

Nursing Homes in Equilibrium: Implications for Long-term Care Policies

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Long-term care (LTC) in the U.S.

- ▶ Large demand: 70% over age 65 develop severe need (U.S. Dept. of Health and Human Services, 2020)
- ▶ Expensive:
 - ▶ \geq \$90K per year for a semi-private room in a nursing-home; \$20-\$40 per hour for home-care (Genworth, 2019)
- ▶ Means-tested Medicaid pays for LTC of many households.

Long-term services and support (LTSS) policies

On the supply side:

- ▶ Medicaid reimbursement rate change (Nyman, 1985, Gertler, 1989, Grabowski, 2001, Hackmann, 2019)
- ▶ Incentivized entry of a nursing home (Hackmann, 2019)

On the demand side:

- ▶ Large literature on the effects of Medicaid means-tested subsidies on savings, welfare, and LTC choice. (e.g., De Nardi et al., 2010, 2016, Braun, Kopecky and Koreshkova, 2017, Mommaerts, 2018)

Aim

- ▶ Build an equilibrium model of a local nursing home market to examine long-term services and support (LTSS) policy effects.
- ▶ Explicitly model the decision-making of both sides of the market.
- ▶ Key decisions:
 - ▶ Households
 - ▶ Entering a nursing home vs. using in-home care
 - ▶ How much care to receive when using in-home care
 - ▶ Nursing homes: price and intensity of care

Share of nursing-home care: over wealth and income

Family structure	Wealth quartiles			
	1st	2nd	3rd	4th
Without family support	65	34	23	45
With family support	33	23	18	19

Note: From HRS (2004-2014). Among the sample with age 80-89, needing help with at least 3 ADLs.

Illustration of household choice: static model

- ▶ Key trade-off faced in LTC type choice:
 - ▶ Flexibility in the choice of care intensity in in-home care
 - ▶ (Potentially) lower unit cost of care in nursing-home care

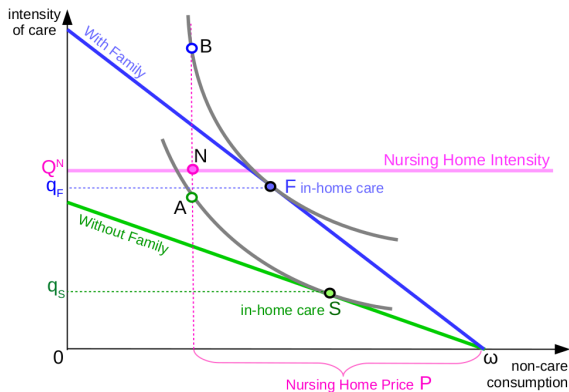


Illustration of household choice: static model

- ▶ Medicaid:
 - ▶ No out-of-pocket LTC cost
 - ▶ Provides consumption floor

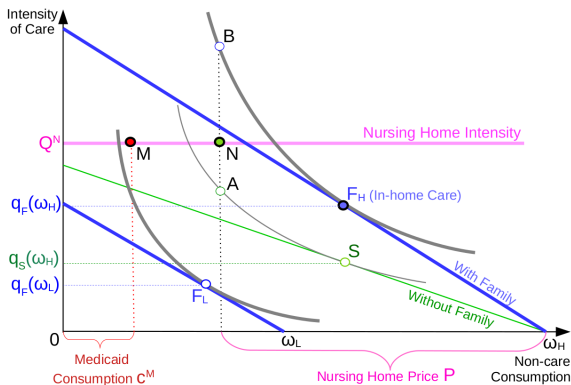
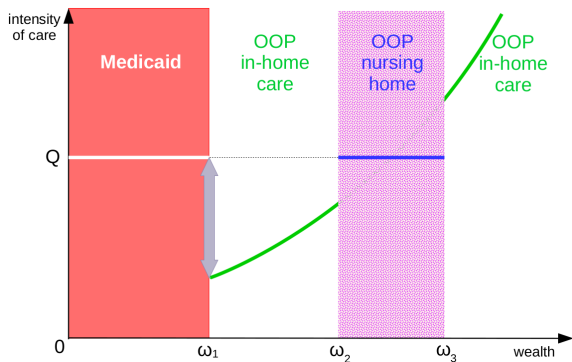


Illustration of household choice: static model

- ▶ Medicaid:
 - ▶ Protects wealth-poor households
 - ▶ Potential source of inefficiency
 - ▶ Pashchenko and Porapakkarm (2019), Arapakis et al. (2022)



Households

- ▶ Households heterogeneous in age, wealth, income, family structure, and health.
- ▶ Starts at age 70.
- ▶ Health: $\{Good, Fair, ADLL, ADLH\}$.
- ▶ Family structure
 - ▶ Coupled vs. single
 - ▶ Have a child nearby (within 10 miles) or not
 - ▶ Marginal cost of in-home care is smaller if with a healthy spouse or a child nearby.
 - ▶ Fixed cost (Ξ) of using in-home care if no family help available.
- ▶ Preference shocks that capture the role of factors not explicitly modeled.

Households

- ▶ Flow utility function:

$$U(\mathbf{c}, \mathbf{q}, \mathbf{k}; \mathbf{h}, F) \equiv \sum_{g=m,f} \mathbf{1}_g [\theta_g^h u(q_g^k; h_g) + \nu(c_g + \mathbf{I}^{k_g=\mathcal{N}} \Delta_{\mathcal{N}} + \mathbf{I}^{k_g=\mathcal{N}\mathcal{M}} \Delta_{\mathcal{N}\mathcal{M}}^{\mathbf{h},F})]$$

- ▶ Budget constraint:

$$W' = (1+r) \left(W + \sum_{g=m,f} \mathbf{1}_g [Y_g - c_g - LTC_g^k(q_g, \mathbf{h}, F)] + T \right),$$

$$LTC_g^k(q_g, \mathbf{h}, F) = \begin{cases} P_j & \text{if } k = j \ \forall j \in \mathcal{N} \\ \rho(\mathbf{h}, F)q_g + \Xi(\mathbf{h}, F) & \text{if } k = \mathcal{H} \\ 0 & \text{if } k \in \{j\mathcal{M}\}_{j \in \mathcal{N}}; k = \mathcal{H}\mathcal{M}. \end{cases}$$

Nursing homes

- ▶ 11 nursing homes in one local market.
 - ▶ Area of one local market from Hackmann (2019)
 - ▶ Number of nursing homes in a given area from the Nursing Home Reports by the Pennsylvania Department of Health (2017).

Nursing homes

- ▶ Maximize profit given the price and intensity set by other nursing homes.

$$\max_{P_j, Q_j} n_j(P_j, Q_j | \mathbf{P}_{-j}, \mathbf{Q}_{-j}) P_j + m_j(Q_j | \mathbf{Q}_{-j}) M - \mathcal{C}(N_j, Q_j) - \chi,$$

$$\text{where } N_j = n_j(P_j, Q_j | \mathbf{P}_{-j}, \mathbf{Q}_{-j}) + m_j(Q_j | \mathbf{Q}_{-j})$$

- ▶ Cost function shows DRS to the number of patients and IRS to care intensity.

$$\mathcal{C}(N_j, Q_j) = \bar{c} N_j^\alpha Q_j^\beta,$$

$$\alpha = 1.41 > 1, \beta = 0.53 < 1$$

Model fit for the targeted moments

A. Care hours distribution					
Health status	25p	50p	Mean	Mean/Median	N (Data)
Data					
ADLH	1,116	2,000	2,489	1.24	1,723
ADLL	240	720	1,242	1.73	1,205
Model					
ADLH	1,142	2,000	2,503	1.25	
ADLL	249	692	1,217	1.76	
B. Share of in-home care (under ADLH)					
Conditions			Data	Model	N (Data)
Have family help			75	77	1,385
Do not have family help			49	54	304

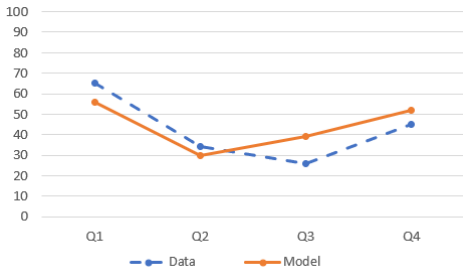
Note: Tabulation uses the sample in their 80s.

Model fit for the targeted moments

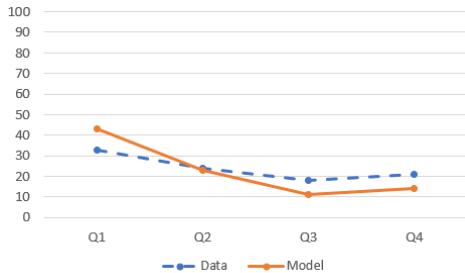
C. Share of Medicaid patients (%)				
	Single	Couple	Nursing home	In-home care
Data				
ADLH	42	23	55	27
ADLL	29	11	45	19
Model				
ADLH	43	32	70	26
ADLL	25	10	45	17

Note: Tabulation uses the sample in their 80s.

Share of nursing-home care by family and wealth



No family



With family

Model validation exercise on the supply side

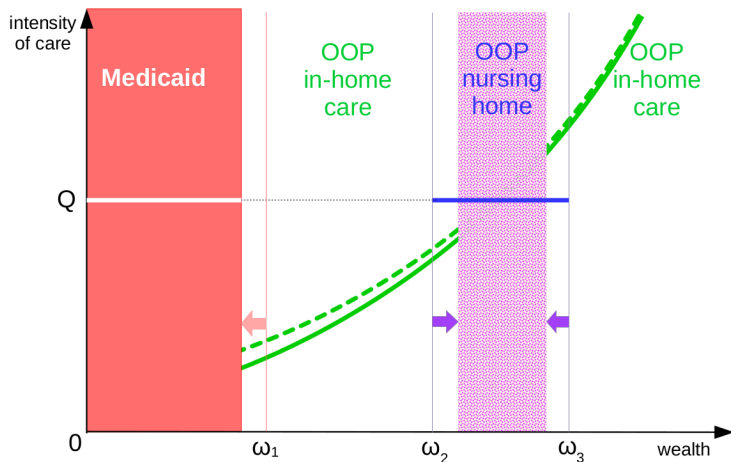
- ▶ A 10% increase in the Medicaid reimbursement rate
- ▶ Q increases by 9.7%
 - ▶ Hackmann (2019): The number of nursing staff increases by 8.7%.
- ▶ P increases by 7.6%.
 - ▶ Literature finds mixed results.

Model validation exercise on the supply side

- ▶ An incentivized entry of a nursing home
- ▶ Q increases by 3.6%
 - ▶ Hackmann (2019): The number of nursing staff increases by 0.1%-0.9%.
- ▶ P barely changes (0.4% increase).
 - ▶ Hackmann (2019): The price changes by -0.7%+0.1%.

Subsidies for in-home care

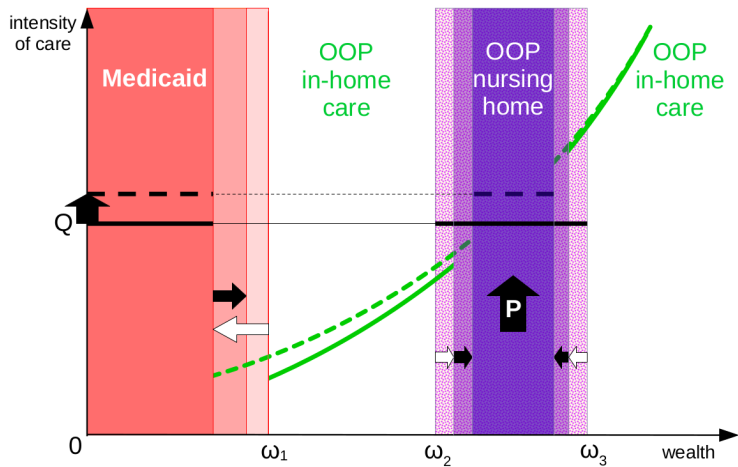
- Consider a policy where the government covers half of the fixed cost of using in-home care ($\Xi = \$20K$) for individuals without family help.



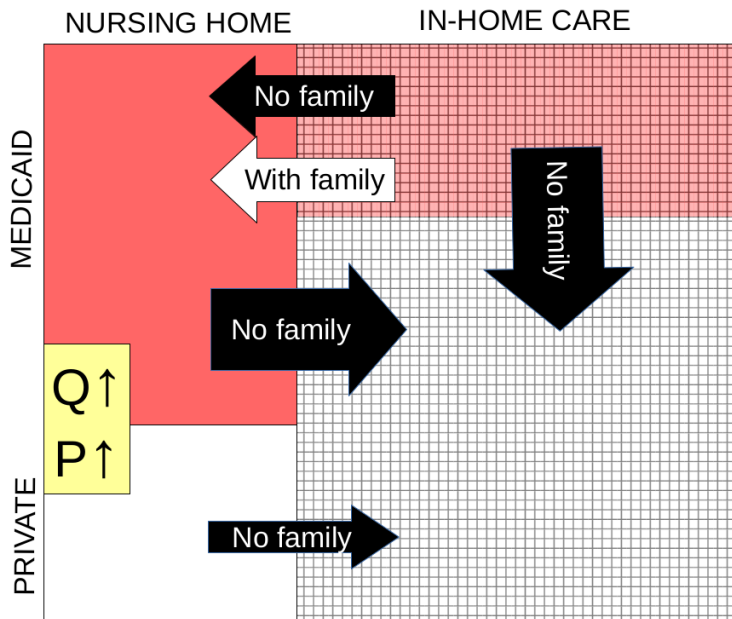
Subsidies for in-home care: effects on a nursing home

	Baseline	No NH response		NH response	
		Δ	$\Delta\%$	Δ	$\Delta\%$
NH care intensity (Q)	2,000	0	0	+133	+6.7
NH price (P , \$K)	85.0	0	0	+4.9	+5.8
Marginal cost (\$K)	69.8	-2.6	-3.7	+0.9	+1.3
Private residents	40.4	-5.8	-14.4	-7.9	-19.6
Medicaid residents	64.3	-3.4	-5.3	+2.7	+4.2
NH private revenue (\$M)	3.44	-0.50	-14.5	-0.52	-15.1
NH Medicaid revenue (\$M)	4.92	-0.26	-5.3	+0.21	+4.3
NH Profits (\$M)	1.87	-0.13	-7.0	-0.12	-6.4
NH residents on Medicaid (%)	61.3	+2.5	+4.1	+8.1	+13.2

Subsidies for in-home care: feedback from supply to demand



Subsidies for in-home care: net care flows



Subsidies for in-home care: welfare effects

A. Aggregates	No NH response		NH response	
	Δ level (\$M)	Δ %	Δ level (\$M)	Δ %
Consumer surplus	+8.6	NA	+8.9	NA
Producer surplus	-1.4	-7.0	-1.3	-6.4
Medicaid savings	-1.3	-1.7	-4.0	-5.1
Nursing home care	+2.9	+5.4	-2.3	-4.3
In-home care	+5.0	+10.9	+7.1	+15.5
Transfers	-9.2	-42.5	-8.8	-40.7
Total	+5.9	NA	+3.6	NA
B. Distribution				
Consumer surplus by wealth groups	Δ level (per household, \$)		Δ level (per household, \$)	
Wealth: Q1	+677		+1,291	
Wealth: Q2	+3,379		+3,521	
Wealth: Q3	+6,616		+6,301	
Wealth: Q4	+6,469		+6,917	

Subsidies for in-home care: Alternative forms

- ▶ Phased-out subsidies
 - ▶ \$10K per year for cash-in-hand \leq \$100K
 - ▶ \$5K per year for cash-in-hand in $(\$100K, \$160K]$
 - ▶ No subsidy for cash-in-hand \geq \$160K
- ▶ Proportional subsidies
 - ▶ Reducing marginal cost by 10%.

Subsidies for in-home care: welfare effects

A. Aggregates	Δ level (\$M)		
	Uniform	Phased-out	Proportional
Consumer surplus	+8.9	+2.6	+4.5
Producer surplus	-1.3	-0.2	-0.7
Medicaid savings	-4.0	+0.5	-3.8
Nursing home care	-2.3	+0.3	-1.2
In-home care	+7.1	+3.4	+1.1
Transfers	-8.8	-3.2	-3.7
Total	+3.6	+2.9	-0.0

B. Distribution	Δ level		
	(per household, \$)		
Consumer surplus by wealth groups	Uniform	Phased-out	Proportional
Wealth: Q1	+1,291	+804	+170
Wealth: Q2	+3,521	+1,741	+432
Wealth: Q3	+6,301	+1,940	+1,200
Wealth: Q4	+6,917	+845	+7,352

- ▶ Wealthier households miss out on the insurance value of the subsidy.
- ▶ Poorer households miss out on the higher nursing home care intensity.

Subsidies for in-home care: welfare effects

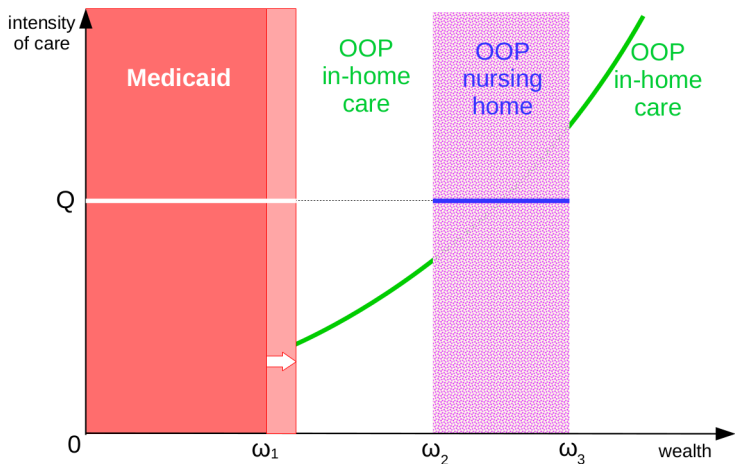
A. Aggregates	Δ level (\$M)		
	Uniform	Phased-out	Proportional
Consumer surplus	+8.9	+2.6	+4.5
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Medicaid savings	-4.0	+0.5	-3.8
Nursing home care	-2.3	+0.3	-1.2
In-home care	+7.1	+3.4	+1.1
Transfers	-8.8	-3.2	-3.7
Total	+3.6	+2.9	-0.0

B. Distribution	Δ level (per household, \$)		
	Uniform	Phased-out	Proportional
Consumer surplus by wealth groups			
Wealth: Q1	+1,291	+804	+170
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Wealth: Q3	+6,301	+1,940	+1,200
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- ▶ Highly regressive policy.
- ▶ No net welfare gain.

Increased Medicaid generosity

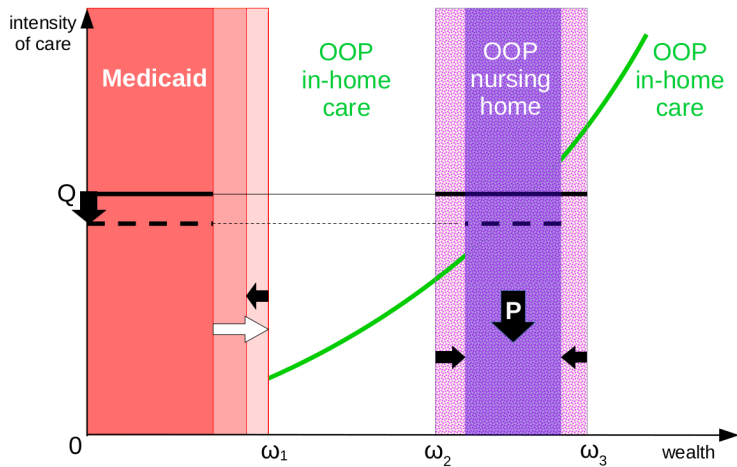
- ▶ Consider a 20% increase in consumption floor under Medicaid



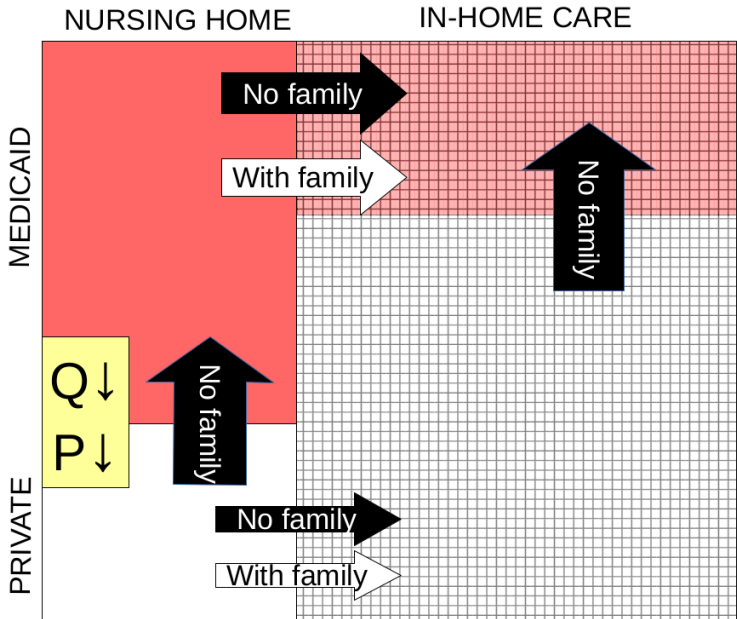
Increase in Medicaid generosity: effects on a nursing home

		No NH response		NH response	
		Δ	$\Delta\%$	Δ	$\Delta\%$
NH care intensity	2,000	0	0	-135	-6.8
NH price (P , \$K)	85.0	0	0	-0.9	-1.0
Marginal cost (\$K)	69.8	+4.7	+6.7	-0.6	-0.9
Private residents	40.4	+0.6	+1.5	-1.9	-4.7
Medicaid residents	64.3	+17.6	+27.4	+9.5	+14.8
NH private revenue (\$M)	3.44	+0.05	+1.5	-0.21	-6.1
NH Medicaid revenue (\$M)	4.92	+1.34	+27.4	+0.72	+14.6
NH Profits (\$M)	1.87	+0.08	+4.3	+0.20	+10.7
NH residents on Medicaid (%)	61.3	+5.3	+8.6	+4.4	+7.2

Increased Medicaid generosity: feedback from supply to demand



Increase in Medicaid generosity: net care flows



Increase in Medicaid generosity: welfare effects

A. Aggregates	No NH response		NH response	
	Δ level (\$M)	Δ %	Δ level (\$M)	Δ %
Consumer surplus*	+15.3	NA	+11.7	NA
Producer surplus	+1.0	+6.1	+2.2	+10.7
Medicaid savings	-16.2	-20.7	-12.9	-16.5
Nursing home care	-14.8	-27.4	-8.0	-14.8
In-home care	-3.2	-7.0	-6.2	-13.5
Transfers	+1.8	+8.3	+1.3	+6.0
Total	+0.1	NA	+0.9	NA
B. Distribution				
Consumer surplus* by wealth groups	Δ level (per household, \$)		Δ level (per household, \$)	
Wealth: Q1	+9,754		+9,382	
Wealth: Q2	+12,683		+11,839	
Wealth: Q3	+6,858		+5,302	
Wealth: Q4	+1,862		-2,676	

Conclusion

- ▶ We construct an equilibrium model of the nursing home market that matches the long-term care usage patterns observed in the data.
- ▶ Policy experiments show that the equilibrium effects are sizable.
- ▶ In-home care subsidy is an efficient policy that reduces the number of Medicaid enrollees while increasing consumer surplus.
- ▶ The model can be used to evaluate potential outcomes of a wide range of LTSS policies.