Appendix

Appendix A. Related literature

The comparative advantages of government and private ownership draw upon a venerable tradition in economics (Vickers and Yarrow 1988). Laffont and Tirole (1993) list several of economic theory's 'conventional wisdoms' about government ownership: government-controlled firms can take broad social welfare as their goal, and may benefit from centralized control, yet also suffer from several disadvantages. The latter include absence of capital market monitoring; soft budget constraints (Kornai 1986; Kornai, Maskin, and Roland 2003); expropriation of investments; lack of precise objectives; as well as lobbying, patronage, and politicized resource allocation (e.g. Shleifer and Vishny 1993).[14] For a discussion from the perspective of transition from central planning to market-based economies, see for example Megginson and Netter (2001) and Estrin et al. (2009).

This paper draws primarily from one conceptual framework, incomplete contract theory or the property rights theory of ownership. In this framework, ownership structure matters only if contracts are incomplete (Grossman and Hart 1986) — that is, when the purchaser "cannot fully anticipate, describe, stipulate, regulate and enforce exactly what it wants" (Shleifer 1998, p. 137). HSV97 contrast government ownership with private for-profit ownership when contracts are incomplete. See Appendix B for a summary of HSV97 assumptions and main results.

According to HSV97, since private for-profit providers have well-defined control rights, they have strong incentive to invest in innovations, but may over-emphasize cost control at the expense of noncontractible quality. By contrast, a government-owned provider lacks clear control rights to implement changes, and this constraint softens incentives for innovations. The HSV97 model predicts that private owners achieve lower costs, but quality may be higher or lower.[15] Many other theories (e.g., soft budget constraints, politicized resource allocation) also predict that private for-profit providers will generally achieve lower costs for a given service than their government counterparts.

Our primary theoretical contribution is to develop a simple model of nonprofits to extend the HSV97 framework as well as to relax the assumption of efficient renegotiation. Indeed, Hart (2008) noted that "it may be interesting to revisit [HSV97] analysis, and the issue of outsourcing more generally, using an ex post inefficiency model of the type described here" (p.410).

HSV97 applied their model to prison privatization; follow-on empirical research has corroborated the theoretical predictions (Mukherjee 2021). The trade-offs highlighted in HSV97 have been applied to understanding the economics of the make-or-buy decision in settings

[14] Shleifer (1998) suggests that the sea-change in attitudes toward government ownership over the second half of the 20th century, among economists and policymakers worldwide, stems from the convergence of four factors: a realization that contracting and regulation can achieve social goals, without necessitating government ownership; competition is seen to be more effective (e.g., compared to the Great Depression era); politicization problems of government ownership seem now more evident; and emphasis on innovation brings the alacrity of private entrepreneurship to the fore.

[15] Sloan (2000) suggests HSV97 may also explain differences between nonprofit and for-profit hospitals; Eggleston (2008) links the weak incentives of government employees to soft budget constraints.

ranging from the US dredging industry (Barkley 2021), to subsidized food delivery in Indonesia (Banerjee et al. 2019), to occupational health services in Finland (Kankaanpää, Linnosmaa and Valtonen 2011), among others.

The motivating example and the empirical application here is provision of health services, from pharmaceuticals to hospitals to nursing homes to population health services. Mixed ownership prevails among many Asian and European health sectors, with typically a larger share of government control than in the US, especially in medical care. Nevertheless, on average more than one in five hospitals in the EU are privately owned, and most of the medical care in South Korea is delivered privately; while private nursing homes serve the majority of frail elderly in a variety of economies, even in ones where government provision dominates for medical care. Some countries prohibit for-profit firms from owning hospitals, while many do not; and even when corporations are proscribed, physician ownership is often allowed, perhaps because regulators assume that professional ethics will constrain quality shaving.[16]

We contribute to the health economics literature on purchasing (Chalkley and Malcomson 2000) and mixed ownership markets, building upon previous models of not-for-profits diverging from pure profit maximization (Newhouse 1970, Pauly and Redisch 1973, Weisbrod 1975, Hansmann 1980, Frank and Salkever 1991, Glaeser and Shleifer 2001).

The theoretical trade-offs highlighted in the present model are illustrated with detailed micro data on ownership form of health service delivery and utilization across high-, middle- and low-income settings, drawing on a range of administrative and survey data sources from the OECD and Demographic and Health Surveys (DHS). Although there is an extensive literature on public and private roles in the health sectors of low- and middle-income countries (e.g., Kremer and Glennerster 2011, Barros and Siciliani 2011, Basu et al. 2012, Ashraf et al. 2014, Das and Do 2023), systematic data on service delivery by ownership form is extremely limited. I extract relevant data from DHS Round VII, roughly spanning 2015 to 2020, building on the analyses of Grépin (2016) as described in Appendix D. From nursing home beds across US commuting zones, to hospital beds across provinces of China and states of India, to outpatient visits by household wealth decile in the low-income countries included in the DHS, nonprofit, proprietary, and government market shares reveal complex patterns consistent with the theoretical predictions of the relative benefits and costs of each ownership form across services of differential contractability.

The "make or buy" question examined here differs from coordinating across firm boundaries regardless of ownership (Agha et al. 2023); it is related to, but distinct from, models of competition across ownership forms (Besley and Malcomson 2018), sometimes under fee-for-service payment in particular leading to a "medical arms race" (Gaynor, Ho and Town 2015). Organizational form is also related to several other aspects of the institutional and market

[16] See for example Healy and McKee 2002; Hensher, Martin, and Edwards 2002; Jakab, Preker and Harding 2002; and the summaries of health systems in transition from the European Observatory and Asia-Pacific Observatory on Health Systems and Policies at https://eurohealthobservatory.who.int/ and https://apo.who.int/.

environment covered extensively in the health economics and related literatures, such as public-private partnerships (e.g., Hart 2003, Iossa and Martimort 2015) or whether public transfers should be in cash or in-kind (Currie and Gahvari 2008). A detailed review of public and private provision of health insurance is related but outside the scope of the empirical evidence assembled here; see Cutler and Zeckhauser (2000) and Barros and Siciliani (2011) for related discussion.

Appendix B. HSV97 assumptions and main results

This section summarizes the main model assumptions and first-order conditions of Hart, Shleifer and Vishny (1997); the paper extends and compares these results to a third ownership form (not-for-profit private, N), ex post frictions, and a supply-assurance model of access.

Adding our model of N to HSV97, let the facility manager M be one of 3 types: Private for-profit F, private not-for-profit N, or government employee/public manager G: $M \in \{G, F, N\}$. In the case of contracting out to a private owner, F or N own the facility. For in-house government delivery, G is a government employee and the government purchaser owns the facility.

Note that our notation differs slightly from HSV97 of necessity, since F naturally denotes a for-profit manager (rather than "facility" in HSV97), and θ is reserved for the psychic costs of aggrievement (following HM08).

The Date 0 contract specifies delivery of benefits B_o for price P_o. The marginal cost of cost reduction effort e and quality improvement effort i is constant at 1. Quality innovation raises quality, but may also increase costs. (When we need to keep track of quality and associated costs separately, we assume $\beta(i) \equiv B(i) - m(i)$ denotes the quality increase net of costs from quality innovation effort i.) We follow HSV97 (p.1133-34) in assuming $b(e) \geq 0$, $\beta(i) \geq 0$, $b(0) = 0$, $b' \geq 0$, $b'' \geq 0$; $c(0) = 0$, $c' > 0$, $c'' < 0$, $c'(\infty) = 0$, and $c' - b' \geq 0$.

Depending on the manager's efforts, the service provided at Date 1 may be modified by the cost and quality innovations, such that social benefits B and costs C become respectively $B(e,i) = B_o + \beta(i) - b(e)$ and $C = C_o - c(e)$.[17] At Date 1, innovations that change the nature of the service may only be implemented with the approval of the owner of the facility—such as a hospital, clinic, or nursing home.[18] In HSV97, any renegotiation takes the form of Nash bargaining over the incremental surplus relative to the default payoffs, splitting the gains 50:50; the price P_o is chosen to allocate the surplus at Date 0 according to relative bargaining power.

[17] Actually $B(e,i) = B_o + B(i) - b(e)$ and $C(e,i) = C_o + m(i) - c(e)$; for the sake of consistency with HSV97 and simplicity, we will use HSV notation.

[18] In an extension, cost control 'innovation' can be re-framed as cost control effort or moral hazard that potentially damages non-contractible quality, with the marginal cost of effort constant at 1. Such moral hazard gives rise to perfunctory rather than consummate performance; it can arise even in the absence of any asset ownership or noncontractible investments, manifest in the gradations of everyday effort exerted as M provides the service to clients. Thus, even when abstracting from the HSV97 ex ante friction model by focusing only on the reference point ex post frictions, cost control and its associated aggrievement arising from perfunctory performance continue to shape the trade-offs of contracting out compared to in-house provision.

There is symmetric information about innovations, costs, and benefits. There are no wealth constraints, by assumption.

Default payoffs

In the absence of renegotiation, in the first instance (i.e., following HSV97 and pre-aggrievement shading), the payoffs to the purchaser and manager are as follows.

(A) Under private for-profit F ownership: e implemented; no i.

$$U^{Gov}_{F,default} = B_o - P_o - b(e),$$
$$U^{F}_{default} = P_o - C_o + c(e) - e - i.$$

(B) Government ownership, with M as employee-manager: Following HSV97, assume that Gov can appropriate fraction $(1-\lambda)$ of any innovations by replacing G with an alternative employee-manager. Any renegotiation with G takes place over the fraction λ of innovation surplus.

$$U^{Gov}_{G,default} = B_o - P_o + (1-\lambda)[-b(e) + c(e) + \beta(i)],$$
$$U^{G}_{default} = P_o - C_o - e - i.$$

(C) For comparison to HSV97, our model of private nonprofit ownership N gives rise to the following default payoffs:

$$U^{Gov}_{N,default} = B_o - P_o - b(e) + \beta(i) - \theta Z_o,$$
$$U^{N}_{default} = P_o - C_o + (1-\alpha)Z_o + \alpha[B_o - b(e) + \beta(i)] + c(e) - e - i.$$

N chooses innovations to maximize $U^{N}_{default}$:

$$-\alpha b'(e_N) + c'(e_N) = 1 \qquad \text{[Appendix (1)]}$$
$$\alpha\beta'(i_\alpha) = 1 \qquad \text{[Appendix (2)]}$$

Accordingly, if $\alpha > 0$, N will exert effort to improve quality and implement some of those ideas, even in the absence of any renegotiation at Date 1 for higher payment.

First-best efficiency benchmark

In the first-best – which could be achieved if the innovations are contractible or the parties can write a complete long-term contract on the modified service – Gov and M choose e and i to maximize total net surplus:

$$\max_{e,i}\{-b(e) + c(e) + \beta(i) - e - i\}. \qquad \text{[HSV97 (1)]}$$

The assumptions regarding concavity lead to a unique optimal solution characterized by the first order conditions:

$$-b'(e^*) + c'(e^*) = 1, \qquad \text{[HSV97 (2)]}$$

$$\beta'(i^*) = 1. \qquad \text{[HSV97 (3)]}$$

The second order conditions $-b'' + c'' < 0$ and $\beta'' < 0$ hold by assumption, so there is a unique solution (e^*, i^*).

Cost innovations are implemented up to the point where the marginal benefit of cost reduction, net of damage to noncontractible quality, equals the marginal effort cost of one; and quality innovations are implemented up to the point where the marginal net value of quality improvement equals the marginal effort cost of one. These optimal investments yield total innovation surplus $S^*(e^*, i^*) = -b(e^*) + c(e^*) + \beta(i^*) - e^* - i^*$.

In HSV97, there are also by assumption no deadweight losses from aggrievement or shading ex post, since renegotiation is always efficient.

Equilibrium under for-profit private ownership

Suppose that F owns the facility. Quality innovations are only implemented at Date 1 if renegotiation occurs, and it always does in HSV97. The parties split the surplus 50:50, given symmetric information about i_F and its associated net benefits $\beta(i_F)$. According to the default payoffs (A), both Gov and F receive $\frac{\beta(i_F)}{2}$. F chooses e and i to maximize U_F^M:

$$c'(e_F) = 1 \qquad \text{[HSV97 (7)]}$$

$$\frac{1}{2}\beta'(i_F) = 1 \qquad \text{[HSV97 (8)]}$$

There are two deviations from benchmark efficiency: F ignores the quality damage from cost reduction, leading to over-investment in cost reduction: $e_F > e^*$. Moreover, because F splits the surplus from quality innovations with Gov, F has lower-than-optimal incentives to invest ex ante effort quality innovation: $i_F < i^*$. To this we add the possibility that renegotiation causes ex post frictions, and may not even take place (see main text).

Equilibrium under government ownership

In the absence of renegotiation, the government purchaser can appropriate fraction $(1 - \lambda)$ of M's innovation efforts, implemented at cost, by (threatening to) fire M and hire a new employee-manager. When $\lambda < 1$, M receives less than half the surplus from implementing innovations.

$$\frac{\lambda}{2}\big(-b'(e_G) + c'(e_G)\big) = 1 \qquad \text{[HSV97 (13)]}$$

$$\frac{\lambda}{2}\beta'(i_G) = 1 \qquad \text{[HSV97 (14)]}$$

Deviations from benchmark efficiency arise because M must seek Gov's approval to implement any innovations, and Gov can realize a fraction $(1 - \lambda)$ of those ex ante efforts. As a result, M can expect at most only half of the innovation surplus, and when $\lambda < 1$, less than half. This blunts M's incentive to invest effort in dreaming up cost and quality innovations that prove valuable at Date 1. Nevertheless, under government ownership M takes account of quality

damage from cost reduction, which may lead to closer-to-optimal balance between cost and quality innovations relative to their social benefits and costs, and allows the purchaser to curb excessive cost reduction that damages quality.

In HSV97, there is no abnormal state. Government commitment to assuring access is captured by paying for the basic service and aversion to quality shaving.

Appendix C. Access as supply assurance: Model of aggrievement-impaired concessions in the Abnormal state

Assume that with (high) probability $(1-\pi)$, at Date 1+ the parties stay in the normal state. However, with (small) probability π, one of two abnormal states occurs: either the "high cost" state or the "changed value" state. The probability of the high-cost state is ε_c, and the probability of the changed-value state is ε_v, where $\varepsilon_c + \varepsilon_v = 1$ and are assumed to be independent, for simplicity.

Specifically, assume that with probability $\pi\varepsilon_c$, the provider's costs are unusually high for an exogenous reason (e.g., spike in energy costs or service provider strike). The purchaser can offer a concession to reduce the high costs from 'very high' ΔC_H to just 'high' ΔC_c, where $\Delta C_H > \Delta C_c > C_o$. The provider incurs cost $C_o - c(e) + \Delta C_H$, unless the purchaser makes a concession (e.g., adjusting the service scope, increasing the payment, or some combination appropriate to the abnormal circumstances). With a concession, the provider's incremental costs decrease to ΔC_c, and overall costs are thus $C_o - c(e) + \Delta C_c$. We follow FH23 in assuming that making such a concession is weakly efficiency-enhancing but reduces purchaser value from ΔV_H to ΔV_c, where $\Delta V_c < \Delta V_H \leq B_o - P_o$.

Assume that the probability of the purchaser making such a concession, γ^G, is a decreasing function of the provider's quality-shaving, $-b(e_M)$, which has left the purchaser feeling aggrieved and the relationship somewhat soured: $0 \leq \gamma^G(e_M) \leq 1$, with $\frac{\partial \gamma^G(e_M)}{\partial e_M} < 0$.

In other words, in the high-cost state, private M feels entitled to concession and the lower of the high-cost outcomes, $\Delta \mathrm{C}_c$. However, Gov feels entitled to ΔV_H rather than the lower value that results from a concession to M, ΔV_c. The probability of Gov granting a concession in the high-cost state is assumed to be decreasing in the level of aggrievement Gov feels in the normal state, to the extent that M's quality shaving damages noncontractible quality (when $e^M > e^*$) while still demanding additional payment for any quality innovations that merely restore quality to the Date 0 contracted level. Thus, with probability $\gamma^G(e_M)$, the parties realize the weakly efficiency-enhancing outcome, $\Delta V_c - \Delta \mathrm{C}_c$. However, with the complementary probability $\big(1-\gamma^G(e_M)\big)$, M will feel aggrieved by Gov's lack of a concession despite exogenously high costs, and M will impose (additional) shading costs on Gov equivalent to fraction θ of additional costs, $(\Delta C_H - \Delta C_c)$. This shading leads to deadweight loss of $-\theta\big[\big(1-\gamma^G(e_M)\big)(\Delta C_H - \Delta C_c)\big]$.

With independent probability $\pi\varepsilon_v$, the changed-value abnormal state arises at Date 1+. This might represent a pandemic or similar crisis. In this circumstance, the value of the service is much higher if it is modified to fit the new circumstances: $0 > \Delta V_v > \Delta \mathrm{V}_o$, although this

modification may be costly M to make: $\Delta C_v > \Delta C_o$. Modifying the service yields greater net value than providing the basic service: $\Delta V_v - \Delta C_v > \Delta V_o - \Delta C_o$. As before, we assume that only the owner can modify the facility to achieve the modified service.

If the facility is privately owned, M may grant a concession to Gov to modify the service, but the probability of such a concession depends on alignment of M's preferences with those of Gov: $0 \leq \gamma^M(\alpha) \leq 1$, with $\frac{\partial \gamma^M(\alpha)}{\partial \alpha} > 0$. The greater α, the more likely M internalizes the value of modifying the service in the changed-value state and grants a concession to Gov to do so.

Conversely, the lower α, the more likely M will "hold up" Gov in the changed-value crisis and refuse to supply the modified service, effectively defaulting on service provision. Gov feels entitled to a concession, given how valuable such a modification is during the crisis. M's hold-up leads to efficiency loss as well as shading by Gov that is proportional to the difference in value from M's refusal, $\theta(\Delta V_v - \Delta V_o)$.

For notational simplicity, let the net value in each state of the world s with or without concessions be denoted $NV_s \equiv \Delta V_s - \Delta C_s$, where $s \in (H, c; o, v)$. Therefore $NV_H \equiv \Delta V_H - \Delta C_H$ is less efficient than NV_c with G's concession in the high-cost A state. Similarly, the basic service yields NV_o in the changed-value state, which is less efficient than M's concession to modify the service to achieve better net value NV_v under the new circumstances (e.g. a crisis like a pandemic).

First-best surplus in state A arises when there is frictionless ex post adjustment to the new state of the world. For the high-cost state, $S^*(\varepsilon_c) = \varepsilon_c NV_c$; and in the changed-value state, $S^*(\varepsilon_v) = \varepsilon_v NV_v$. Therefore, the highest surplus in the abnormal state is achieved when both parties agree to the appropriate concessions: $S^*(A) = \varepsilon_c NV_c + \varepsilon_v NV_v = S(A|\gamma^G = 1, \gamma^M = 1)$. The efficiency benchmark for expected surplus in the abnormal state is

$$ES^*(A) = \pi\{\varepsilon_c NV_c + \varepsilon_v NV_v\}$$

Government in-house provision has the distinct advantage of avoiding hold-up ex post by private managers and thus allowing expeditious adjustment of the service to the abnormal circumstances: $ES^G(A) = ES^*(A)$.

By contrast, private ownership involves the likelihood of hold-up and associated aggrievement. In the high-cost state, Gov imposes a harder budget constraint, $\gamma^G(e_M) < 1$, the larger the damage to quality from M's overly-aggressive cost control. This hard budget constraint leaves M aggrieved from bearing the higher cost, leading to deadweight loss from M withholding noncontractible cooperation, as well as lost net value ($NV_H < NV_h$):

$$S^M(\varepsilon_c) = \gamma^G(e_M) NV_c + \big(1 - \gamma^G(e_M)\big)[NV_H + \theta(\Delta C_H - \Delta C_c)]$$

In the changed-value state, M "holds up" Gov by refusing to grant a concession, the smaller α; this lack of adjustment reduces the net value of the service in the changed-value state, and causes associated deadweight loss from G's aggrievement:

$$S^M(\varepsilon_v) = \gamma^M(\alpha) NV_v + \big(1 - \gamma^M(\alpha)\big)[NV_o + \theta(\Delta V_v - \Delta V_o)]$$

Since alignment of preferences leads a nonprofit provider with $\alpha > 0$ to internalize some of the damage to non-contractible quality from cost control and to be more likely to grant a

concession to Gov in the changed-value state, surplus in the Abnormal state is generally higher under N ownership relative to F, and highest under G in-house provision through an employee-manager who never holds up G in the Abnormal state:
$ES^G(A) = ES^*(A) > ES^N(A) \geq ES^F(A)$, where $ES^N(A) = ES^F(A)$ iff $\alpha = 0$.

Appendix Table 1. Summary of the Probabilities of Normal and Abnormal states at Date 1+ and the Payoffs in the Abnormal State

Probability	State of the world	Payoffs without concession	Who makes concession	Payoffs with concession
$(1-\pi)$	Normal	--	--	--
π	A (Abnormal)			
$\pi\varepsilon_c$	A: High cost	$\Delta V_H \leq 0$ $\Delta C_H > 0$	G: γ^G	$\Delta V_c < \Delta V_H$ $\Delta C_c < \Delta C_H$ Where $\Delta V_c - \Delta C_c \geq \Delta V_H - \Delta C_H$
$\pi\varepsilon_v$	A: Changed value	$\Delta V_o < 0$ $\Delta C_o \geq 0$	M: γ^M	$0 > \Delta V_v > \Delta V_o$ $\Delta C_v > \Delta C_o$ Where $\Delta V_v - \Delta C_v > \Delta V_o - \Delta C_o$

Note: Assume for simplicity that ε_c and ε_v are independent and $\varepsilon_c + \varepsilon_v = 1$.

Appendix D. Data

Educational enrollment data comes from the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics as shown in Appendix Table 2 below.

Appendix Table 2. Share of student enrollment in private schools by level of education

	Pre-primary	Primary	Secondary	Tertiary
Low income countries	31.2	11.1	16.9	
Middle income countries	34.5	19.7	28.6	
High income countries	43.7	13.0	20.6	
Central and Eastern Europe	6.2	2.9	5.0	
North America and Western Europe	37.8	12.4	19.0	
Sub-Saharan Africa	30.2	13.4	21.2	
Asia (Southern)	25.1	33.9	50.0	
Asia (Eastern and South-eastern)	54.8	9.9	18.3	
Latin America and the Caribbean	25.4	20.4	19.1	
Germany	64.8	5.0	9.6	11.2
US	40.6	8.9	8.9	26.4
Japan	75.8	1.2	20.6	78.8
Republic of Korea	77.4	1.6	30.9	80.3
China, Hong Kong SAR	99.0	18.8	20.2	17.9
China	55.5	7.8	12.4	14.5
India	19.5	37.5	51.2	57.7

Source: The United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics (UIS), data extracted on 26 Apr 2022 06:21 UTC (GMT) from UIS.Stat.

The data for hospital beds by ownership category in the Organization for Economic Cooperation and Development (OECD) countries (Figure 1, Panel A) comes from the OECD Health Statistics database, available at https://www.oecd.org/health/health-data.htm.

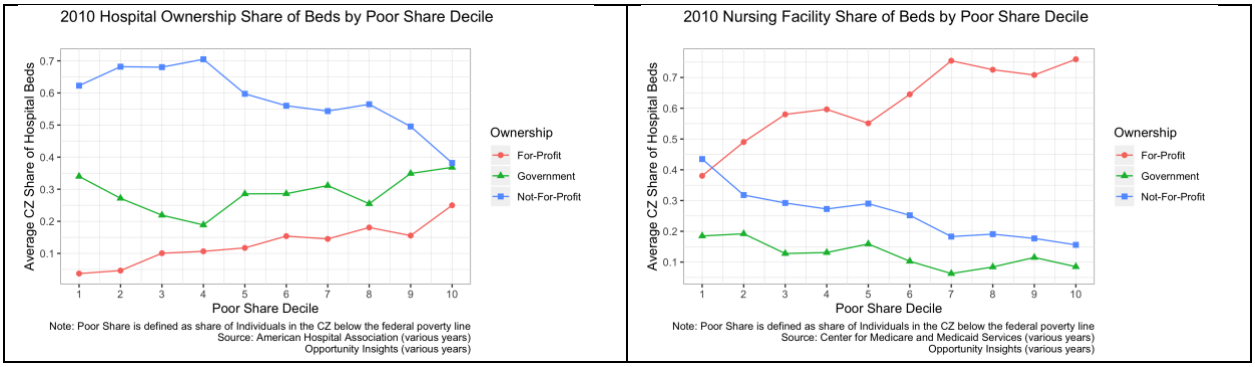
The data on ownership categories of US hospital beds (Figure 1 Panel B) and US community hospital beds (Figure 4) comes from the American Hospital Association (AHA) annual surveys through the National Bureau of Economic Research database (in compliance with the confidentiality standards associated with the use of Health Forum, LLC, an American Hospital Association company, AHA Annual Survey Database), supplemented by the AHA surveys within the Wharton Research Data Services database.

WRDS acknowledgment: Wharton Research Data Services (WRDS) was used in preparing the figures for "Nonprofits and the Scope of Government: Theory and an Application to the Health Sector." This service and the data available therein constitute valuable intellectual property and trade secrets of WRDS and/or its third-party suppliers.

For US nursing home beds, the Centers for Medicare and Medicaid Services (CMS) provides overview data used to extract the ownership shares by geography.

The data on ownership for US hospital beds and nursing home beds are linked to commuting zones and their characteristics (e.g. 2010 household income decile in Figure 1 Panel A, 2010 percent below the federal poverty line in Appendix Figure 1 below) using the data provided by Opportunity Insights (https://opportunityinsights.org/data/). The share of each of the three ownership forms among hospital beds in a given commuting zone is positively correlated with the share of that ownership form among nursing home beds; in different years between 2006 and 2018 and all three ownership forms, hospital and nursing home bedshares exhibit mildly positive correlations between 0.25 and 0.34.

Appendix Figure 1. Hospital and nursing home beds by share of population below the federal poverty line, US commuting zones



Source: Author analysis of AHA and CMS data as described in appendix D text in detail.

Data for ownership categories of inpatient beds in the People's Republic of China (Figure 1 Panel C, Figure 2 Panel B) is extracted from the China Health Statistics Yearbooks, various

years, as summarized in the "EPS China Data" service[19] (now canceled) from where they were downloaded as various times in the 2021-2022 period.[20] (The statistics found in EPS are identical to those in《中国卫生和计划生育年鉴》(《中国卫生年鉴》before 2014), which are accessible through 中国卫生与社会发展统计数据库 (but behind paywalls): https://data.cnki.net/trade/yearbook/Single/N2017010032?z=Z020).

The statistical yearbooks report China's hospitals according to two different categorizations of ownership control, each with two mutually exclusive and comprehensive alternatives: "公立" (public) vs. "民营" (private); and "营利性" (for-profit) vs. "非营利性" (non-profit). The latter is only consistently available since 2007 as the profit status of non-government organizations was clarified. In the data reported in this paper, statistics for "Public" (G) are directly imported from the database; statistics for "Private non-profit" (N) and "Private for-profit" (F) are derived as (Non-profit - Public) and (Private - Private non-profit), respectively. Other area characteristics such as provincial GDP per capita in Figure 2 Panel B are also extracted from official yearbooks as reported in EPS.

India hospital beds and per capita income data come from the National Sample Survey 75th Round Report 2019 and the National Health Profile 2019 as compiled by Kapoor et al. (2020) for their COVID-19 modeling estimates for India (produced with a team of researchers affiliated with the Center for Disease Dynamics, Economics and Policy and Princeton University.)

For the organizational ecology of service delivery in low-income countries, data is sparse. I extract variables on public and private ownership of outpatient service providers from the Demographic and Health Surveys Round VII, roughly spanning 2015 to 2020 (see Appendix Table 2), following the variable categorization as detailed in Grépin (2016) and her appendix. Unfortunately, data is insufficient to break down the non-government category by profit status, given limited use of the DHS survey categories asking about NGOs and other not-for-profit providers.

The data analyzed in Figure 2 Panel C represent over 1.7 million survey respondents and about 1.3 million households across 40 countries that collectively represent 41% of the global population (62.8% of the population of low- and middle-income countries excluding China). DHS households with visits to both public and private providers receive half weight for each category. Some additional results from these analyses originally cited this paper as "Eggleston 2022, 'Tasks, Ownership, and Health Service Production' " in a report prepared for the Asian Development Bank titled "Evidence-Based Public-Private Collaboration in the Health Sector:

[19] EPS China Data (EPS China Data->Humanities and Social Sciences->China Health Statistics): http://www.epschinadata.com/data-resource.html.

[20] The data was cross-checked with pdf versions or hardback copies of the statistical yearbooks, when available in Stanford library, in Beijing, or the official website of the National Health Commission of the PRC, http://www.nhc.gov.cn/).

The Potential for Collaborative Governance to Contribute to Economic Recovery from COVID-19 in Asia" available at https://dx.doi.org/10.22617/WPS230027-2.

Appendix Table 3. DHS Countries, Dates and Sample Sizes, Round VII

Region	Country	Years	Households	Individuals
Sub-Saharan Africa	Angola	11/2015- 02/2016	16109	20063
	Benin	11/2017- 02/2018	14156	23523
	Burundi	10/2016- 02/2017	15977	24821
	Cameroon	06/2018- 12/2018	11710	20505
	Ethiopia	01/2016- 06/2016	16650	28371
	Gabon	01/2020- 10/2021	11781	17937
	Gambia	11/2019- 03/2020	6549	16501
	Guinea	02/2018- 06/2018	8200	13000
	Liberia	10/2019- 02/2020	9068	12314
	Madagascar	03/2021- 07/2021	20510	27906
	Malawi	10/2015- 02/2016	26361	32040
	Mali	08/2018- 11/2018	9510	15137
	Mauritania	11/2019- 04/2021	11658	21477
	Nigeria	08/2018- 12/2018	40427	55132
	Rwanda	11/2019- 07/2020	12949	21147
	Sierra Leone	05/2019- 08/2019	13399	22771
	South Africa	06/2016- 11/2016	11083	12132
	Tanzania	08/2015- 02/2016	12563	16780
	Uganda	06/2016- 12/2016	19588	23842
	Zambia	07/2018- 01/2019	12831	25815
	Zimbabwe	07/2015- 12/2015	10534	18351
North Africa/West Asia/Europe	Albania	09/2017- 12/2017	15823	17003
	Armenia	12/2015- 04/2016	7893	8871
	Jordan	10/2017- 01/2018	18802	21118
	Turkiye	10/2018- 02/2019	11056	7346
Central Asia	Tajikistan	08/2017- 11/2017	7843	10718
South & Southeast Asia	Afghanistan	06/2015- 02/2016	24395	40221
	Bangladesh	10/2017- 03/2018	19457	20127
	India	06/2019- 04/2021	636669	825954
	Indonesia	07/2017- 09/2017	47963	59636
	Maldives	03/2016- 11/2017	6050	12041
	Myanmar	12/2015- 07/2016	12500	17622
	Nepal	06/2016- 01/2017	11040	16925
	Pakistan	11/2017- 04/2018	14540	18759

	Philippines	08/2017- 10/2017	27496	25074
	Sri Lanka	05/2016- 11/2016	27210	18302
	Timor-Leste	09/2016- 12/2016	11502	17229
Oceania	Papua New Guinea	10/2016- 12/2018	16021	22531
Latin America & Caribbean	Colombia	02/2015- 03/2016	44614	74501
	Haiti	11/2016- 04/2017	13405	24166

Source: Demographic and Health Surveys (DHS) Program methodology: https://dhsprogram.com/methodology/survey-search.cfm?sendsearch=1&crt=1&listgrp=1

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