first number, we can infer the remaining two.

The learning by doing hypothesis of the previous section has strong implications for how the nonprofit shares behave dynamically, and how they might change in response to shocks in underlying parameters. In a stationary economy with a constant (or rising) output price p, we showed that there was a single age of conversion τ before which all firms choose nonprofit status and after which all firms choose for-profit status. This thus implies that *gross* entry rates into the two sectors satisfy $e_1(N) = 0$ and $e_0(N) > 0$ in a steady-state. If we assume that the *gross* exit rates are exogenous and denoted by $\delta = (\delta_0, \delta_1)$,[26] then some firms remain nonprofit for their whole life, exiting before converting, while others are initially nonprofit and then convert into for-profit status later on in their life-cycle. In terms of our previous notation, this implies the transition probabilities for a firm in a for-profit status satisfy $q_{10} = 1 - q_{11} = 0$ with its net entry rate satisfying $\kappa^1(N) = -\delta_1$. For nonprofit firms, the conversion probability satisfies:[27]

$$q_{01} = 1 - q_{00} = \frac{(1-\delta_0)^\tau}{\sum_{a=0}^{\tau}(1-\delta_0)^a} \equiv q(\tau, \delta_0)$$

This is the probability of conversion from nonprofit status conditional on being in the nonprofit sector. It has this special form, because conversion only occurs at age τ. The numerator represents the probability of surviving to the age of conversion and the denominator the proportion of firms which choose nonprofit status. Note that the conversion rate falls the slower learning by doing takes place: $q_\tau \leq 0$. Due to the asymmetry of conversion under learning by doing, nonprofits lost through conversion and bankruptcy are replaced by new entrants into the industry in a steady-state. More precisely, substituting this transition behavior into equations 6 and 7, one obtains:

$$N^0 = N^0(1 - q(\tau, \delta_0)) + N^0(e_0(N) + 1 - \delta_0)$$

$$N^1 = N^0 q(\tau, \delta_0) + N^1(1 - \delta_1)$$

Rewriting these equations yields expressions for the quantities N and f in which we were interested:

$$f = [1 + \frac{N^0}{N^1}]^{-1} = [1 + \frac{\delta_1}{q(\tau, \delta_0)}]^{-1} \tag{10}$$
$$\delta_0 + q(\tau, \delta_0) = e_0(N)$$

[26]Since there is no mechanism for exit in our model, we assume that firms are randomly subject to idiosyncratic shocks which drive them to exit.

[27]If a is the age of the firm then $\Pr(d = 0, a > \tau) = 0$, and $\Pr(d' = 1 | d = 0, a < \tau) = 0$. The result then follows:

$$\begin{aligned} q_{01} &= \Pr(d' = 1 | d = 0, a = \tau) \Pr(a = \tau | d = 0) \\ &= \frac{\Pr(a = \tau)}{\Pr(d = 0)} = \frac{(1-\delta_0)^\tau}{\sum_{a=0}^{\tau}(1-\delta_0)^a} \end{aligned}$$

Knowledge of the transition probabilities and the function $e_0(N)$ yields knowledge of the relative share of nonprofit firms, as well as the number of firms N. Indeed, absent knowledge of $e_0(N)$, we can still determine the relative share and the equilibrium net entry into nonprofit status.

The comparative statics in this dynamic case mimics some of the effects in the static analysis. As before, the for-profit share of firms covaries negatively with the total number of firms in the industry:

$$f = [1 + \frac{\delta_1}{q(\tau, \delta_0)}]^{-1} = [1 + \frac{\delta_1}{e_0(N) - \delta_0}]^{-1}$$

This positive relationship between market structure and nonprofit activity implies that anything shifting the entry rate, such as artificial or real barriers to entry, also shifts the share of nonprofits in the industry. Similarly, we have predicted effects for policy changes (like stricter regulation or oversight) which affect rates of exit. While obviously the share of for-profit firms falls in the exogenous exit rate from for-profit status δ_1, it is less obvious that it rises in the exogenous exit rate from *nonprofit* status, δ_0.This occurs because as more nonconverting nonprofit firms go bankrupt they increase the share of for-profits.

We have built on our static model, and we now have sharp predictions about the precise mechanism for conversion from one status to the other, and about the effects of conversion behavior on the share of nonprofit production. In a steady-state, the share of for-profit firms falls in the time of conversion τ, because as τ rises, every firm spends a larger amount of its life-span as a nonprofit firm. Recall from the previous section that the profit ceiling π_R and the relative total costs of nonprofit firms induce a higher conversion age τ, while increases in price p and increases in the relative total costs of nonprofit firms reduces this age of conversion. Therefore, when the constraint π_R rises, or when the relative total costs of nonprofit firms fall, possibly through tax policy, the steady-state share of for-profit firms must fall. Similarly, when p rises or when the relative total costs of for-profit firms fall, the share of for-profit firms rises, because profits in the for-profit sector reach π_R more quickly. If nonprofit firms face a lower price than for-profit firms, this price differential covaries negatively with τ. As a result, if the relative price faced by a nonprofit falls, the share of for-profit firms rises. These implications of conversion behavior give us, for the dynamic model, another instance of our general result: as profits available under for-profit status rise, so does the share of for-profit firms.

5. EMPIRICAL ANALYSIS

All the predictions of this paper stem from the basic claim that the equilibrium share of nonprofits is negatively related to rents available under for-profit status. In this section, we discuss empirical evidence relating to this claim for the US long-term care industry from 1989 to 1994. First, we will describe the data set available to us. Second, we will demonstrate a positive relation between the level of rents available and the level of for-profit share across US states. Third, using share data for all states over a five year period, we will be unable to reject the possibility of a steady-state in long-term care; most yearly variation within states is unsystematic. However, within the small amount of systematic yearly variation within states, we will once again find that forces which increase rents are positively correlated with increases in the share of for-profit firms. This supports the claim of the dynamic section that positive changes in rents available will be correlated positively with positive changes in the share of for-profit firms.

5.1. The Data Set. We have panel data across US states on determinants of profitability and for-profit shares in the long-term care industry. These data are from HCIA's *Guide to the Nursing Home Industry* for 1996, as well as unpublished supplements to that guide. In particular, we have data on a large share of nursing homes for every state including the District of Columbia. The data include all nursing home facilities which file Medicaid and Medicare claims in a given year; about 14,000 out of all 18,000 homes in the US. These claims require various financial and operational data, and from these data, HCIA constructs characteristics for the average facility in a state and year.

The data include the number of for-profit facilities, church-run facilities, government-run facilities, and other "unaffiliated" nonprofit facilities (i.e., unaffiliated with a church or with a governmental agency) within the state and year. We only have this profit status data for the years 1989 and 1994, and we construct nonprofit shares for the intermediate years using simple linear interpolation.[28] We have more complete data on the determinants of profits of the nursing homes within each state and year. These data include the percentage of resident days subsidized by Medicaid in the homes. We supplement this measure of the share of the demand side that is subsidized with data from the Health Care Financing Administration on the average Medicaid per Diem, *i.e.,* the average Medicaid payment to the home per patient day, paid statewide. Since higher Medicaid per Diem payments indicate both higher subsidization and higher costs of operation we construct a measure of the per Diem subsidy relative to cost. For purposes of sensitivity analysis, we construct two possible measures of this relative subsidy: our primary measure normalizes the per Diem payment by the average direct care expense per patient day for for-profit institutions, as measured in the HCIA sample; the second normalizes by the average direct and indirect care expenses per patient day for -profit institutions, also as measured in the

[28]We find that our results do not differ qualitatively with or without the interpolated values. While the standard errors get much bigger when the values are excluded, the increase does not eliminate the significance of the coefficients.

HCIA sample.

In addition to the data on average characteristics of homes within a state, our data also includes many statewide statistics, which we also use to construct a measure of the competitiveness of the industry within each state. These data are obtained by HCIA not from the statewide samples, but from state government statistical services, so that they represent figures for the entire long-term care industry within the state. To measure competitiveness, we construct a ratio of the total number of beds in the long-term care industry, to the statewide number of persons over the age of 65 in thousands. As the per capita bed count rises, the industry must become more competitive. Indeed, such bed counts are used as the main measure governing CON laws across states. We also construct a similar ratio normalizing by thousands of persons over the age of 75, for the sake of sensitivity analysis. While we have complete data series from 1989 to 1994 on the total population over the ages of 65 and 75, we only have data on the total number of beds for the years 1991 and 1993. We construct data for 1992 using linear interpolation, and we construct data for 1989-90, and 1994, using linear extrapolation. Finally, from the Bureau of Labor Statistics, we have data on real per capita income within the state. We will use this data to test for a particular source of confounding bias, specified more precisely below.

All these data series are summarized in Table 1. As shown and discussed, the long-term care industry is predominantly for-profit, and highly subsidized by Medicaid. Recall, moreover, that the measures of total operating expense, direct care expense, and indirect care expense are taken for the for-profit facilities within the HCIA statewide samples. Recall also that "unaffiliated facilities" are those without Church or Government ties. Observe the wide band of variation for the competitiveness measures, as well as for the relative subsidy measures,[29] an important source of identifying variation we use to test our predictions.

5.2. Testing the Static Share Predictions. Within the static model of section 3, we provided two mechanisms by which the rents available to for-profit firms lower nonprofit shares: increased demand subsidies (both in level and availability), and constrained competition. To test these predictions, we will use two measures of subsidy levels within a state: the percentage of resident days within the facility accounted for by Medicaid patients (corresponding to ρ, the availability of the subsidy); the ratio of Medicaid subsidy to care expense (corresponding to s, the level of the subsidy). We

[29]In general, differences in statewide regulations and markets may generate differences in profitability across states. For example, the level of private insurance may generate such differences, especially since nonprofit hospitals may be forced (or perhaps be willing) to treat the uninsured. See, for instance, Norton and Staiger (1994) who empirically assess how this condition affects a hospital's location decision; a decision to locate in poorer areas will, for instance, result in a higher obligation to treat uninsured patients. Wedig *et al* (1989) demonstrate further that for-profit hospitals choose to locate in regions with more generous reimbursement schemes.

will measure competition using per capita beds, as specified in the discussion of the data in Table 1. Holding constant the number of people over the age of 65, we assume that the demand for long-term care also remains constant. Therefore, differences in per capita beds available we assume reflect different levels of market concentration, possibly as a result of different entry restrictions across states.

Using these data, we can use regression analysis to test the predictions of the model. Our unit of observation here will be the state and year. We wish to uncover the correlation between for-profit shares at the state level, and our measures of rents and competitiveness. We will estimate the basic equation:

$$f = \gamma_1 + \gamma_2(\rho) + \gamma_3(s) + \gamma_4(N) + \varepsilon$$

As before, f refers to the for-profit share in a state; ρ is measured by the share of patient days subsidized by Medicaid; s is measured by the log difference of Medicaid subsidy and care expense; the relative number of firms N is measured by the natural logarithm of statewide beds per capita. Table 2 reports the results of these regressions. We see that the coefficient on N is not much affected by the inclusion of subsidy measures of any kind. The results indicate that a one percent increase in beds per capita results in a 0.15 percentage point decrease in the share of for-profit firms, regardless of subsidy policy. In addition, we find that this effect remains relatively insensitive to the measure of beds chosen: both beds per 1000 people over age 65, and beds per 1000 people over age 75 yield a coefficient of about -0.15. Consistent with our theoretical findings, as the market becomes more competitive, for-profit status becomes less prevalent.

Predictably, the two dimensions of subsidization are correlated: the inclusion of s decreases the coefficient on ρ by almost 0.2. Before the inclusion of s, γ_2 equals about 0.7; after its inclusion, the coefficient on ρ falls to around 0.5. The 0.7 figure reflects the joint effect of the two subsidy dimensions: since the coefficient is higher before inclusion of s, and since the resulting coefficient on s is positive, we can infer that the two measures are positively correlated, but each remains positively significant even controlling for the presence of the other. The coefficient on s falls slightly, from 0.2 to 0.17, when we change normalization: when we normalize the subsidy by dividing it by direct care expense, we get a coefficient of 0.2, but when we normalize by dividing it by direct and indirect care expense, it falls slightly. This could be evidence of attenuation bias, since direct care expense may be the relevant expense against which the per patient subsidy is weighed by the facility. In this case, normalizing by the sum of direct and indirect care expense introduces some noise (even though direct and indirect care expense will be somewhat correlated).

We may summarize our results by looking at the regression in which all three variables are included. We find that a one percent increase in the number of beds available to every 1000 people over the age of 65 lowers the share of for-profit firms by 0.15 percentage points. Controlling for the level of the subsidy, a one percentage point increase in the number of patient days subsidized by Medicaid results in a one half percentage point fall in the share of for-profit firms. Controlling for the share of days subsidized by Medicaid, on the other hand, a one percent increase in the level of the per diem Medicaid rate (holding direct care expenses constant) results in a 0.2 percentage point increase in the share of for-profit firms. All these coefficients are significantly different from zero, and all accord remarkably well with the discussed predictions.

In the final two columns of Table 2, we test for a possible source of confounding bias. Wealthier states might have, all other things equal, higher demand for long-term care, so that rents available rise, and thus the for-profit share rises. However, such states might also support more generous Medicaid programs, if welfare programs are normal goods. This would result in upward bias of our subsidy coefficients and could result in a spurious positive coefficient. To test for this effect, we include the log of real per capita income as a regressor. Upon first including this variable, we find that it has a negative, but insignificant coefficient. We suspect that this negative sign is generated by a positive correlation between per capita income and the relative costs of land, labor, and possibly other inputs. To subject this suspicion to a test, we purge per capita income of its correlation with the relative costs of running a long-term facility, and then include this purged per capita income measure in our basic regression. Specifically, we first regress the log of per capita income on the log total expense per patient for facilities in a state; we use the residuals from this regression as the additional regressor in our basic equation. Upon doing this, we find that the coefficient, while still insignificant, becomes positive. From the initial point estimate of -0.08, the coefficient climbs to 0.04. We find that the inclusion of per capita income, whether or not it is purged, has no effect on the other coefficients. Therefore, the possibility of wealth generating confounding bias does not seem present at this level of aggregation.

In Table 3, we examine another source of spurious correlation. The share of for-profit firms used as the dependent variable in the Table 2 regressions calculates the proportion of for-profit facilities out of all the facilities in the state. However, some facilities may not have a choice of profit status, or may be subject to some other source of heterogeneity. For instance, a government-run facility cannot be for-profit, and a church-run facility may have a much different altruism level than facilities unaffiliated with the government or a charitable institution such as a church. We check whether our results hold up when we eliminate this heterogeneity. To do so, we calculate the for-profit share as the proportion of for-profit facilities out of all facilities, *except* government- and church-run facilities. These results are contained in Table 3, which indicates that this new dependent variable does not alter the qualitative results depicted in Table 2. All the coefficients fall in absolute value, however, because eliminating government and church facilities decreases the variation across states in for-profit shares. Nonetheless, the qualitative results are unchanged.

5.3. Testing for a Steady-State. In Section 4, we analyzed the conditions necessary for the existence of steady-state shares in an industry. In this section, we will be unable to reject the existence of such a steady-state. Since we have data from 1989 and 1994, we can analyze the change in for-profit shares over this period. As a first pass, we examined the aggregate nationwide share of for-profit facilities, as shown in our statewide samples. We find that the share of for-profit firms falls by one percentage point, but even this fall is even on the order of an approximation error: rounding the shares to the hundredths place yields the implication of a percentage point fall in the share of for-profit firms, but no change in the share of government-run, church-run, or other nonprofit institutions.[30]

To test the hypothesis more formally, we assume that in a steady-state, the change in for-profit share for every state is given by a draw from a mean zero distribution. If we assume that the variance of for-profit shares does not vary across states, we can average the change in for-profit shares across states, divide by the estimated standard deviation of the change in shares, and thus form a simple t-statistic. Upon doing so, we find t-values of 0.06, 0.15, 0.00, and -0.14, for the change in for-profit, unaffiliated nonprofit,[31] church-affiliated, and government-affiliated institutions, respectively. Clearly, all these t-values are far from significant.

However, the assumption of constant variance may not be appropriate. States with fewer total facilities will tend to display greater variance in the share of for-profit facilities, since a given absolute change results in a larger change in share. To address this problem, we split up the sample into quintiles, based on the total number of facilities present in 1994. We calculate a single mean, standard deviation, and t-statistic for each quintile. In other words, we rank every state by its total number of facilities in 1994, and split up the sample of states into the lowest 10 states, the next 10, and so on, with the final group (those states with the most facilities) contains 11 states. We then compute t-statistics within these subsamples, which should display roughly constant variance. The results of these calculations are shown in Table 4. Again, none of the t-statistics even approach significance. We are unable to reject the hypothesis that the share changes represent independent draws from a mean zero distribution.

5.4. Within-State Effects. Since we could not reject the existence of a steady-state, we expect that the annual changes in for-profit share within states will be largely

[30] As mentioned earlier, we find the share of private nonprofit homes to be around 0.2.

[31] This includes all nonprofit institutions without church or government affiliation.

unsystematic, so that regressing the annual change in for-profit shares within states on the annual changesin the various explanatory variables will not result in much explanatory power. Moreover, since our theory of entry and conversion behavior holds in the long-run when capital flows freely, a regression of yearly changes may be inappropriate. These hypotheses turn out to be largely consistent with the results. If we examine 5-year changes, however, we do find a negative correlation between the change in for-profit shares and the change in the competitiveness of the marketplace. Of course, due to the extremely small number of observations, we have to increase the level of aggregation in order to explain much variation.

Having found that regressions of annual changes reveal little, we calculate, for all states, the change in the for-profit share[32] between 1994 and 1989, as well as the changes in the percent of Medicaid resident days, the changes in the log of the relative subsidy, and the changes in the log of per capita beds, over that 5-year interval. Initially, we find no significant relation between the change in for-profit share and the first two explanatory variables, but we are able to detect a weak negative relation when we consider the change in the log of per capita beds. In Table 5, we show that a simple regression of the change in for-profit shares on the change in the log of per capita beds yields a negative, but insignificant coefficient, with a t-statistic of -1.4. The lack of explanatory power comes both from the high degree of unsystematic variation in for-profit shares, and the paucity of observations. In order to compensate for the lack of observations, we try to eliminate some noise in the statewide changes by running the regression using cell means. A cell is defined by a decile of the change in the log of per capita beds. Within that decile, we calculate a mean change in log per capita beds, and a mean change in the for-profit shares. In the end, we have 10 observations with which to run a regression; the dependent variable is the mean change in for-profit shares within a decile, and the independent variable is the mean change in log per capita beds within that same decile. The regression using these 10 observations results in a rather high R-squared value, as well as a significantly negative coefficient on the explanatory variable. Figure 5 depicts a plot of the 10 cell means, along with the estimated regression line. The regression results are shown in the right-hand column of Table 5.

We can conclude that the change over time in for-profit shares can be explained only by the change in marketplace competitiveness. The difficulty we have in explaining the change in for-profit shares, however, is a testament to the prevalence of a steady-state equilibrium, in which there would be little systematic change in shares within states. We also have evidence that the change in marketplace competitiveness, as measured by restricted beds per old person, may be the most powerful explanatory

[32]In this section, we consider only the proportion of for-profit firms in the total of unaffiliated facilities, so we exclude government and church facilities.

variable we have over the 5-year horizon; perhaps firms adjust most quickly to changes in marketplace competitiveness. The dynamic model predicted that a change over time which decreased the profitability of for-profit status would decrease the number of conversions, and thus lower the share of for-profit firms. While there does not appear to be much movement away from the steady-state, as evidenced by the unsystematic movement in for-profit shares, a positive change in the competitiveness of the long-term care industry is associated in the data with a negative change in for-profit shares. The prevalence of steady-state dynamics removes most of the systematic determinants of the change in for-profit shares, but the determinants which remain do seem to match the predictions of the dynamic model.

To summarize, we have found that the predictions made by our models have been confirmed by the data to a remarkable degree. We see that the major prediction, of the positive correlation between profitability and for-profit shares, has been borne out repeatedly in these data. The relation is more apparent in levels than in differences, but we have seen that most of the movement within states in these data is not of a systematic nature, and in any event, our theory of share changes applies best to the long-run, which might be longer than the data horizon we have available. As a result, it takes more work to tease out what systematic relations prevail between the first-differenced quantities.

6. CONCLUDING REMARKS

Industries in which private nonprofit production is present and dominant, such as health care and education, make up more than a fifth of US economic activity. This paper has discussed forces determining the share of nonprofit production in mixed industries. Most generally, we predict that the share of nonprofit production falls with the profits available under for-profit status, a relation which provides a direct link between observable market characteristics and nonprofit shares of output. We argued that this had many useful implications, such as, among other things, that the share of nonprofits rise with the number of firms in the industry, falls with demand subsidies, and falls with the pace and extent of learning-by-doing.

Our analysis suggests a feasible interpretation of the broad differences across industries with respect to the share of nonprofit activity. For instance, the presence of direct price competition, and the relative absence of third party payers in the field of education would explain why nonprofit institutions dominate this field entirely. On the other hand, we do see for-profit institutions in health care, which faces third party payers and in which incumbents seem more protected through CON-Laws. This is consistent with our claim that industries with more nonprofit activity will be more competitive and less profitable than those with more for-profit activity. Empirically, we have found that within the long-term care industry, differences in entry restrictions and subsidy policies across states exert economically significant effects on the share of nonprofit activity. This suggests another possible explanation for the existence of a predominantly nonprofit short-term care industry and a predominantly for-profit long-term care industry: looser entry restrictions and less generous subsidization in the short-term care industry may explain why short-term care institutions are nonprofit more often than long-term care institutions.

In addition, our major implications have a few corollaries which contradict the main arguments of previous studies. First, previous work has alleged that output-preferring nonprofit firms always produce on a higher scale than for-profit firms. We have found this to be true in the short-run, but the long-run outcome depends on the relative prevalence of altruism and the particular form of output-preference. While we do not rule out the case in which nonprofit firms (by which we mean firms which choose nonprofit status) produce more output in the long run, it is not necessary for an output-preferrer to have higher long-run output than a profit-maximizer. However, this claim has often been the backbone of previous studies.

Second, it is often claimed that only market power allows nonprofits to spend any profits on their own objectives, such as for instance cross-subsidization of consumers by output-preferring firms.[33] "Cross-subsidization" is the practice of charging poorer consumers below costs and making up the loss by charging wealthier consumers above

[33]See, for instance, James and Rose-Ackerman (1986), page 46.

costs; in effect, wealthier customers subsidize poorer ones. While competition does rule out profit-making on wealthier customers, our model implies that an output-preferrer even under competitive conditions may well provide uncompensated or undercompensated care to poorer consumers. Even if this results in economic losses, the value of output in itself may offset the cost of lost economic profits. The negative profits accepted by an altruistic producer will not have to be covered by profit-making activity elsewhere, but represent donations by the donor/investors in the firm.[34] Under competitive conditions, an output-preferring firm might choose nonprofit status and negative profits, while an output-averting firm might choose for-profit status and positive profits. In fact, under free entry (and infinite supply of altruism), the most output-preferring firm dominates, so that monetary profits get driven down to levels below zero. While in the aggregate this may represent a transfer (or "subsidy") to consumers, at the firm-level, we explain it as the outcome of rational firm behavior under competitive conditions.

Third, In the literature on nonprofit firms, there has been useful, but in our view inordinate, attention paid to the division between ownership and control. Significantly, this separation and the extent of its effects are not uniquely important in the nonprofit sector. The prevailing line of argument asserts that once ownership and control are divorced, shirking by managers becomes acute in nonprofit firms which accept positive donations, because those donations perpetuate waste in the firm. Indeed, donations are treated as profits to possibly be spent by profit-deviators. However, since the donor continues to be as rational as a regular investor in a for-profit firm, he will have an incentive to donate only if the firm carries out his objectives. In the special case of profit-maximization, the donor/investor simply finds the firm most efficient at maximizing profits. In the more general case of profit-deviation, she has an incentive to find a firm whose objectives most closely mirror her own. To be sure, informational asymmetries will arise once ownership and control are divorced, as repeatedly stressed in agency analysis, but they apply to investors as well as donors.

Our paper suggests an important potential area of research: the efficiency properties of market versus regulated behavior under profit-deviating firm behavior.[35] In the presence of profit-deviating firms, Pareto efficient production may not imply marginal and minimum average cost pricing, because the preferences of the firms may

[34]This applies less to U.S. short-term health care, where free inputs are a less significant revenue source.

[35]Asymmetric information is often put forward as an explanation of nonprofit status being the efficient form of production (see e.g. Weisbrod (1988), Easly and O'Hara (1983), or the review in Hansmann (1987). However, less emphasis has been placed on using this explanation to offer predictions concerning the shares of nonprofit output in or across industries. Is long-term care almost entirely for-profit and short-term health care almost entirely nonprofit because of informational differences between the two markets? Are the large differences across regions in the US and other countries due to informational differences?

dictate prices below monetary marginal costs. Many observers have argued that any profit-deviating motives distort production and force it away from efficient marginal cost-pricing.[36] A direct implication of our analysis, however, is that marginal cost pricing need not be efficient under profit-deviating motives. With profit-deviating preferences, there are no unexploited gains from trade between consumers and producers even when prices are below average costs, and profits are negative. There is no externality, since the firm *wants* to price below cost. A better understanding of efficiency issues and nonprofit behavior will affect how we view the efficiency consequences of standard interventions, particularly in the arena of anti-trust. If regulatory nonprofit status results in production subsidies which cannot be used for profits, then why should subsidization take place on the supply side? Instead of nonprofit tax breaks, the state might provide demand subsidies which have the same output consequences. Furthermore, if supply is subsidized, why is it subsidized relatively more for those who earn *lower* profits; that is, why is the subsidy tied to a non-distribution constraint? Indeed, important policy questions rest on the answers to such questions.

On a more general level it is somewhat surprising that economic research has not addressed the nonprofit sector in greater detail. While useful, the relatively larger and almost exclusive focus on the for-profit sector by economists overlooks this extensive part of the economy. To better understand this large sector, more analytic effort should be focused on its unique problems. Current analytic efforts have proposed many special and idiosyncratic models of nonprofit firms; however, in this paper, we have consistently found that *standard* formal analysis of the profit-maximizing firm affords powerful, and empirically verifiable, predictions. The well-established tools and results of neoclassical firm behavior , including the assumption of profit-maximization and free entry, seems to have many unexplored implications, particularly when profit-deviating firms can be viewed simply as profit-maximizers with reinterpreted cost functions.

[36] See James and Rose-Ackerman (1988).

A. OPTIMAL INDIVIDUAL CONVERSION BEHAVIOR

We now present the formal solution to the problem posed in equations 5. If we take as given the countable set of conversion times $\tau = \{\tau_i\}$, this problem is a countable set of standard optimal control problems. For all odd i, we have the fixed-endpoint problem for the nonprofit firm:

$$\max_{y(t)} \int_{\tau_i}^{\tau_{i+1}} e^{-rt} \min(\pi_R, py(t) - c^0(Z(t), y(t)))dt \tag{11}$$

$$s.t.\ \dot{Z}(t) = y(t)$$

Similarly, for all even i we have the standard fixed-endpoint problem for the for-profit firm:

$$\max_{q(t)} \int_{\tau_i}^{\tau_{i+1}} e^{-rt}(py(t) - c^1(Z(t), y(t)))dt \tag{12}$$

$$s.t.\ \dot{Z}(t) = y(t)$$

With each problem i, we can associate a "costate variable" $\lambda_i(t)$; the costate for the entire problem $\lambda(t)$ will be defined in a piecewise fashion using these component functions λ_i. For the nonprofit decision problems in 11, when the constraint on profits fails to bind, the optimal path $y(t)$ satisfies the usual necessary conditions:

$$e^{-rt}(c_2^0(Z(t), y(t)) - p) = \lambda_i(t) \tag{13}$$

$$\dot{\lambda}_i(t) = e^{-rt} c_1^0(Z(t), y(t)) \tag{14}$$

We have two similar necessary conditions when the firm chooses for-profit status and solves 12:

$$e^{-rt}(c_2^1(Z(t), y(t)) - p) = \lambda_i(t) \tag{15}$$

$$\dot{\lambda}_i(t) = e^{-rt} c_1^1(Z(t), y(t)) \tag{16}$$

Notice that these are precisely the conditions we saw using our simple asset-pricing analysis. We also have a transversality condition implying that $\lim_{T\to\infty} \lambda(T) \geq 0$ (also implied by the asset-pricing analysis). When the constraint on profits binds, λ will continue to be weakly decreasing,[37] so λ is everywhere weakly decreasing; since

[37]This can be shown by associating a multiplier with the constraint on profits, say $\gamma(t)$. Now

$$\lambda(t) = (1 - \gamma(t))e^{-\rho t}(c_2(Z, y) - p)$$

the costate λ must be continuous, the transversality condition implies that it must be positive throughout. Thus, marginal cost exceeds price.

The choice of switching points must maximize the objective function in the usual sense. The resulting first order condition may be written as (for all $i > 1$):

$$\min(\pi_R, py(\tau_i) - c^0(Z(\tau_i), y(\tau_i))) = (py(\tau_i) - c^1(Z(\tau_i), y(\tau_i)))$$

If the ceiling on profit does not bind, nonprofit status is strictly superior (as in earlier sections), so this condition cannot hold unless this ceiling does bind. The condition then simplifies to:

$$\pi_R = (py(\tau_i) - c^1(Z(\tau_i), y(\tau_i)))$$

A high ceiling π_R or a high cost of for-profit operation may preclude this condition, but if some τ_S ever satisfies this condition, no other $\tau > \tau_S$ will do so. We will show the following proposition:

Proposition 1. *The firm will switch status at most once. If $\exists\ \tau^*$ at which the firm switches status, $\forall \tau \neq \tau^*$, the firm strictly prefers one status or another.*

This will follow if we can show that profits increase over time for the for-profit firm. Suppose the firm switches at some τ. If the firm switches anywhere, it must start as a nonprofit. Since the firm starts as a nonprofit, its equilibrium time zero profits must be $\leq \pi_R$. Since the firm ever switches to for-profit status, its initial profits at the time of the switch must be π_R. Therefore, if profits rise for a for-profit firm, its profits will never return to the level π_R at which switching is optimal. It then suffices to show that profits rise over time for the for-profit firm.

The total differential for the change in profits over time is:

$$\dot{\pi}(t) = \frac{\partial \pi}{\partial Z}\dot{Z}(t) + \frac{\partial \pi}{\partial \lambda}\dot{\lambda}(t)$$

We previously argued that $\frac{\partial \pi}{\partial \lambda} < 0$, since this corresponds to a fall in the shadow value of knowledge relative to profit; observe that comparative statics on 15 yields the expression $\frac{\partial y}{\partial \lambda} = \frac{e^{rt}}{c^1_{22}(Z,y)} > 0$, which implies that $\frac{\partial \pi}{\partial \lambda} = -e^{rt}\frac{c^1_2(Z,y)}{c^1_{22}(Z,y)} < 0$. Holding λ fixed and increasing Z corresponds to holding the equilibrium slope of the profit (or cost) function fixed and raising Z.

$$\dot{\lambda}(t) = (1 - \gamma(t))e^{-\rho t}c_1(Z, y)$$

$\gamma(t)$ is nonzero if and only if the constraint binds. Since λ is continuous, when the constraint does bind $\gamma(t) \leq 1$, otherwise λ would switch signs. Therefore, $\dot{\lambda}(t) \leq 0$ even under a binding constraint.

Our restriction on the cost function, illustrated in Figure 4, implies that total cost then falls and equilibrium output rises, because the decrease in marginal cost does not raise output enough to increase total cost. We can now state the restriction more formally. Given the inverse function $y(Z, c)$, implicitly defined according to

$$c(Z, y(Z, \psi)) = \psi \tag{17}$$

we can write our assumption as

$$y_{12}(Z, \psi) < 0 \tag{18}$$

Equation 18 provides another way of interpreting the property illustrated in Figure 4: marginal cost is increasing along horizontal lines (as Z increases).

To examine the effect of holding λ fixed and increasing Z, first observe $\frac{\partial \pi}{\partial Z} = -c_1^1(Z, y) - c_2^1(Z, y)\frac{\partial y}{\partial Z}$. Moreover, comparative statics on 13 yields $\frac{\partial y}{\partial Z} = -\frac{c_{12}^1(Z,y)}{c_{22}^1(Z,y)}$. Substitution then implies $\frac{\partial \pi}{\partial Z} = -c_1^1(Z, y) + c_2^1(Z, y)\frac{c_{12}^1(Z,y)}{c_{22}^1(Z,y)}$. Differentiation of 17 yields

$$y_{12} = -\frac{1}{(c_2)^2}(c_{12} - c_{22}\frac{c_1}{c_2})$$

The assumption in 18 holds for both firm types, so $c_{12}^1 - c_{22}^1\frac{c_1^1}{c_2^1} > 0$, which is equivalent to $\frac{\partial \pi}{\partial Z} > 0$. Since $\dot{\lambda}(t) < 0$, and $\dot{Q}(t) > 0$, $\dot{\pi}(t) > 0$:

$$\dot{\pi}(t) = \left(-c_1^1(Z, y) + c_2^1(Z, y)\frac{c_{12}^1(Z, y)}{c_{22}^1(Z, y)}\right) y(t) - \frac{c_2^1(Z, y)}{c_{22}^1(Z, y)} c_1^1(Z(t), y(t)) > 0$$

Profits are strictly rising for the for-profit firm. Exactly the same analysis could be used to show that profits rise for the unconstrained nonprofit firm, but that result is unnecessary to show that if the firm ever switches to for-profit status, it cannot switch back. Specifically, it only switches status at a point where profits equal π_R, but as soon as it switches to for-profit status, its profits will never return to this level.

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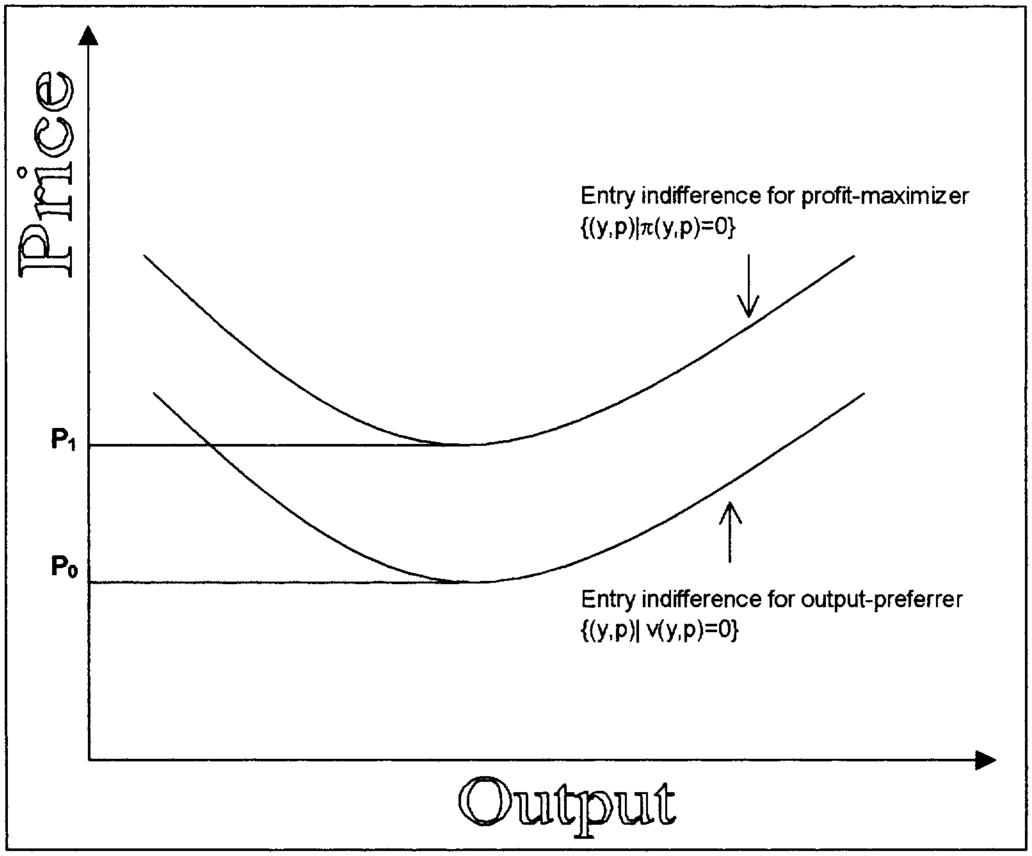

Figure 1: Break-even relations for profit-maximizer and output-preferring producer.

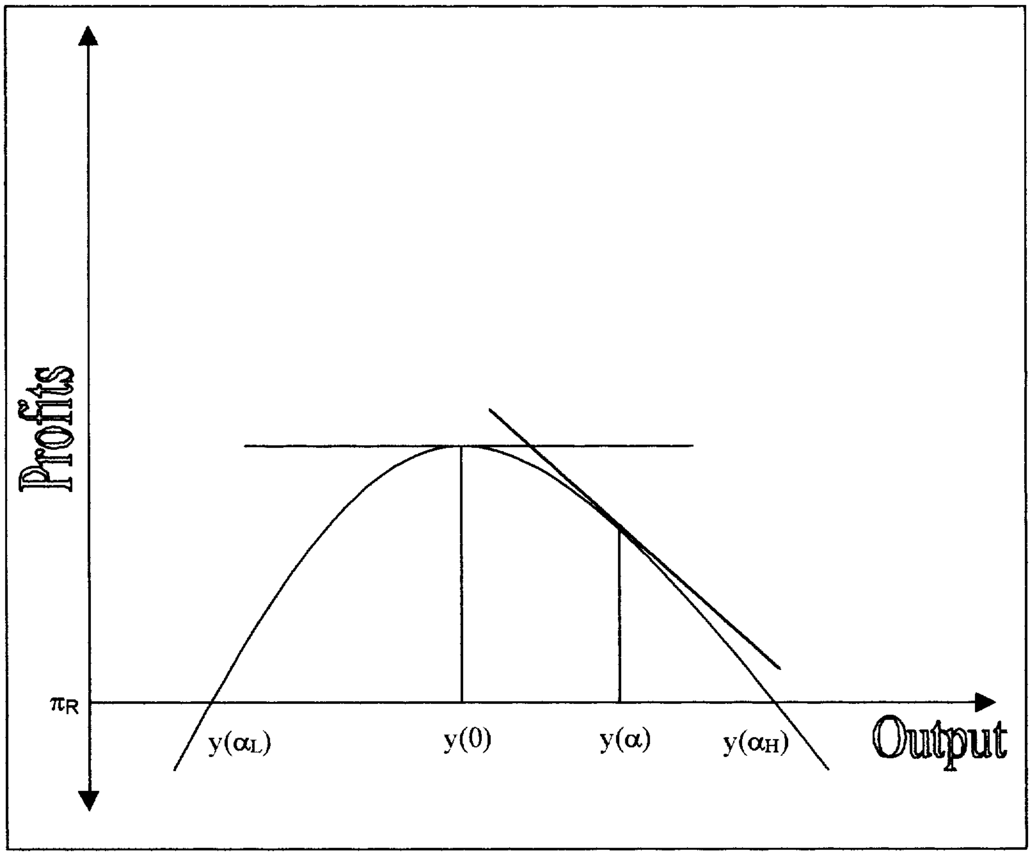

Figure 2: Output choice for producers with heterogeneous preferences.

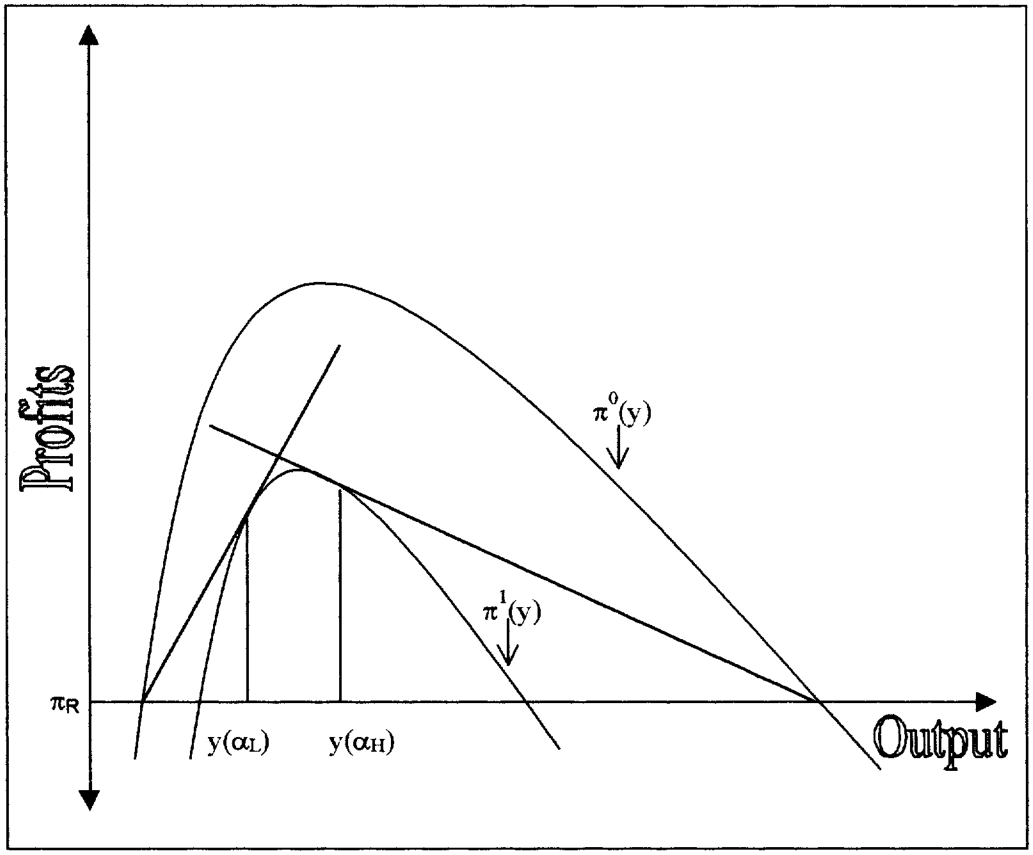

Figure 3: Output choice of heterogeneous producers facing different profit functions.

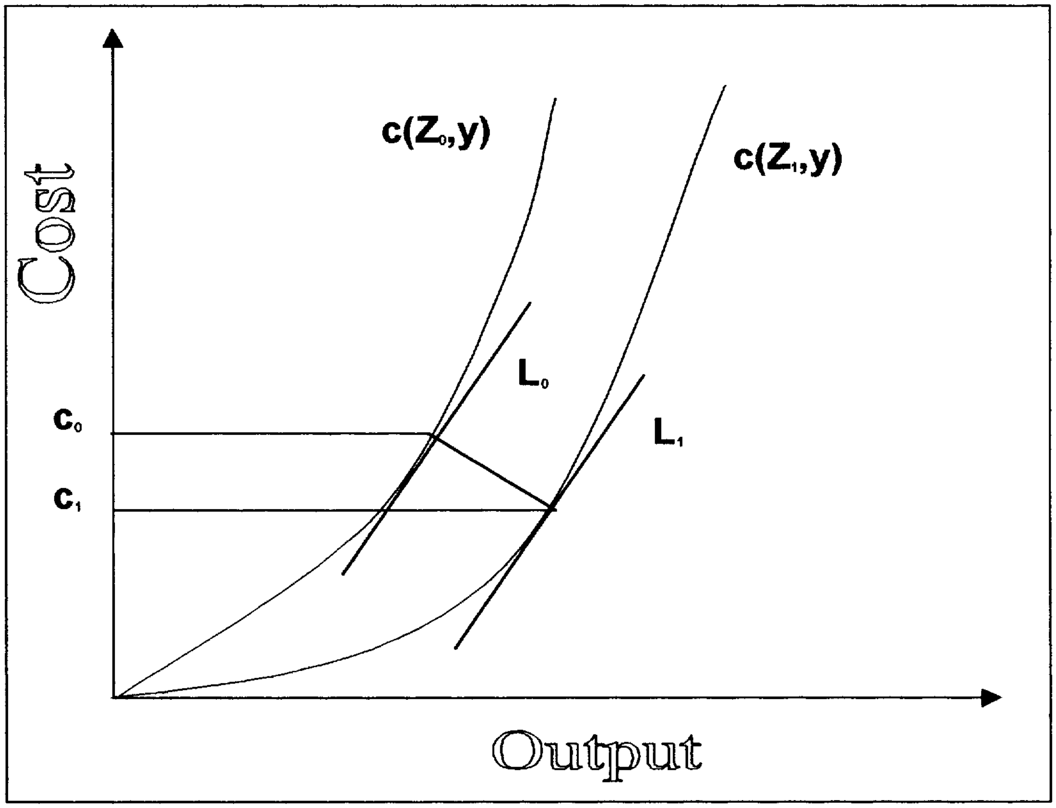

Figure 4: Implied shape of cost function.

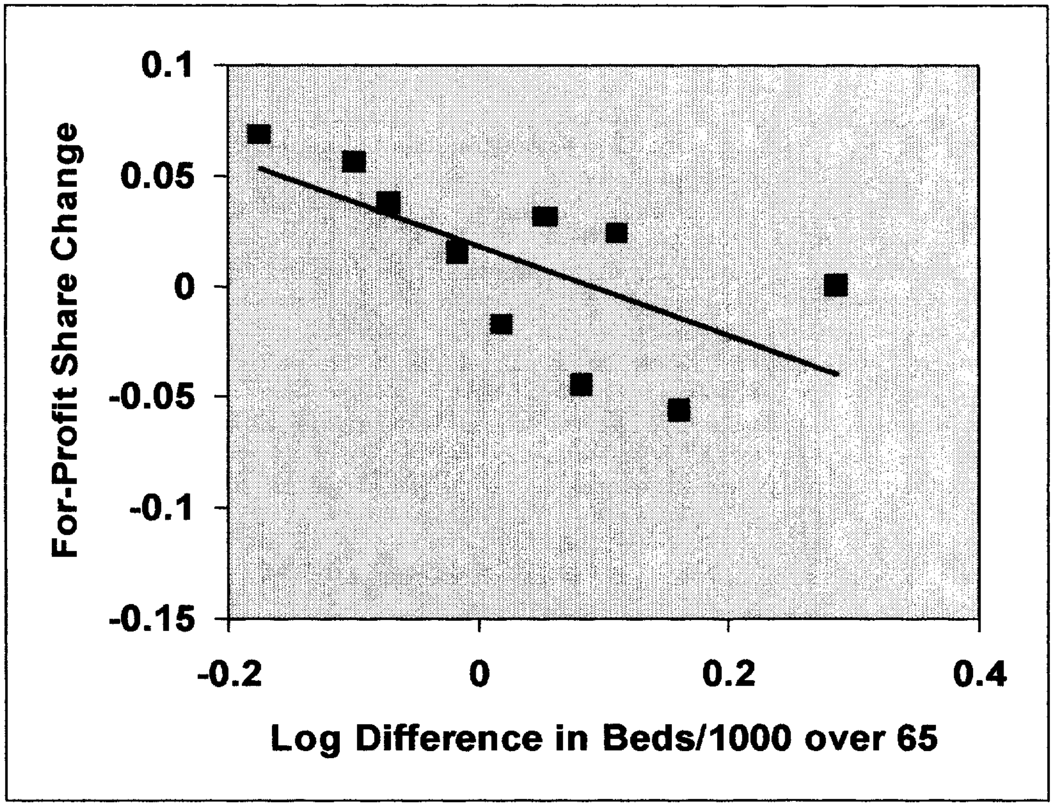

Figure 5: Relation between 5-year changes in shares and competitiveness.

Table 1: Summary Statistics for Long-Term Care Industry (1989-1994)[a]

	Mean	Standard Deviation	Minimum	Maximum
Share of For-Profit Facilities in All Facilities[b]	0.67	0.20	0.00	1.00
Share of For-Profit Facilities in unaffiliated Facilities[c]	0.78	0.18	0.00	1.00
Share of Medicaid Bed Days in For-Profit Facilities	0.72	0.09	0.45	0.97
Share of Medicaid Bed Days in All Facilities	0.70	0.11	0.37	0.91
Beds per 1000 people over 65[d]	55.17	16.87	23.66	87.21
Beds per 1000 people over 75[d]	126.96	34.19	62.17	185.58
Per Capita Income ($1000)[e]	18.43	3.23	11.91	29.80
Total Operating Expenses per Patient Day ($)	71.43	20.20	34.41	137.00
Total Direct Care Expenses per Patient Day ($)	25.37	7.82	10.06	50.86
Total Indirect Care Expenses per Patient Day ($)	12.45	3.24	5.65	27.32
Medicaid Per Diem ($)[f]	67.22	22.04	33.33	217.19
Ratio of Subsidy to Direct Care Expense[g]	2.70	0.42	1.77	4.23
Ratio of Subsidy to Direct and Indirect Care Expense[h]	1.79	0.25	1.24	2.81

Source: HCIA, Survey of Nursing Homes, 1989-1994.

[a]All Data are collected at the state level.

[b]Data are from 1989 and 1994.

[c]Excludes Church- and Government-run facilities.

[d]Data are from 1991 and 1993.

[e]Data are from Bureau of Economic Analysis.

[f]Data are from 1989-1993.

[g]Medicaid per Diem divided by Direct Care Expense per patient day.

[h]Medicaid per Diem divided by Direct and Indirect Care Expense per patient day.

Table 2. Least Squares Regression Results for Long-Term Care Industry (1989-1994).[a]

Explanatory Variable	Share of For-Profit in All Facilities						
Constant	0.19 † 2.71	0.79 † 7.41	0.89 † 7.04	0.77 † 6.21	0.83 † 6.75	1.58 † 2.31	0.79 † 6.50
Share of Medicaid Bed Days[b]	0.73 † 7.94	0.69 † 8.53	0.67 † 8.57	0.48 † 4.79	0.51 † 5.12	0.49 † 5.02	0.48 † 4.75
Log of Beds per 1000 people over 65[c]		-0.15 † -5.39		-0.15 † -4.88	-0.15 † -4.66	-0.15 † -4.62	-0.16 † -4.69
Log of Beds per 1000 people over 75[c]			-0.14 † -4.97				
Ratio of Subsidy to Direct Care Expense				0.20 † 2.99		0.17 † 2.42	0.20 † 3.02
Ratio of Subsidy to Direct and Indirect Care Expense					0.17 † 2.30		
Log of Per Capita Income ($)						-0.08 -1.26	
Log of Per Capita Income ($) Purged of Health Care Costs[d]							0.04 0.45
R-Squared	0.18	0.26	0.23	0.27	0.26	0.27	0.27
Number of Observations	226	226	224	178	178	178	178

[a]T-statistics given below point estimates based on White's heteroskedasticity-consistent variance estimator.

[b]Data for For-Profit Facilities. Data for 1990-1993 linearly interpolated by state and profit status.

[c]1992 linearly interpolated by state and profit status; 1989-90, 1994 linearly extrapolated by state and profit status.

[d]Calculated as the residual from a regression of Log Per Capita Income on Log Total Operating Expenses per patient day. Regression of 196 observations yields coefficient of 0.42, standard error of 0.030, and R-Squared of 0.51.

†Significantly different from zero with 95% confidence.

‡Significantly different from zero with 90% confidence.

Table 3. Least Squares Regression Results for Unaffiliated Long-Term Care Industry (1989-1994).[a]

Explanatory Variable	Share of For-Profit in Unaffiliated Facilities						
Constant	0.47 † 7.25	0.96 † 11.50	1.01 † 10.41	0.99 † 10.42	1.03 † 10.86	2.11 † 4.09	0.98 † 10.59
Share of Medicaid Bed Days[b]	0.50 † 5.85	0.47 † 6.18	0.43 † 6.32	0.31 † 3.32	0.34 † 3.62	0.32 † 3.58	0.31 † 3.29
Log of Beds per 1000 people over 65[c]		-0.12 † -5.14		-0.13 † -4.89	-0.13 † -4.70	-0.12 † -4.52	-0.13 † -4.56
Log of Beds per 1000 people over 75[c]			-0.10 † -4.66				
Ratio of Subsidy to Direct Care Expense				0.14 † 2.59		0.10 † 1.79	0.14 † 2.57
Ratio of Subsidy to Direct and Indirect Care Expense					0.11 ‡ 1.95		
Log of Per Capita Income ($)						-0.12 † -2.31	
Log of Per Capita Income ($) Purged of Health Care Costs[d]							-0.01 -0.17
R-Squared	0.15	0.24	0.20	0.25	0.24	0.27	0.25
Number of Observations	226	226	224	178	178	178	178

[a]T-statistics given below point estimates based on White's heteroskedasticity-consistent variance estimator.

[b]Data for For-Profit Facilities. Data for 1990-1993 linearly interpolated by state and profit status.

[c]1992 linearly interpolated by state and profit status; 1989-90, 1994 linearly extrapolated by state and profit status.

[d]Calculated as the residual from a regression of Log Per Capita Income on Log Total Operating Expenses per patient day. Regression of 196 observations yields coefficient of 0.42, standard error of 0.030, and R-Squared of 0.51.

†Significantly different from zero with 95% confidence.

‡Significantly different from zero with 90% confidence.

Table 4. Test of Steady-State Condition on Sample by Quintile.[a,b]

	First Quintile [0, 30.6)			Second Quintile [30.6, 96.2)			Third Quintile [96.2, 174.2)			Fourth Quintile [174.2, 298.2)			Fifth Quintile [298.2, 794]		
Five Year Share Change	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
For-Profit	-0.03	-0.21	0.25	0.04	-0.09	0.32	0.03	-0.02	0.11	0.00	-0.15	0.22	-0.01	-0.07	0.03
	-0.20			0.32			0.74			0.04			-0.35		
Unaffiliated Nonprofit[c]	0.03	-0.13	0.19	-0.08	-0.57	0.20	-0.01	-0.04	0.04	-0.03	-0.23	0.05	0.01	-0.05	0.07
	0.36			-0.34			-0.53			-0.35			0.24		
Church-Affiliated	0.02	-0.06	0.13	0.04	-0.09	0.24	-0.01	-0.06	0.02	0.00	-0.03	0.08	0.00	-0.01	0.02
	0.26			0.33			-0.46			0.10			0.16		
Public	-0.01	-0.25	0.13	0.00	-0.06	0.05	-0.01	-0.05	0.02	0.02	-0.05	0.22	0.00	-0.06	0.06
	-0.13			-0.01			-0.32			0.30			0.01		

[a]Quintile taken with respect to the statewide total of facilities present in 1994.

[b]T-statistics appear below reported means.

[c]Excludes nonprofit institutions with Government or Church Affiliation.

Table 5. First Difference Regression Results (1989-1994).[a]

	Change in Share of For-Profit in Unaffiliated Facilities		
	All Observations	All Replaced by Deciles[b]	Deciles Only[c]
Constant	0.0173761 1.009	0.0188972 † 5.348	0.018572 † 2.368
Log Difference in Beds per 1000 over 65	-0.1531204 -1.439	-0.1902622 † -6.108	-0.20138 † -2.675
R-Squared	0.0379	0.4234	0.4417
Number of Observations	51	51	10

[a]T-statistics given below point estimates based on White's heteroskedasticity-consistent variance estimator.

[b]Every observation replaced by its cell mean, where a cell is defined by a decile of the Log Difference in Beds per 1000 over 65.

[c]Only the ten distinct cell means are used.

†Significantly different from zero with 95% confidence.