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Cross-Subsidization in Nursing Homes: Explaining Rate Differentials Among Payer Types

Jennifer L. Troyer*

Are Medicaid patients being subsidized by other residents in nursing homes? This article employs cross-sectional data on nursing homes and residents in a multiproduct empirical cost analysis to obtain the benchmark magnitudes of patient service costs needed to assess the issues. The estimated cost function provides evidence that Medicaid reimbursement rates are lower than the average incremental cost of care for Medicaid patients in approximately one quarter to one third of Florida nursing homes. One possible explanation for this apparent cross-subsidization, considered here, is that patients pay a premium in self-insured rates early in their residency to fairly cover the expected future losses if they later convert to Medicaid. Based on the empirical frequencies of patient transitions to different payer status over the length of the nursing home stay, it is shown that the apparent cross-subsidization is explained, to a large extent, by an intertemporal conversion surcharge.

1. Introduction

Nursing home owners have long insisted that the Medicaid program does not reimburse them enough to cover the costs of providing care to Medicaid patients, but it is not clear that nursing homes are actually losing money on Medicaid residents (Ettner 1993). Using standard profit-maximization models of firm behavior, Morrisey (1994) has critically considered the potential for cross-subsidization by health service providers and has concluded that such behavior is unlikely. Using empirical methods, several authors have explored the possibility of cross-subsidization in the hospital industry. For example, Dranove (1988) determined that Illinois hospitals cost shifted in response to substantial reductions in Medicaid payments in the early 1980s. In contrast, Hadley, Zuckerman, and Iezzoni (1996), Dor and Farley (1996), and Dranove and White (1998) found no evidence of hospital cost shifting. However, a lack of cross-subsidization in the hospital industry does not necessarily imply a lack of cross-subsidization in the nursing home industry, where residents not funded by the government are unorganized and generally pay out-of-pocket for care.

Despite the mounting evidence against cost shifting in hospitals, there are at least two possible explanations for findings of cross-subsidization in the nursing home industry that are consistent with economic theory. First, industry regulators may be granting favors to nursing home providers in exchange for the provision of unprofitable nursing home days for govern-

* Department of Economics, University of North Carolina at Charlotte, 9201 University City Boulevard, Charlotte, NC 28223, USA; E-mail jtroyer@email.uncc.edu.

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ment-funded patients (Posner 1971). For example, Certificate-of-Need (CON) regulators may be doling out rewards in the form of scarce CON licenses to nursing homes that provide unremunerative care for Medicaid patients (Fournier and Campbell 1997). Alternatively, regulators may protect firms that take on additional Medicaid residents by restricting the bed supply in the market, providing market power for an existing firm. Applications for new beds in Florida may include a mix of beds set aside for Medicaid patients and beds open to any patient type. Thus, a CON approval would give the nursing home more beds overall, where the nursing home applying for the CON anticipates the ability to profit from the application if approved, while a CON denial for a competitor would enforce the market power of existing homes.

Second, there may be considerable uncertainty with respect to whether a nursing home resident is going to convert to Medicaid. Thus, nursing homes may accept a self-pay or Medicare patient without certainty about how the individual's care will be funded for the duration of his/her stay. Legally, nursing homes may face an explicit responsibility to continue to provide unremunerative services to a resident that converts to Medicaid after entering the nursing home. As a hedge against this obligation, the nursing home may impose a surcharge on all self-pay residents to compensate for the risk of conversion to Medicaid. *Ex ante,* nursing homes do not know with certainty which patients will spend-down to Medicaid. Thus, nursing homes may charge self-pay patients an actuarially fair high price to account for the risk of conversion in future periods. In other words, self-pay patients may be forced to pay an intertemporal conversion surcharge to compensate firms for the risk of conversion to Medicaid. Common knowledge about the risk of conversion would be factored into a determination of the full cost price.

The possibility of a surcharge for intertemporal conversions coupled with the reality of relatively low Medicaid reimbursement rates in Florida nursing homes leads to two questions that will be addressed sequentially in this article. First, are Medicaid reimbursement rates in Florida adequate to cover the incremental cost of care provided to Medicaid residents? If not, is the risk of conversion substantial enough to explain the rate differential among payer types? If the price paid for Medicaid patients does not cover the costs of care for Medicaid patients, a case may be made for cross-subsidization in the cross-section examined. Given the transition of some individuals from self-pay or Medicare to Medicaid over time, an additional examination of the rate structure of apparently cross-subsidizing homes is warranted. If the average revenue for patients not on Medicaid upon admission offsets realized future postconversion losses on average in every nursing home, the intertemporal conversion surcharge explains differences in prices across payer types entirely. If instead the expected net revenue for patients not on Medicaid upon admission is nonzero, there remains a portion of the rate structure that could be construed as cross-subsidization.

Investigation of these issues requires a carefully designed empirical cost analysis. While Little (1992) examined cost shifting in nursing homes using aggregate data, there have been no other studies of cross-subsidization in nursing homes and there have been no studies of cross-subsidization using facility- and resident-level data. Using firm-level and resident-level data from Florida, this article will present estimates of the incremental cost of treating different patient groups and will examine the risk of conversion. The article will begin in section 2 with a discussion of important characteristics of the Florida nursing home industry, followed by section 3 with a discussion of the hypotheses and methods used in the analysis. Section 4 contains the empirical estimates, followed by a concluding section that examines the public policy implications of the results.

2. The Case for Cross-Subsidization in Florida's Nursing Home Industry

Payer Types and Reimbursement Rates in Florida

In nursing homes today, there are three major payer types: private pay, Medicaid funded, and Medicare funded. Private-pay (i.e., self-pay) residents or their families pay for nursing home expenses without any government assistance. The Medicaid program covers long-term care for the poor, subject to the eligibility standards established by the state. Under the Medicaid program in Florida, for example, a nursing home is reimbursed at a prospective rate per day for each Medicaid-funded resident. Over the period examined in this study, in Florida, nursing homes are paid the same daily reimbursement rate for each Medicaid-funded resident per day, regardless of the disability level of the resident.

The third major payer for nursing home care is the Medicare program, a federal program that funds medical care for the elderly and pays for convalescent or terminal, not long-term, nursing home care. Medicare nursing home coverage is currently limited to 100 days, and it requires prior hospitalization and a physician-established need for skilled nursing services. In the period before 1998 considered in this study, nursing homes submitted cost reports to the Medicare program and they were reimbursed for all covered costs. While Medicare pays for all care for the first 20 days of a qualifying nursing home stay, it requires a copayment, which is generally paid with private or Medicaid dollars. In 1996, the Medicare per diem copayment for days 21–100 of a nursing home stay was $78.50.

In Florida, the proportion of 1996 nursing home revenues obtained from private-pay nursing home residents (25%) was approximately equal to the proportion of all nursing home days utilized by private-pay residents (22%). In contrast, the proportion of revenue from Medicaid residents (41%) was less than their proportionate presence in the nursing home (58%), and Medicare revenues (34%) exceeded Medicare's proportionate share of residents (20%).

For the first half of 1997, the statewide average Medicaid reimbursement rate was $93.16. The highest rate paid to any facility during this period was $141.76, and the lowest rate paid to any facility was $66.83. In contrast, in 1996, the average reported daily rate paid by private-pay residents was $126.87 for a semiprivate room, and the mean revenue per patient day from Medicare-funded residents was $371.82. Since Medicare patient care is reimbursed on a cost basis per patient, a Medicare reimbursement rate is not available. Medicare revenue per patient per day, while not equivalent to such a rate, may arguably serve as a reasonable proxy.

Risk of Conversion to Medicaid

The rate differentials outlined in the previous discussion are likely to make Medicaid residents less desirable than other patients in markets with excess demand. State and federal laws have long existed to protect people from being evicted when they convert to Medicaid. The exception to this statement are nursing homes that refuse to participate in the Medicaid program entirely or fail to obey the law. In Florida in 1997, approximately 11% of all facilities were not certified to accept Medicaid patients. Regulations state that residents can only be forced to leave under specific circumstances: when the facility cannot meet the resident's needs, when the resident is in danger, when the resident poses a threat to other residents, when the resident is well enough to leave the home, or when the resident has failed to pay for nursing home services. In addition, residents facing a discharge must be given a written notice 30 days in advance of the discharge, where the notice must contain information about how to file an appeal.

Thus, nursing homes have a long-term legally enforceable commitment to care for nursing home residents when they convert to Medicaid.

However, dumping of Medicaid residents, whose care is reimbursed at a relatively low rate, has been documented. For example, in 1998, Vencor Inc. attempted to dump Medicaid patients at a Florida nursing home, and, in other states, the chain was getting rid of Medicaid residents by withdrawing from the Medicaid program entirely (Peterson and Soteropoulos 1999). Clearly, Medicaid residents are perceived as less lucrative and part of this reputation is tied to relatively low Medicaid reimbursement rates.

Cross-Subsidization Versus Intertemporal Conversion Surcharge

The presence of the risk of conversion and inadequate Medicaid reimbursement rates means that the profit-maximizing nursing home charges a higher rate to self-paying residents to compensate the home for the expected future cost of residents who convert to Medicaid in some future period. In an intertemporal sense, self-pay residents pay a premium associated with the risk of conversion; if actuarially fair, the rate structure will fully reflect the expected cost to the nursing home of conversion to Medicaid. An intertemporal surcharge of this sort is not identical to the traditional definition of cross-subsidization among patients, where cross-subsidization imposes a burden on one group of payers to cover the expenses of another group of payers (Sloan and Becker 1984). While reductions in Medicaid payment rates will increase the risk to the nursing home of conversions and cause an increase in the surcharge paid by self-pay residents, the premium increase may be actuarially fair and economically efficient. In contrast, the static cross-subsidization story is inconsistent with economic theory. Under standard profit-maximization conditions, a firm that sells health care services to two groups of patients will not raise the price of care to one group of patients in response to a price cut from the second group of patients because doing so would drive profitable patients to other lower-priced nursing homes (Morrisey 1994).

Assuming a nursing home accepts only Medicaid and self-pay residents, a stay for an individual entering the home as self-pay may be divided into two time periods: the date of entry of a self-pay resident into the nursing home and the subsequent stay of that resident who may convert to Medicaid. When there is a positive probability of conversion ($0 < \rho \leq 1$), the optimal preconversion price to self-pay patients (P_P) is a negative function of the exogenously determined Medicaid reimbursement rate (P_{MD}). In period 1, nursing home residents enter the nursing home as self-pay patients, and revenue from self-pay patients is $X_P P_P$. In period 2, given the legally enforceable obligation not to dump Medicaid residents, expected revenues from individuals identified as self-pay in period 1 are

$$E(revenue_P) = \rho(P_{MD}X_P) + (1 - \rho)(P_P X_P). \quad (1)$$

Ignoring discounting, the profit-maximizing nursing home's objective function over both periods is

$$\max(\pi) = (\pi_1) + \rho(\pi_2) + (1 - \rho)(\pi_1), \quad (2)$$

where

$$\pi_1 = P_P X_P - C_P X_P \quad (3)$$

$$\pi_2 = P_{MD}X_P - C_{MD}X_P. \quad (4)$$

C_P and C_{MD} are average costs per patient for self-pay patients and Medicaid-funded patients, respectively. P_{MD} is exogenously determined and is assumed to be less than C_{MD}, making the regulated Medicaid rate unremunerative. The profit function, where $D(P_P)$ measures the extent of the firm's market power, is

$$\pi = (2 - \rho)(P_P - C_P)D(P_P) + \rho(P_{MD} - C_{MD})D(P_P). \tag{5}$$

The optimal price to self-pay residents upon admission, P_P^*, depends on $(P_{MD} - C_{MD})$, that is, the price depends on the degree to which the regulated reimbursement rate after conversion fails to cover the costs of care for these patients. Indeed,

$$\frac{dP_P}{d(P_{MD} - C_{MD})} = -\frac{\rho}{(2 - \rho)}. \tag{6}$$

The bigger the deficit, the higher the price charged to entering self-pay patients, that is, the higher the intertemporal conversion surcharge to self-pay residents.

Cross-Subsidization Resulting from Florida's CON Program

Nursing homes may subsidize Medicaid residents as a means of buying favors from regulators, such as CON approvals. Through the CON program, Florida has developed a mechanism that restricts the nursing home bed supply and ensures access for some Medicaid-eligible nursing home residents. Under Florida statute, the Agency for Health Care Administration (AHCA) is given the authority to impose a condition on a nursing home CON, requiring that a specified number or percentage of nursing home beds be set aside for exclusive use by Medicaid recipients. If a nursing home agrees to such a condition, the condition may act as an explicit contract with regulators, even if cross-subsidization is required. Given that ensuring access for Medicaid residents is one of the stated goals of the CON statutes in Florida, it is not surprising that CON conditions are commonly imposed. As of 1997, there were 364 nursing home CONs and 20 hospital skilled nursing unit CONs with conditions being monitored by AHCA. For reference, in 1997, there were 665 skilled nursing homes and 65 hospital skilled nursing units, which are made up of beds licensed for delivery of skilled nursing services. In a few cases, nursing homes have more than one CON condition. As discussed below, nursing homes may also establish an implicit contract with regulators, accepting a proportion of Medicaid patients in return for market power protections in the form of entry barriers to other operators or potential operators in the market.

There is a considerable amount of competition for CONs in Florida. An examination of CON application data reveals that only approximately 30% of all nursing home-related CONs were approved from 1986 to 1996. Thus, new homes may agree to accept Medicaid patients as leverage for proposed expansions and existing homes may agree to accept Medicaid residents in exchange for denials of competitors' CON applications.

CON regulation may create a barrier to entry that could limit both the number of firms in the market and eliminate the contestability of the market by potential firms (Nyman 1994). As Vogel (1983, p. 603) argues, apparently, "The monopoly power CON restrictions create is apparently far more valuable to those operators than [the expected value of] any new investment they might forgo." Such market power may allow for cross-subsidization in profit-maximizing firms by limiting competition in nursing home markets.

After the repeal of the federal CON program for nursing home beds in 1986, many states

were expected to eliminate CON programs. However, in 1994, 41 states still had a CON program for nursing homes and 5 additional states had a moratorium on new nursing home beds (Harrington et al. 1997a). Florida's program remains firmly intact. Campbell and Fournier (1993) examine the objectives of Florida's CON program for hospitals. The authors find that a hospital's indigent-care burden is an important consideration in the CON approval process; hospitals providing more indigent care are systematically rewarded by regulators. Fournier and Campbell (1997) also find, when controlling for the endogeneity of indigent care, that regulators in Florida systematically awarded licenses to hospitals providing greater amounts of care to the poor. While nursing homes do not provide indigent care, they do serve Medicaid patients, and they are regulated by the same division and section of AHCA that determines hospital CONs. Thus, Florida regulators may encourage cross-subsidization by granting valuable regulatory favors to nursing homes that provide unremunerative care to Medicaid residents, where the favors may be in the form of CON approvals for providing private-pay care or denials of CON applications to potential rivals or competitors in the market.

In theory, nursing homes that charge higher self-pay prices without also caring for a sufficient number of low-paying Medicaid residents are likely to see regulators increasing the supply of beds in the market, awarding CONs to nursing homes willing to set aside a proportion of beds for Medicaid patients. Other authors have shown that CONs have a negative effect on nursing home bed supply (Feder and Scanlon 1980; Harrington et al. 1997b). This appears to be the case in Florida, where the nursing home bed supply (30 beds per 1000 people over age 65) is one of the lowest in the country, creating the possibility of excess demand in Florida.

3. Hypotheses and Methods

Cost Function Estimation

The issue of cross-subsidization has been examined from the perspective of costs in the literature concerned with natural monopoly regulation. Like public utilities, nursing homes may be modeled as multiproduct firms, with outputs denominated in nursing home beds per payer type per day. Economists have formulated two tests for cross-subsidization: the average incremental cost test and the stand-alone test (Braeutigam 1989; Viscusi, Vernon, and Harrington 1992). According to the average incremental cost test, if the cost of jointly producing a quantity of Medicaid patient days (X_{MD}), of private-pay patient days (X_P), and of Medicare patient days (X_{MR}) is $C(X_{MD}, X_P, X_{MR})$, then the incremental cost of producing X_{MD} is the added cost of producing X_{MD} given that X_P of private-pay patient days and X_{MR} of Medicare patient days are already being produced. Expressed using the above notation, the incremental cost of producing X_{MD}, $IC(X_{MD})$, is as follows:

$$IC(X_{MD}) = C(X_{MD}, X_P, X_{MR}) - C(0, X_P, X_{MR}) \tag{7}$$

and the average incremental cost (AIC) of producing a Medicaid patient day is

$$AIC(X_{MD}) = IC(X_{MD})/X_{MD}. \tag{8}$$

Cross-subsidization exists if the price of X_{MD} is less than the average incremental cost of producing X_{MD}. The incremental cost test establishes a lower bound on the revenues that must be generated by production of Medicaid patient days to deem the production subsidy free. In

contrast, the stand-alone test sets an upper bound on the revenues generated by producing private-pay resident days; if the revenues generated by production of private-pay resident days exceed the costs of providing only private-pay resident days, then proceeds from production of the private-pay resident days are being used to subsidize the production of other goods. Mathematically,

$$C(X_P, 0, 0) \geq X_P P_P, \tag{9}$$

where $C(X_P, 0, 0)$ is the cost of producing only private-pay resident days, X_P is the number of private-pay resident days produced, and P_P is the daily rate paid by private-pay residents. In words, the costs of producing only private-pay patient days must be greater than or equal to the revenue from private-pay residents if private-pay residents are to avoid cross-subsidizing other resident types. If the revenue were greater than the cost, then investors would benefit from the existence of a new firm that only produces private-pay resident days.

For the cost function estimates, a multiproduct generalized translog cost function is used to avoid placing undue restrictions on the form of the production function. Authors using the translog form for nursing home and hospital cost function estimation include Conrad and Strauss (1983), Gertler and Waldman (1992), McKay (1989), and Vita (1990); Caves, Christensen, and Tretheway (1980) provide an excellent discussion of the properties of the translog cost function. The translog is based on the neoclassical cost function, where costs are a function of outputs and input prices. The use of the translog function, as opposed to functional forms such as Cobb–Douglas, reduces the restrictions placed on the structure of production. The generalized translog is used because it allows for zero levels of output. For the ordinary translog function, zero levels of outputs are a problem given that the natural logarithm of zero is undefined. The generalized translog solves this problem by applying a Box–Cox transformation to the output variables. The Box–Cox transformation of output Y is $(Y^{\lambda} - 1)/\lambda$, where λ is the Box–Cox parameter to be estimated. As λ approaches zero, the Box–Cox transformation closely approximates the natural logarithmic transformation.

The total costs of an individual nursing home are a function of outputs (measured by resident days), of relative input prices, and of a vector of control variables. The model contains three outputs: Medicaid patient days, Medicare patient days, and private-pay patient days, where private-pay patient days include days funded by other means. The choice of three outputs is driven by general differences across patients that cause them to qualify (or fail to qualify) for a specific type of reimbursement program. For example, Medicare coverage requires that the patient be hospitalized for at least three days prior to entering the nursing home, that the patient be admitted to the nursing home within 30 days of the hospital discharge, and that a medical doctor certify that skilled nursing is required. Thus, Medicare pays primarily for rehabilitative nursing home care. In contrast, Medicaid residents must meet certain asset and income tests, which may occur for a portion of residents after a long period of illness or institutionalization.

The model also contains four input prices: labor (including nursing services), property, patient care services (less nursing services), and other inputs. The relative prices of the first three inputs are measured by the following price indices: a hospital wage index for the metropolitan statistical area (MSA), a housing price index by county, and a general price index by county. Because of unavailability of data on the price of other inputs, the conventional assumption that these prices are uniform across the nursing homes in the sample is employed. Through this assumption, the price of other inputs serves as a numeraire in imposing the input homogeneity restrictions.

Table 1. Description of Cost Function Variables

Variable	Definition
Ln (total cost)	Logarithm of total nursing home costs per year
Outputs	
Private ($X1$)	Annual number of private-pay and other resident patient days
Medicaid ($X2$)	Annual number of Medicaid resident patient days
Medicare ($X3$)	Annual number of Medicare resident patient days
Input prices	
Wage index ($W1$)	Annual price index for hospital wages of MSA, a proxy for relative nursing home wages
Housing price index ($W2$)	Annual price index by county for housing
General price index ($W3$)	Annual composite price index by county
Fixed input	
Capital	The number of beds in the nursing home
Control variables	
Percent elderly	The proportion of the population in the county over age 65
Case mix	The Katz index of activities of daily living or the Thomas index, case-mix indices of health status
Herfindahl	The Herfindahl index, a measure of market concentration, based on resident days for all nursing homes within the county
Nonprofit	Binary variable equal to one if the hospital is nonprofit
Government owned	Binary variable equal to one if the hospital is government owned
Chain owned	Binary variable indicating whether the nursing home is part of a chain of nursing homes
Hospital based	Binary variable indicating whether the nursing home is hospital based
Beds per elderly	The number of beds per person age 65+ in the county, a measure of the restrictiveness of the market for nursing home beds, resulting from the Certificate-of-Need process
Quality	The number of deficiencies per patient day, the number of registered nurse hours per patient day, and/or the number of total nurse hours per patient day
Urban	Binary variable indicating whether the nursing home is in an MSA

A description of the variables used in the cost function estimates and descriptive statistics are presented in Tables 1 and 2, respectively. While many of the control variables are standard elements of nursing home cost function estimates, several warrant further explanation. A nursing home's costs are likely to be influenced by the disability level of the patient population (i.e., case mix) and the quality of care provided. For each nursing home, two average facility-level case-mix measures are constructed since patient-level data are not available. The first measure of case mix is constructed following Cohen and Spector (1996), who utilize a system designed by Bill Thoms, where case mix is expressed in minutes of staff time typically required for the care of residents based on their disability levels and care required.[1] The second measure of case

[1] Details regarding construction are available from the author upon request.

Table 2. Descriptive Statistics for Cost Function Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Total costs	$3,078,716	$1,625,158	$499,176	$18,133,960
Outputs				
Private pay days (*X*1)	9016	7104	0	49,847
Medicaid days (*X*2)	23,240	16,009	0	106,279
Medicare days (*X*3)	3814	2799	0	20,034
Percent private pay (*X*1)	27.18%	0.2006	0	1
Percent Medicaid (*X*2)	57.68%	0.2641	0	0.9814
Percent Medicare (*X*3)	15.13%	0.2166	0	1
Input price indices				
Wage index	92.2077	5.3977	79.27	105.3157
Housing price index	97.2047	12.3901	10.85	130.25
General price index	99.0778	4.9915	82.87	114.2611
Fixed input				
Capital (number of beds)	110.5447	31.1815	5	180
Control variables				
Percent elderly	19.54%	0.0712	0.08	0.357
Case mix (Katz)	4.4388	0.4098	2.1176	5.5000
Case mix (minutes)	147.0856	19.2704	58.5556	255.7928
Herfindahl	0.1221	0.1745	0.0165	1
For profit	82.02%	0.3540	0	1
Nonprofit	15.55%	0.3306	0	1
Chain owned	74.98%	0.3882	0	1
Hospital based	7.87%	0.2694	0	1
Quality (deficiencies)	0.0872	0.812	0.0043	0.8680
Quality (RNs per patient day)	0.1026	0.1354	0.0100	1.1154
Quality (all labor)	0.6622	0.2320	0.0200	2.4929
Beds per elderly	0.0342	0.0200	0.0128	0.2002
Urban	89.10%	0.3119	0	1
Number of observations	618			

mix, the Katz index of activities of daily living (ADL), is the most commonly used measure of the health status of an individual or nursing home population in nursing homes (Katz et al. 1963). Given the available data, a measure very similar to the Katz index is constructed. The slightly altered formulation involves summing the total number of residents needing either partial or total assistance in each of seven categories (bathing, dressing, going to the toilet, transferring, two categories involving continence, and feeding) and dividing the sum by the total number of residents in the home. The smaller the number, the more healthy the nursing home population.

To control for quality-driven differences in nursing home costs, three measures of quality are used: the number of cited inspection violations, that is, inspection deficiencies, per patient per day; the number of registered nursing hours per patient per day; and the total number of nursing hours per patient per day. Clearly, quality of health-related services is both difficult to define and difficult to measure. In the industrial organization literature, Leffler (1982) provides a general discussion of product quality and firm behavior. He defines quality as the amount of the unpriced attributes contained in each unit of the priced attribute, where higher quality involves a higher level of the unpriced attribute per unit. In the case of a nursing home, the priced attribute is resident days. In this analysis, the unpriced attributes are skilled nursing (registered nurse) contact hours, general nursing contact hours, or degree of compliance with state inspection-related guidelines. Thus, with respect to the first two measures, a higher quality nursing home is one that has more registered nurse hours per patient day or more total nurse hours per patient day. Turning to the last measure, a higher quality nursing home has fewer inspection violations per patient day. These measures have been used by other authors; Nyman (1985, 1989) uses violations of licensing laws as a proxy for quality, while Braun (1991), Davis (1991), Kooreman (1994), Monroe (1990), and Zinn (1994) use registered nursing hours as measures of quality.

The quality measures involving nurse hours capture two types of attributes associated with nursing care. First, all nurses have a degree of medical expertise, where more nurse hours per patient translates into more medical care per patient. Registered nurses clearly have more formal training than licensed vocational nurses and nurse aides. Thus, registered nurses should provide more of this attribute, medical expertise, per resident day than other nurses. Second, nurses provide human contact to residents, where more nurse hours per patient translates into more individualized attention for each resident.

In addition to quality and case mix, nursing home costs may be influenced by the proportion of elderly in the market population (percent elderly), market concentration (Herfindahl and interaction terms), ownership type (for-profit, nonprofit, or government owned), being part of a chain of nursing homes (chain owned), firm size (number of beds), location within a hospital (hospital based), location in an urban setting (urban), and a measure of the restrictiveness of CON policies in the market (beds per elderly). Given data limitations, the county is used as the market area, as is often done in the literature (Gertler 1985; Nyman 1989; Ettner 1993; Zinn 1994; Gulley and Santerre 1997). The argument for use of the county as a measure of the market area is supported by the Day (1972) study of Delaware nursing homes, where Day found that five out of six nursing home residents were housed in facilities less than 25 miles from their community home. Likewise, using New York State's 1980 survey of long-term care facilities, Gertler (1989) found that 75% of patients residing in nursing facilities had previously lived in the same county. However, given that county sizes vary across states, it is not clear that these results apply to Florida.

While most of the variables have been used in other studies of nursing home costs, the measure of CON policy is rather unique. Under a more restrictive CON policy, few beds per individual age 65 and over in a market may result in higher costs if firms are less competitive. One may argue that this measure may not be appropriate in some rural, low-income counties with few beds per elderly capita because the low number of beds may be a result of market conditions and not of CON policy. Two pieces of evidence tend to negate this claim: The correlation between the CON application approval rate for the county and a binary variable for being in an urban area is 0.0863, implying that there is a positive relationship between being in a metropolitan statistical area (MSA) and the CON approval rate; and the correlation between the CON approval rate and per capita income in the county is 0.06616, implying that there is a positive relationship between the CON approval rate and per capita income.

The right-hand side variables in the cost-function specification, with the exception of the binary variables, are mean scaled to help reduce problems of multicollinearity. Mean scaling, which involves normalizing the right-hand side variables by dividing each observation's value by the sample mean prior to the log and Box–Cox transformations, reduces the size of the original variable and of the log of the original variable. As a result of the reduction, the slope of the log function is steeper at lower values. (See Fournier and Mitchell 1992 and Vita 1990 for other examples of the utilization of this technique.)

Thus, the cost function is as follows:

$$\ln C = \alpha_0 + \sum_i \alpha_i[(Y_i^{\wedge} - 1)/\lambda] + 1/2 \sum_i \sum_j \delta_{ij}[(Y_i^{\wedge} - 1)/\lambda][(Y_j^{\wedge} - 1)/\lambda] + \sum_k \beta_k \ln W_k$$

$$+ 1/2 \sum_k \sum_l \gamma_{kl} \ln W_k \ln W_l + \sum_k \sum_l \rho_{ik}[(Y_i^{\wedge} - 1)/\lambda] \ln W_k + \phi \ln K + \epsilon,$$

where Y_i is the output indexed by $i = 1, 2, 3$, W_k is the input price index indexed by $k = 1, 2, 3$, and K is the number of beds in the nursing home, a measure of fixed inputs.

Given linear homogeneity and other restrictions, as in previous research (Conrad and Strauss 1983; McKay 1989; Gertler and Waldman 1992; Vita 1990), the model is estimated along with the factor share equations using nonlinear seemingly unrelated regressions.

In order to conduct the cost analysis and examine the issue of an intertemporal conversion surcharge, data on nursing home residents, nursing home financial data, and Medicaid nursing home reimbursement data were obtained from Florida's AHCA. In addition, two types of nursing home inspection data, Provider of Services and Online Survey Certification and Reporting (OSCAR) System data, were provided by the Health Care Financing Administration. The data period 1994–1996 was selected based on availability and a three-year average of all relevant variables used to smooth out reporting error. All variables expressed in dollar terms have been deflated using the Consumer Price Index.[2]

Inferences from the Model

First, the parameter estimates from the cost function can be used to estimate predicted values for average incremental costs for each facility in the sample. From these predicted values

[2] Notably, when conducting empirical estimates using the nonaveraged data, the signs of the coefficients are largely the same but are often not significant, perhaps due to noise in the data. Estimates of the cost functions by year, using nonaveraged data, are available from the author upon request. In addition, a more detailed description of the data is available from the author upon request.

and the facility data on payment rates, tests for cross-subsidization can be performed. In addition, differences in the costliness of different payer types can be explored.

Second, for facilities that are identified as cross-subsidizing Medicaid patients, the further possibility of intertemporal surcharges for conversion can be explored as an alternative explanation for the cross-subsidization result. This test requires an examination of the expected discounted value of future net revenues for different payer types in the identified facilities in light of frequency and duration data for payer conversion.

4. Empirical Estimates

Cost-Based Tests for Cross-Subsidization

As discussed above, the issue of cross-subsidization may be examined from the perspective of costs using the average incremental cost test and the stand-alone test. To test for subsidization of Medicaid residents by residents funded through other means and to test for the ability of self-pay residents to subsidize such care, a joint-production cost function, $C(X_{MD}, X_P, X_{MR})$, is estimated. The cost function may be evaluated at zero production of Medicaid patients to find $C(0, X_P, X_{MR})$ or at zero production of Medicaid and Medicare patients to find $C(0, X_P, 0)$.

While eight cost-function specifications were specified to allow for estimates using two measures of case mix and combinations of three measures of quality, the direction and magnitude of the relationships are consistent across measures of case mix and quality. Thus, only three specifications are reported in Table 3, where each specification involves different measures of quality: Column 1 includes only inspection deficiencies, column 2 includes inspection deficiencies and registered nurse hours per patient day, and column 3 includes inspection deficiencies and all nurse labor hours per patient day.

The cost-function estimates, found in Table 3, produce, at the mean values of the explanatory variables, predicted total cost estimates of approximately $2.5 million; these compare favorably with the sample mean of the total cost variable, which is $2.7 million. The use of three outputs, as opposed to one or two outputs, is supported by F-tests, which provide empirical support for separating nursing home residents into three groups.[3] All of the coefficients on the output variables are positive, the coefficients on the input price indices are positive, and the control variables have economically intuitive signs. For example, an increase in the case-mix variable, that is, a decrease in the health of the patient population in a nursing home, leads to an increase in costs.

Moreover, nonprofit and government-owned nursing homes have higher costs than for-profit homes, where the costs are higher for government-owned than nonprofit facilities. However, the costs of for-profit and nonprofit homes may be fundamentally different. When evaluated at the sample means, nonprofit firms are predicted to have costs that are 29.9% higher than for-profit firms. However, 21.4% of the 29.9% differential may be explained by differences in the measured characteristics of nonprofit and for-profit facilities. In other words, most of the cost

[3] In the case where all nursing home resident days were grouped into one output measure, the F-test statistic is 61.049, with three restrictions and (618 − 42) = 573 d.f., yielding a p-value of less than 0.0001. When private-pay and Medicaid resident days are grouped together, the test statistic is 137.834, with two restrictions and (618 − 42) = 573 d.f., yielding a p-value of less than 0.0001.

Table 3. Cost Function Estimates

Variable	Quality = Inspection Violations (Column 1)	Quality = RNs (Column 2)	Quality = Inspection Violations and All Labor (Column 3)
Constant	14.73812[a]	14.71028[a]	14.62868[a]
	(180.04)	(180.36)	(177.27)
Private pay ($X1$)	0.13447[a]	0.13357[a]	0.13809[a]
	(8.34)	(8.35)	(8.74)
Medicaid ($X2$)	0.23147[a]	0.23794[a]	0.25474[a]
	(8.12)	(8.40)	(9.06)
Medicare ($X3$)	0.31656[a]	0.31264[a]	0.30998[a]
	(20.41)	(20.25)	(20.35)
(Private pay)(private pay)	0.04414[a]	0.04351[a]	0.04477[a]
	(5.60)	(5.66)	(6.02)
(Medicaid)(Medicaid)	0.04027[a]	0.03928[a]	0.04262[a]
	(5.36)	(5.32)	(5.98)
(Medicare)(Medicare)	0.05535[a]	0.05649[a]	0.05392[a]
	(8.23)	(8.61)	(8.55)
(Private pay)(Medicaid)	−0.02927[a]	−0.03508[a]	−0.03401[a]
	(3.29)	(4.59)	(4.71)
(Private pay)(Medicaid)	−0.07246[a]	−0.07706[a]	−0.07459[a]
	(6.68)	(7.15)	(7.14)
(Medicaid)(Medicare)	−0.10034[a]	−0.10001[a]	−0.09748[a]
	(9.11)	(9.23)	(9.20)
Wage index	0.45749[a]	0.45749[a]	0.45749[a]
	(187.18)	(187.21)	(187.07)
Housing price index	0.13127[a]	0.13130[a]	0.13136[a]
	(55.67)	(55.74)	(55.79)
General price index	0.12303[a]	0.12304[a]	0.12306[a]
	(121.30)	(122.43)	(122.79)
(Wage)(wage)	0.03611	0.03878	0.03504
	(0.83)	(0.90)	(0.81)

Table 3. Continued

Variable	Quality = Inspection Violations (Column 1)	Quality = RNs (Column 2)	Quality = Inspection Violations and All Labor (Column 3)
(Wage)(housing price)	0.00054	−0.00120	0.00025
	(0.03)	(0.07)	(0.01)
(Wage)(general price)	−0.05234[a]	−0.05225[a]	−0.05222[a]
	(2.15)	(2.16)	(2.18)
(Housing price)(housing price)	−0.01124	−0.00952	−0.01063
	(0.75)	(0.64)	(0.71)
(Housing price)(general price)	−0.01316	−0.01347	−0.01326
	(1.59)	(1.64)	(1.63)
(General price)(general price)	0.06057[a]	0.05964[a]	0.06130[a]
	(1.90)	(1.88)	(1.95)
(Private pay)(wage)	−0.01272[a]	−0.01267[a]	−0.01256[a]
	(4.69)	(4.69)	(4.67)
(Private pay)(housing price)	0.00530[a]	0.00526[a]	0.00517[a]
	(2.05)	(2.04)	(2.02)
(Private pay)(general price)	0.01076[a]	0.01071[a]	0.01055[a]
	(8.86)	(8.93)	(8.87)
(Medicaid)(wage)	0.00069	0.00070	0.00072
	(0.31)	(0.32)	(0.33)
(Medicaid)(housing price)	0.01072[a]	0.01065[a]	0.01049[a]
	(4.89)	(4.91)	(4.89)
Medicaid)(general price)	0.00929[a]	0.00920[a]	0.00908[a]
	(9.09)	(9.16)	(9.17)
(Medicare)(wage)	0.01993[a]	0.01983[a]	0.01969[a]
	(6.67)	(6.66)	(6.65)
(Medicare)(housing price)	0.00085	0.00091	0.00099
	(0.30)	(0.32)	(0.35)
(Medicare)(general price)	−0.02013[a]	−0.02004[a]	−0.01986[a]
	(15.22)	(15.35)	(15.33)

Table 3. Continued

Variable	Quality = Inspection Violations (Column 1)	Quality = RNs (Column 2)	Quality = Inspection Violations and All Labor (Column 3)
Percent elderly	−0.02950	−0.02417	−0.02022
	(0.60)	(0.50)	(0.42)
Case mix (Katz)	0.13747[a]	0.13388[a]	0.12063[a]
	(2.43)	(2.39)	(2.19)
Herfindahl	−0.00922	−0.00117	−0.00548
	(0.56)	(0.07)	(0.34)
% Elderly × Herfindahl	0.00309	−0.00660	−0.00337
	(0.19)	(0.41)	(0.22)
Case mix × Herfindahl	0.01130	0.01702	0.01257
	(0.27)	(0.42)	(0.31)
Government owned	0.34717[a]	0.33191[a]	0.31785[a]
	(7.13)	(6.82)	(6.62)
Nonprofit	0.08426[a]	0.08568[a]	0.07949[a]
	(3.66)	(3.75)	(3.53)
Chain owned	−0.02990	−0.02684	−0.02051
	(1.51)	(1.37)	(1.06)
Number of beds	0.01816	0.02518	0.03275[a]
	(0.97)	(1.34)	(1.75)
Hospital based	−0.00224	−0.01020	−0.01038
	(0.06)	(0.26)	(0.27)
Quality (deficiencies)	−0.01661[a]	−0.01906[a]	−0.02044[a]
	(2.29)	(2.63)	(2.87)
Quality (RNs per patient day)		0.02744[a]	
		(3.31)	
Quality (all labor)			0.12240[a]
			(5.31)
Beds per elderly	−0.00453	−0.00329	−0.00333
	(0.55)	(0.40)	(0.41)

Table 3. Continued

Variable	Quality = Inspection Violations (Column 1)	Quality = RNs (Column 2)	Quality = Inspection Violations and All Labor (Column 3)
Urban	−0.01600	−0.01159	−0.00881
	(0.55)	(0.34)	(0.26)
Predicted total cost	$2,531,806	$2,530,835	$2,529,880
Number of observations	618	618	618
Mean AIC of Medicaid	$24.49	$20.47	$23.92
% With cross-subsidization–average incremental cost	34%	34%	45%
% With cross-subsidization—stand alone	17%	18%	15%

[a] Significant at at least the 5% level. *t*-Statistics are contained in parentheses.

difference between for-profit and nonprofit entities may be explained by differences in size, patient populations, and levels of service. In terms of quality, an increase in the number of inspection-related deficiencies per patient is associated with lower costs and an increase in the number of nurse hours per patient is associated with higher costs. In other words, higher quality implies higher costs.

Mean scaling also allows for ease in interpretation of some of the coefficients. For example, the coefficient for each output represents the elasticity of that output with respect to costs at the sample mean value of the variable. As expected, the production of private-pay patient days is more sensitive to changes in costs than the production of Medicaid and Medicare days. This is due to the fact that changes in factor costs can most easily be passed along to Medicare and Medicaid residents, who do not pay out of pocket for nursing home care.

Given the estimates, the average incremental cost per day of a Medicaid patient in a nursing home with mean characteristics (1996 dollars) is \$29.39 to \$67.66, where the range is a result of considering each of the eight cost functions specified. Using the first specification in Table 3, the estimated average incremental cost per Medicaid patient day for individual facilities ranges from approximately \$10 to \$345. Controlling for facility-level case mix and quality and using the first specification in Table 3, the estimated marginal cost of Medicaid care for a home with average characteristics is \$45.48. In contrast, the estimated marginal cost of private care is \$56.95. The difference between these values is statistically significant, with a t-test statistic equal to 8.654. Thus, at the margin, Medicaid residents are less costly than private-pay residents, which explains some of the observed differences in daily rates among payer types.

When examining the predicted *AIC* for each facility, it is apparent that, in approximately one third to one half of nursing homes, the facility's Medicaid reimbursement rate is less than the average incremental cost of providing nursing home care to Medicaid patients. An alternative method of obtaining the *AIC* is to estimate the cost function using a smaller sample of nursing homes with no Medicaid residents. Using the coefficient estimates from the no-Medicaid sample and mean values for the right-hand-side variables from the entire sample, 29–30% of all nursing homes were found to be cross-subsidizers. To take advantage of the full sample, the subsequent analysis involves estimates using all nursing homes in the sample.

Correspondingly, approximately 17% of all firms fail the stand-alone test conducted for self-pay residents. In other words, nearly 17% of nursing homes obtain more revenue from self-pay residents than it costs them to produce only private-pay resident days. Thus, private-pay customers of these firms would be better off if they left the home and formed their own nursing home catering to only self-pay residents, as the newly created entity would have a daily rate that is less than what they are currently paying. While the predicted value of average incremental costs and stand-alone costs are point estimates subject to statistical error, they are suggestive of the true cost levels in the industry. Thus, there is evidence that cross-subsidization of Medicaid patients is taking place in some skilled nursing facilities, where private-pay residents in some facilities appear to be in a position to subsidize such care.[4]

[4] While the cost function estimates reveal that some facilities are cross-subsidizing care to Medicaid residents, for some nursing homes that are identified as cross-subsidizers, the average incremental cost of care for self-pay residents is also greater than the self-pay price. In his paper, Vita (1990) discusses the properties of flexible form functions like the translog cost function. Flexibility is a local property, which implies that flexible forms may perform poorly for data points located far from the approximation point, which, by convention, is usually the sample mean. As shown in Equations 7 and 8, the incremental cost estimate for Medicaid residents requires that the function be estimated at zero

Table 4. Facilities That Model Predicts to Be Cross-Subsidizers Versus Non–Cross-Subsidizers

Variable	Mean	
	Cross-Subsidizers	Non–Cross-Subsidizers
Total costs	$3,398,67	$2,307,624
Quality (deficiencies)	0.05963	0.08141
Quality (RNs per patient day)	0.07309	0.06619
Case mix (Thoms)	154.29017	141.53258
Case mix (Katz)	4.64554	4.38620
For profit	93.02%	77.08%
Nonprofit	6.98%	18.75%
Herfindahl	0.05739	0.14703
Chain owned	80.41%	70.83%
Beds per elderly	0.02816	0.03987
Urban	97.67%	83.33%
Self-pay daily rate	$88.06	$69.23
Hospital based	4.12%	0.00%
Number of observations	138	408

Given that the model gives some questionable forecasts of *AIC* for self-pay residents in some nursing homes when using the full sample of nursing homes, apparent cross-subsidizing nursing homes for which the private-pay price is less than the average incremental cost of care for self-pay patients are identified and excluded from the cross-subsidizer sample. These nursing homes comprise approximately one third of the sample of the nursing homes found to be cross-subsidizers. As was noted by an anonymous referee, these may be failing firms. In 2000, 16.9% of all Florida nursing homes were in bankruptcy (Childs 2000). When the remaining identified cross-subsidizers using the *AIC* test are considered, the proportion of nursing homes identified as cross-subsidizers drops to between 22 and 33% of all nursing homes.[5]

Given that some nursing homes have been identified as cross-subsidizers using the *AIC* test, one might wish to develop a profile of such homes. An examination of the mean characteristics of homes that appear to cross-subsidize is contained in Table 4.[6] Cross-subsidizing nursing homes have higher annual total costs than homes that do not cross-subsidize. In addition, cross-subsidizing homes have higher private-pay daily rates, are more likely to be located in urban areas, and are more likely to be for-profit and chain owned. They are also more likely to be located in markets with fewer beds per elderly capita, that is, cross-subsidizing homes are more likely to be in markets in which the bed supply is restricted by CON regulators. On average, nursing homes identified as cross-subsidizers are in markets with 28 beds per 1000 elderly capita, compared with 40 beds per 1000 elderly for nonsubsidizers. Thus, there is some evidence that nursing home owners subsidize care to Medicaid residents in exchange for regulatory favors.

level of output for Medicaid residents only. In contrast, as shown in Equation 9, the stand-alone cost estimate requires that the function be estimated at zero level of output for Medicaid and Medicare residents. Thus, the *AIC* test is used to identify cross-subsidizing firms.

[5] The identity of cross-subsiders depends jointly on point estimates of *AIC* from the model. To check the robustness of these *AIC* estimates, the model was bootstrapped, using 100 random samples with replacement from the full sample, and from each one, an estimate of *AIC* was obtained. In sum, the results are robust to modifications in the criteria used to identify cross-subsidizing firms. These results are available from the author upon request.

[6] The results are presented for the homes identified using the first specification in Table 3, but the results are consistent when using the other seven specifications to establish the group of cross-subsidizers.

Existence of an Intertemporal Conversion Surcharge

The finding of cross-subsidization using the static cost function estimates may not represent cross-subsidization across residents in nursing homes because it fails to address the potential for transitions to different payer types over the length of stay. Nursing home residents not entering the nursing home on Medicaid may undergo the following transitions: enter on Medicare and exit on Medicare; enter on Medicare and convert to Medicaid before exit; enter on Medicare and convert to self-pay before exit; enter on Medicare, convert to self-pay, and convert to Medicaid before exit; enter as self-pay and exit as self-pay; and enter as self-pay and convert to Medicaid before exit. The monetary impact of the risk of transition can be examined for a sample of nursing home resident stays (144,654) in nursing homes identified as cross-subsidizers.

As shown in Table 5, 42.58% of residents that enter a cross-subsidizing nursing home on Medicare exit the nursing home within 20 days of admission. This is not surprising given that Medicare will only pay fully for the first 20 days of rehabilitative care following a three-day hospitalization. Therefore, individuals who might choose to take advantage of skilled nursing services during the period in which they are fully covered may not choose to remain in the nursing home when a fairly substantial copayment is required. In addition, only about 6% of individuals who enter a cross-subsidizing nursing home on Medicare ever convert to Medicaid. A similar proportion of self-pay residents eventually convert to Medicaid during their stay.

The present value estimates of net revenue may be calculated for each transition group. While most nursing home stays are of modest duration, some individuals do have lengthy stays. Thus, a conservative annual interest rate of 2% is used in the present value estimates.[7] In addition, data on the length of time that it takes for patients that begin on Medicare to transition to self-pay are not available. Three alternative estimates of the duration of this transition period were used in the calculations: 20, 50, and 100 days. The results reveal that the use of different cutoffs affect only the magnitude, not the sign, of the present value estimates, so only the estimates assuming the conservative 20-day cutoff are contained in Table 5.

In each case for each transition type, the present value of a resident's payment stream over the nursing home stay may be calculated given the average time spent in each payer category, the nursing home-specific reimbursement rate for each payer type, the nursing home-specific average incremental cost estimate for each payer type, and the interest rate. For the sake of this analysis, the self-pay reimbursement rate and estimated self-pay average incremental cost are used to calculate the net revenue per day for the Medicare portion of the nursing home stay.

In all three cases where the individual transitions to Medicaid during the nursing home stay, the average present value of the stream of payments is negative. Thus, in general, Medicaid-funded residents are not completely subsidizing their own costs of care through higher payment levels in the early days of the nursing home stay. However, the nursing home does appear to be adjusting the self-pay rate to account for the probability of transition, as evidenced by a positive present value for the net revenue stream for individuals who enter on Medicare or enter as self-pay. Indeed, less than 5% of all cross-subsidizing nursing homes have predicted net negative returns for patients who enter the nursing home on Medicare or as self-pay.

To gain insight into the magnitude of the surcharge, one can examine the predicted net revenue and net losses from all patients entering the nursing home as self-pay or Medicare

[7] The estimates do not change significantly when discounting is not considered and when a larger interest rate is used.

Table 5. Present Value of Net Revenue and Transition Probabilities

Enter Nursing Home on Medicare (20-Day Transition)			Enter Nursing Home as Self-Pay		
Transition Type	Mean *P*(Transition Type | Enter Medicare)	Mean Present Value of Net Revenue Stream	Transition Type	Mean P(Transition Type | Enter Self-Pay)	Mean Present Value of Net Revenue Stream
Medicare only	42.58%	$121.72	Self-pay only	94.49%	$3277.12
Medicare to Medicaid	1.22%	−$134.88	Self-pay to Medicaid	5.51%	−$395.47
Medicare to self-pay	51.42%	$1399.99			
Medicare to self-pay to Medicaid	4.78%	−$438.04			
Predicted PV of enter as Medicare		$772.07	Predicted PV of enter as self-pay		$3073.25

funded. If the surcharge is actuarially fair, the net revenue from the self-pay portion of a representative patient's stay should approximate the net loss from the Medicaid portion of the stay. As Table 6 shows, the predicted net revenue per patient for patients entering the nursing home as self-pay or Medicare residents is approximately $320, where the self-pay portion of the stay provides $1818 in net revenue and the Medicaid portion of the stay provides a net loss of $1498.[8]

In sum, nursing homes do serve some residents who convert to Medicaid and provide negative net revenues to the firm. Moreover, even though the nursing home is unable to identify these individuals at the outset, they are able to compensate for net losses from these payers through net revenues from those that do not convert to Medicaid. The finding that residents who convert to Medicaid are probabilistically net losers for the cross-subsidizing nursing home supports the idea of cross-subsidization among some residents, but that finding may be explained in large part by an intertemporal surcharge paid by all self-pay residents in the home to address the risk of conversion. Indeed, for a representative patient entering the nursing home as self-pay or Medicare funded, approximately 82% of the net revenue from the self-pay portion of a nursing home stay represents increased payments to offset the risk of conversion to Medicaid in nursing homes identified as cross-subsidizers.

5. Conclusion

While some of the differences in payer daily rates may be explained by differences in the marginal cost of caring for self-pay and Medicaid patients, the incremental cost tests using cross-sectional data reveal that approximately one quarter to one third of Florida's nursing homes are subsidizing Medicaid residents. However, the conclusion of substantial cross-subsidization is somewhat misleading. When examining the subset of nursing homes identified using the average incremental cost tests, it is evident that those that convert to Medicaid probabilistically result in net losses for the average cross-subsidizing nursing home. In contrast, residents that enter the nursing home as self-pay or on Medicare are probabilistically net winners for cross-subsidizing nursing homes. Examination of the predicted net revenues for all patients entering the nursing home as self-pay or Medicare funded reveals that most nursing homes are compensating for the risk to the nursing home of conversions by charging a surcharge to all self-pay residents.

While the results reveal that cross-subsidization is not nearly as widespread as Florida nursing home owners claim, there is some evidence of cross-subsidization in the industry. Cross-subsidization is undesirable for several reasons. First, charging higher rates to private-pay residents may encourage middle-income people to shelter assets or hasten the transition of middle-income private-pay residents to Medicaid payer status. (See Norton (1995) and Taylor, Sloan, and Norton (1999) for more on the spend-down phenomenon.) The price distortions created by cross-subsidization may change the patterns of consumption in welfare-reducing ways, where

[8] Given the negligible effect of discounting on the results contained in Table 5, discounting is not used in the calculation of the values in Table 6. The number of identified cross-subsidizers depends to some degree on the specification. All of the results presented after the cost functions are reported use the first specification in column 1 of Table 3. Using the cost function specification that yielded the most cross-subsidizers (47% of all homes minus the ones for which the self-pay price is less than the *AIC* for self-pay residents), the transitions were reconsidered. There are small differences in the predicted revenue amounts, but the conclusions remain the same.

Table 6. Predicted Net Revenue and Net Losses from Patients Entering the Nursing Home as Self-Pay or Medicare

Transition Type	Mean Probability of Transition Type	Average Net Revenue Per Patient Day	Average Length of Stay as Payer Type	Net Revenue for Each Segment of Stay	Expected Net Revenue for Self-Pay Part of Stay	Expected Net Revenue for Medicaid Part of Stay
Medicare only	25.87%					
Medicare to Medicaid	0.74%					
Medicaid portion of stay		−$53.22	461.2	−$24,544.31		−$181.79
Medicare to self-pay	31.25%					
Self-pay portion of stay		$26.40	13.5	$355.29	$111.02	
Medicare to self-pay to Medicaid	2.91%					
Self-pay portion of stay		$26.40	88.8	$2343.38	$68.12	
Medicaid portion of stay		−$53.22	436.1	−$23,211.60		−$674.73
Self-pay only	37.07%					
Self-pay portio of stay		$26.40	147.9	$3905.77	$1447.97	
Self-pay to Medicaid	2.16%					
Self-pay portion of stay		$26.40	334.7	$8838.41	$191.03	
Medicaid portio of stay		−$53.22	557.6	−$29,674.25		−$641.36
Total	100.00%					
Predicted net revenue from Medicaid and self-pay parts of stay					$1818.14	−$1497.88

Medicaid patients face reduced access to nursing home care and self-pay residents pay more for care than they would in the absence of low Medicaid reimbursement rates.

The finding of cross-subsidization in some Florida nursing homes is of particular relevance given recent changes in the Medicare program. The shift to prospective payment for Medicare-funded nursing home care will inevitably decrease the payment rates for Medicare residents. Indeed, the legislation implementing prospective payment was projected to reduce Medicare reimbursements for nursing homes by about nearly $16 billion over five years (Giacalone 2001). In addition, there have been a number of high-profile bankruptcies in the industry in recent years. Nursing homes, which have been shown to cross-subsidize (or impose an intertemporal conversion surcharge) under less financially restrictive conditions, may increase such behavior or decrease quality levels. Both potential implications have been the focus of public concern in recent years, and the study findings reveal that nursing homes were already engaged, to some degree, in these activities in 1996, before prospective payment for Medicare.

The shift of the Medicare program from cost-based to prospective payment for nursing home care may not bode well for self-pay nursing home residents if the federal government moves too far in the direction of restricting reimbursement rates. Currently, the burden of payment for Medicaid patients in nursing homes where the state underpays falls on the shoulders of all self-pay residents. While for many nursing homes the price to self-pay residents may be actuarially fair, it reflects a risk that would not be present if the Medicaid program raised reimbursement rates. Thus, this study provides a snapshot of the effect of low Medicaid reimbursement rates when coupled with a vigorous CON program before the change to prospective payment for Medicare-funded nursing home care.

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