The Effect of Healthcare Costs on Low-Skill Domestic Outsourcing

Sean Bassler

University of Minnesota

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Low-Skill Domestic Outsourcing

- Domestic Outsourcing is when workers supply labor to firms
  - within the same country
  - while not being directly employed by them.
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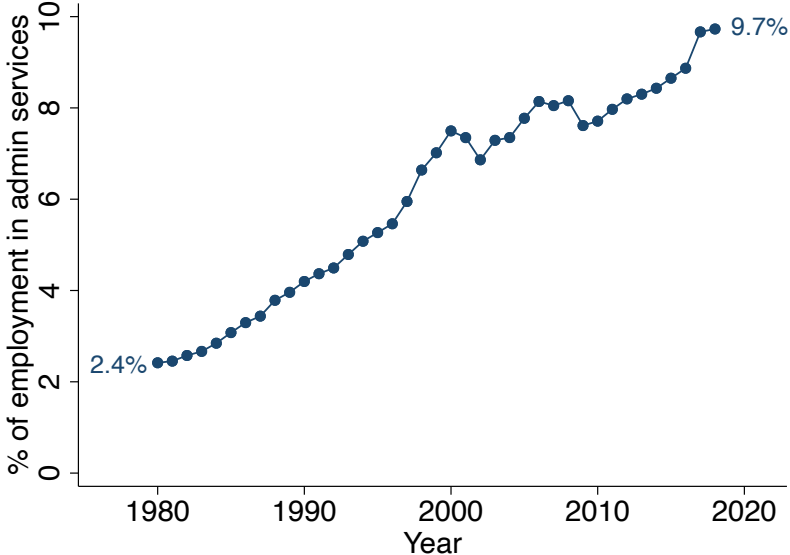
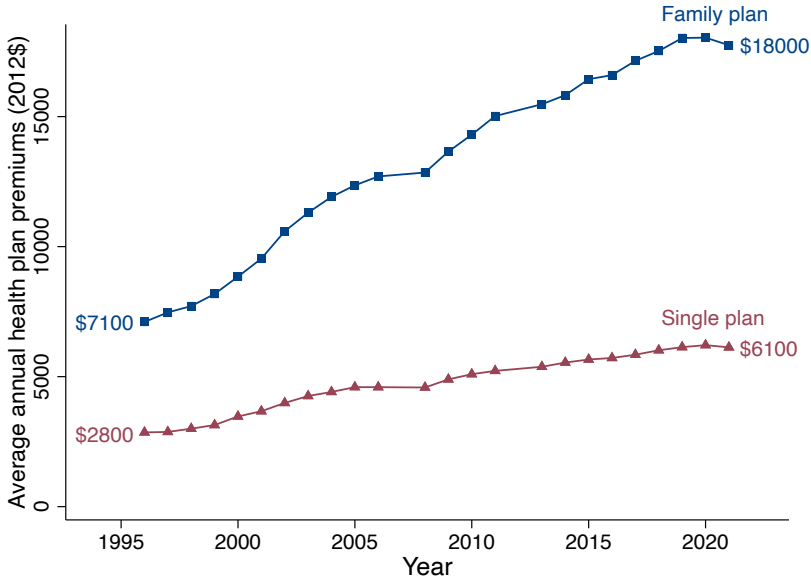
  - e.g., Aramark, Bon Appetit Management Co.
- Measure using **Administrative Services (NAICS 561)**
  - Supplies low-skill domestically outsourced labor to the economy
  - Includes janitorial services (561720), temporary help services (561320), etc.

Low-skill domestic outsourcing is increasing...



Health insurance costs also increasing



Questions + Motivation

- **Questions**
  - What % of the increase in low-skill D.O. can be explained by rising healthcare costs?
  - Welfare, efficiency effects of related policy proposals?
- **Motivation**
  - Welfare concerns from politicians, economists, media.
  - Reason why it increased is debated and influences policy response.

Main Idea: Healthcare Costs $\uparrow \Longrightarrow$ Low-Skill D.O. $\uparrow$

- Two important frictions from the IRS tax code
  - Tax advantage of employer health plans cause firms to offer health plans
  - Anti-discrimination - firms must offer all employees the same health plans more

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  - Traditional firms, mix of skill levels, generous health plans.

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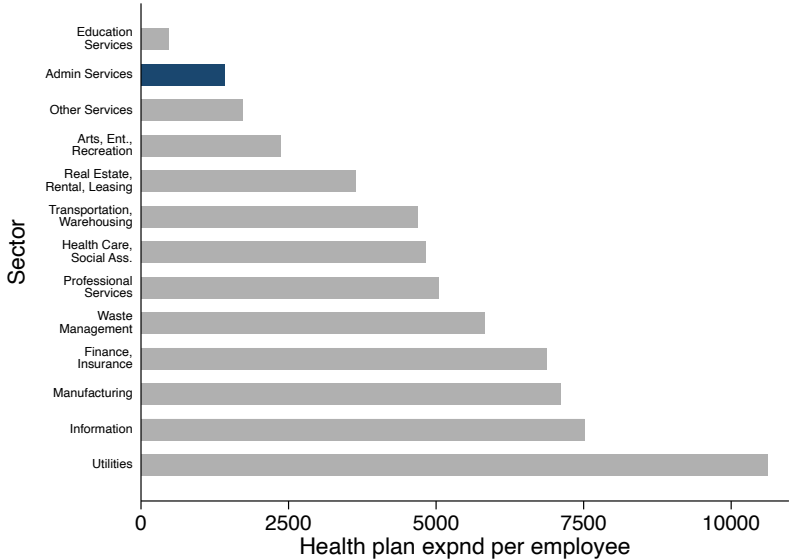
Admin Services has low health plan expenditures



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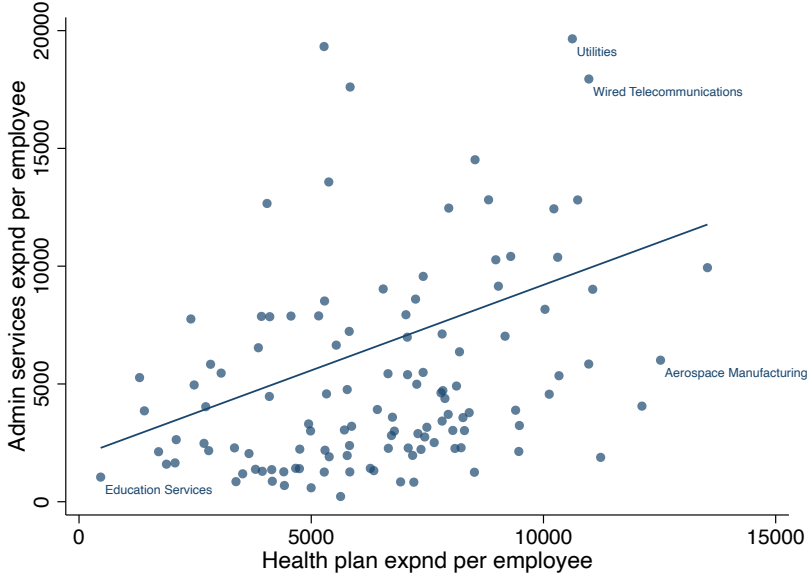
Expenditure on low-skill D.O. increases with health contributions



What I do: Novel Theory

- Wages and health plans
- Employees and outsourced workers, CES
- Tax advantage and anti-discrimination laws

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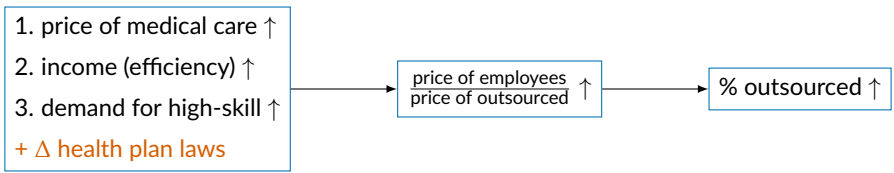
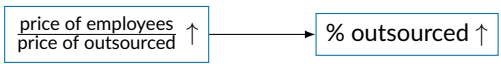


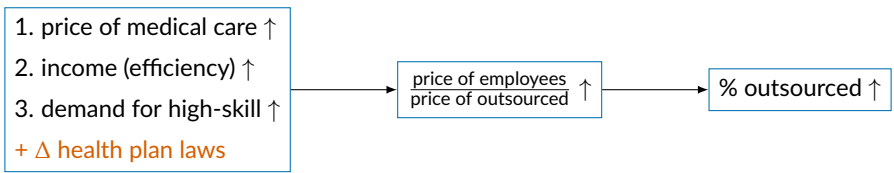
What I do: Accounting Exercise in 2 Steps

1. Estimate the effect of *rising healthcare costs* on low-skill D.O.
   - Closed form relationship btw $\frac{\text{price of employees}}{\text{price of outsourced}}$ and the outsourcing rate.
   - From data: $\frac{\text{price of employees}}{\text{price of outsourced}} \uparrow$ due to health plans
   - Only parameter required: the EOS btw employees and outsourced.
   - Result: $\frac{\textit{price of employees}}{\textit{price of outsourced}} \uparrow \longrightarrow$ 10% of the rise in low-skill D.O.



What I do: Accounting Exercise in 2 Steps

2. Estimate the effect of *underlying trends* on low-skill D.O.
   - Requires the entire model structure.
   - Calibrate to 1975, change one facet to its 2012 value, repeat.
   - See how $\frac{\text{price of employees}}{\text{price of outsourced}}$ — and thus the outsourcing rate — changes.
   - Result: price of medical care ↑ + laws ⟶ 10% of the rise in low-skill D.O.



What I do: Policy Counterfactuals

Welfare Effects

	Skill		
Policy Counterfactual	Low	Medium	High
Remove anti-discrimination laws	↑	-	↑
Remove tax advantage of employer health plans	↑	↓	↑
Outsourced workers get in-house health plans	↓	-	-

Related Literature: Domestic Outsourcing

- Empirical, effect of domestic outsourcing on wages.
  - Goldschmidt & Schmieder, 2017; Dube & Kaplan, 2010; Drenik et al., 2023; Dorn et al., 2018; Felix & Wong, 2021; Daruich et al., 2023.
- Why do firms domestically outsource? Why is it increasing?
  - Holmes & Snider, 2011; Bilal & Lhuillier, 2021; Bergeaud et al., 2021; Chan & Xu, 2017; Weil, 2019; Bostanci, 2021; Autor, 2003; Houseman et al., 2003; Abraham & Taylor, 1996.
- Structural, efficiency + welfare effects.
  - Bostanci, 2021; Chan & Xu, 2017; Bilal & Lhuillier, 2021.
- **Main Contribution:** First to measure effect of healthcare costs on D.O.

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Environment

Time is discrete. 3 types of agents.

1. **Workers**
   - Endowed with labor, heterogeneous in skill $s \in \mathcal{S} = \{low, medium, high\}$.
   - Preferences turn goods c and medical care m into utility u.

$$\psi \left(\frac{c}{u}\right)^{1-1/\sigma} + (1-\psi)\left(\frac{m}{u^{\epsilon}}\right)^{1-1/\sigma} = 1.$$

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2. **Traditional firm** - technology inputs employees n_s^f and outsourced workers o_s^f.

$$y = z \prod_{s \in \mathcal{S}} \left(\left(n_s^f\right)^{1-1/\theta_s} + \alpha_s^{1/\theta_s} \left(o_s^f\right)^{1-1/\theta_s} \right)^{\frac{\varphi_s \theta_s}{\theta_s - 1}}$$

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3. **Outsourcing firms** - One for each skill level. Technology: $O_s = n_s^o$.

Timing of a Period

1. Firms offer compensation packages.
2. Workers choose where to work $j \in \mathcal{J}$.
3. Workers purchase goods c and medical care m.

Compensation packages: wages and health plans

- Compensation packages
  - Wages w - can purchase goods c and medical care m
  - Health plans a - can only purchase medical care m
- Two friction from the IRS tax code
  1. Tax advantage - wages taxed, while health plan are not.

$$w(1-T) \qquad \text{vs.} \qquad a$$

  2. Anti-discrimination laws - firms must offer all employees same health plans

$$a_s^j = a_{s'}^j \quad \forall s, s' \in \mathcal{S}$$

Worker Problem

- Given a compensation package, choose consumptions to maximize utility

$$v(a_s^j, w_s^j) = \max_{c, m_a, m_w} u\left(c, m_a + m_w\right)$$

$$s.t. \quad c + p_m m_w \leq w_s^j (1 - T)$$

$$p_m m_a \leq a_s^j$$

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- Given all firms, choose where to work to maximize utility

$$\max_{j \in \mathcal{J}} v(a_s^j, w_s^j) \equiv v_s \quad \text{reservation utility}$$

Traditional Firms Problem

$$V(\{p_s, v_s\}_s) = \max_{\{n_s^f, o_s^f, a_s^f, w_s^f\}_s} y(\{n_s^f, o_s^f\}_s) - \sum_{s \in \mathcal{S}} \Big(\underbrace{(w_s^f + a_s^f) n_s^f}_{\substack{\text{employee} \\ \text{expenditure}}} + \underbrace{p_s o_s^f}_{\substack{\text{outsourcing} \\ \text{expenditure}}} \Big)$$

$$s.t. \quad a_s^f = a_{s'}^f \quad \forall s, s' \in \mathcal{S}$$

$$\underbrace{v(a_s^f, w_s^f)}_{\substack{\text{worker's indirect} \\ \text{utility function}}} \geq v_s \quad \forall s \in \mathcal{S}$$

Outsourcing Firms Problem

$$V_s^o\left(p_s, v_s\right) = \max_{n_s^o, a_s^o, w_s^o} p_s n_s^o - \left(w_s^o + a_s^o\right) n_s^o$$

$$s.t. \qquad \underbrace{v\left(a_s^o, w_s^o\right)}_{\substack{\text{worker's indirect} \\ \text{utility function}}} \geq v_s$$

- AD Law has no effect because outsourcing firm uses only 1 skill level.

Equilibrium Intuition Definition

- Reservation utility levels v_s are set so that labor markets clear.

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- Reservation utility levels v_s are set so that labor markets clear.
- All compensation packages $\{a_s^j, w_s^j\}_{j \in \mathcal{J}}$ yield v_s.
- Workers indifferent to where they work.

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Low-skill outsourcing rate $\frac{n_l^o}{N_l}$ increases w/ relative price of employees

$$\frac{n_l^o}{N_l} = \frac{\alpha_l \rho_l^{\theta_l}}{1 + \alpha_l \rho_l^{\theta_l}}.$$

- θ_l and α_l are exogenous parameters.
- $\rho_l \equiv \frac{w_l^f + a_l^f}{w_l^o + a_l^o}$ is the endogeneous relative price of employees

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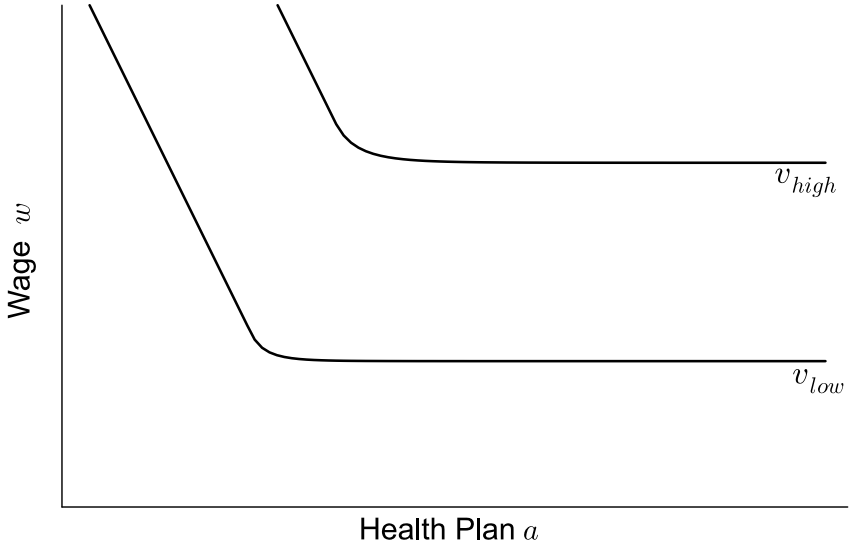
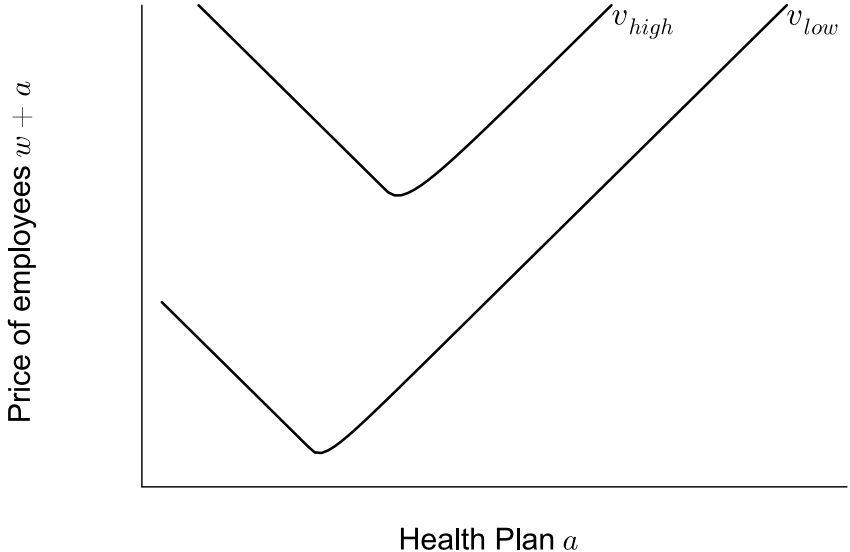
- Up next:
  - How do trends in price of medical care effect ρ_l and thus $\frac{n_l^o}{N_l}$?
  - How do laws come into play?

Indifference curves that firms face



Employee Price Curves



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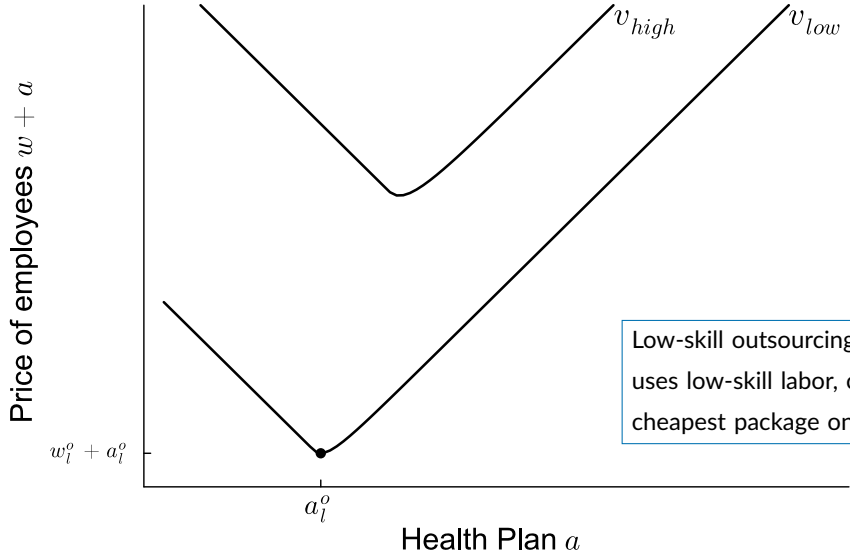
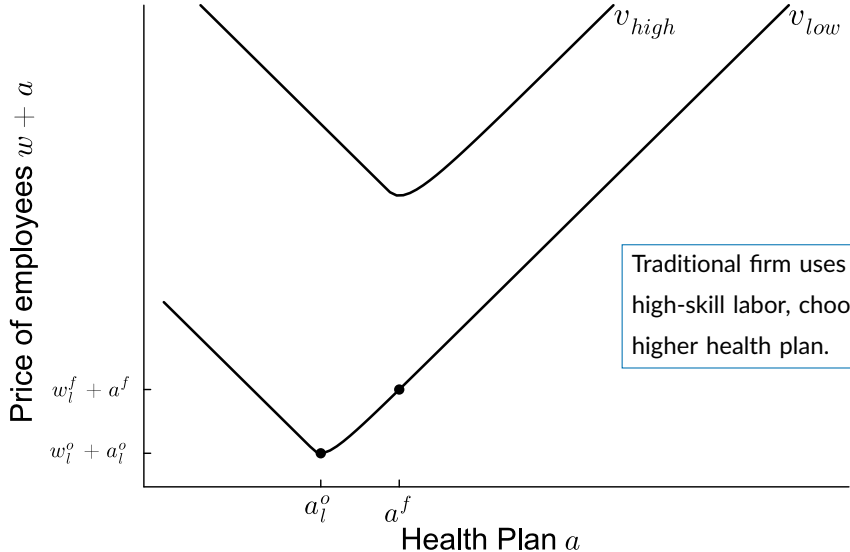


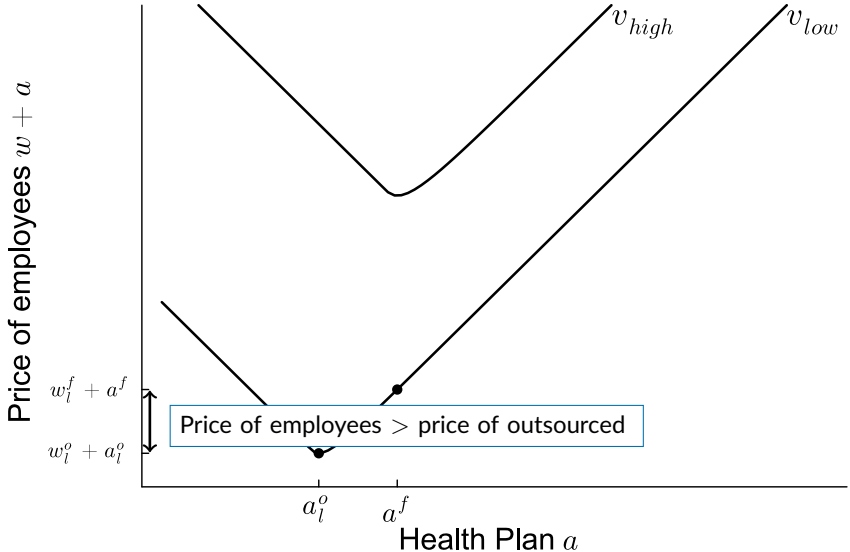
Low-skill outsourcing firm only uses low-skill labor, chooses cheapest package on the IC.

Employee Price Curves

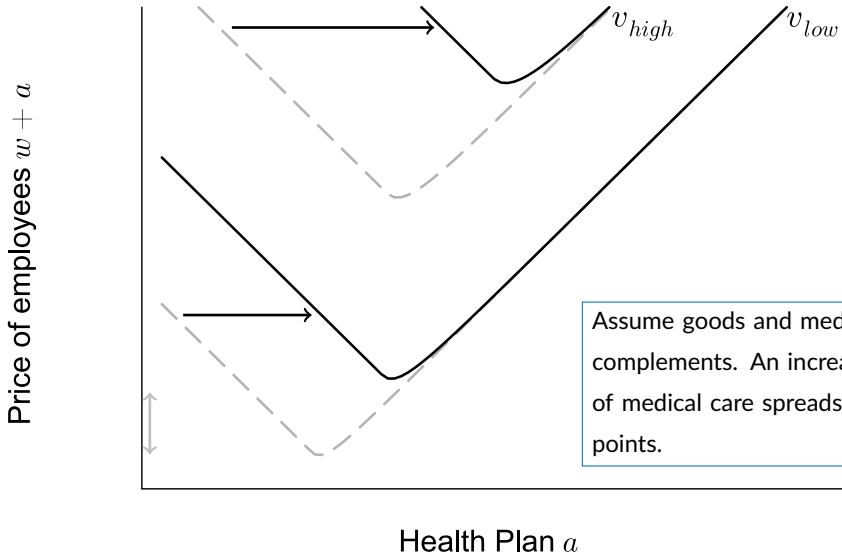


Traditional firm uses low- and high-skill labor, chooses a higher health plan.

Employee Price Curves: With Laws $\rho_{lt} > 1$

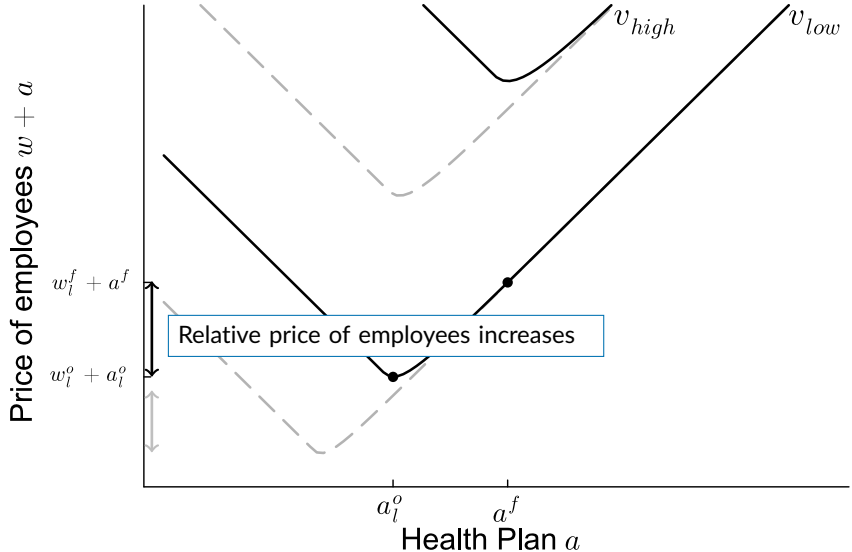


Employee Price Curves: What happens when p_m increases?

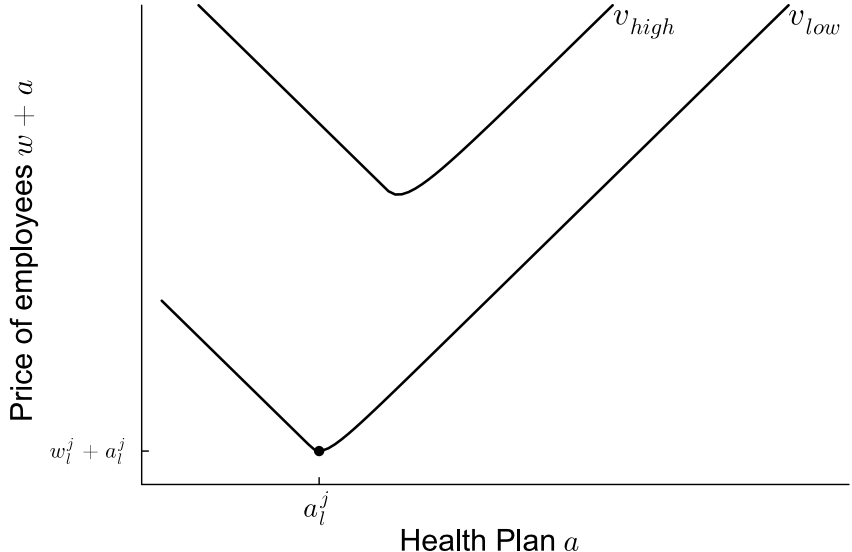


Assume goods and medical care are complements. An increase in the price of medical care spreads out the saddle points.

Employee Price Curves: With laws, $p_m \uparrow \Longrightarrow \rho_l \uparrow$



Employee Price Curves: Removing the AD law makes $\rho_{lt} = 1$



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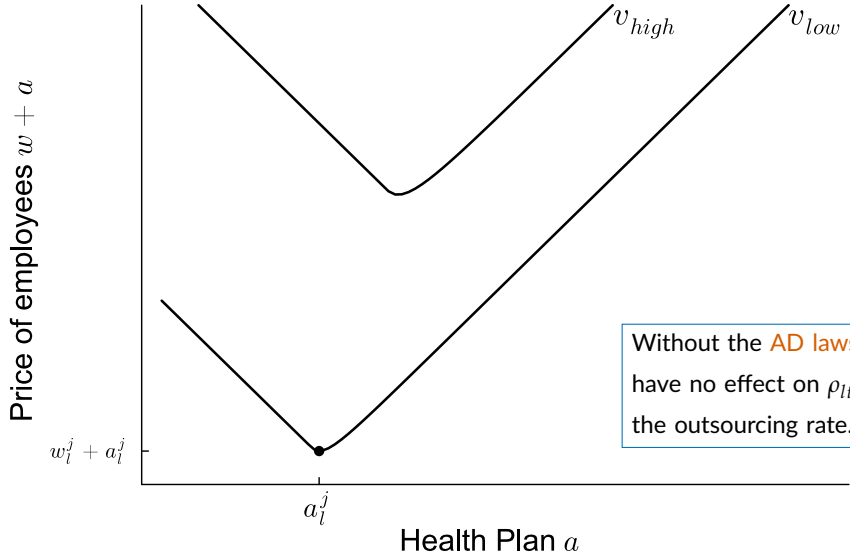
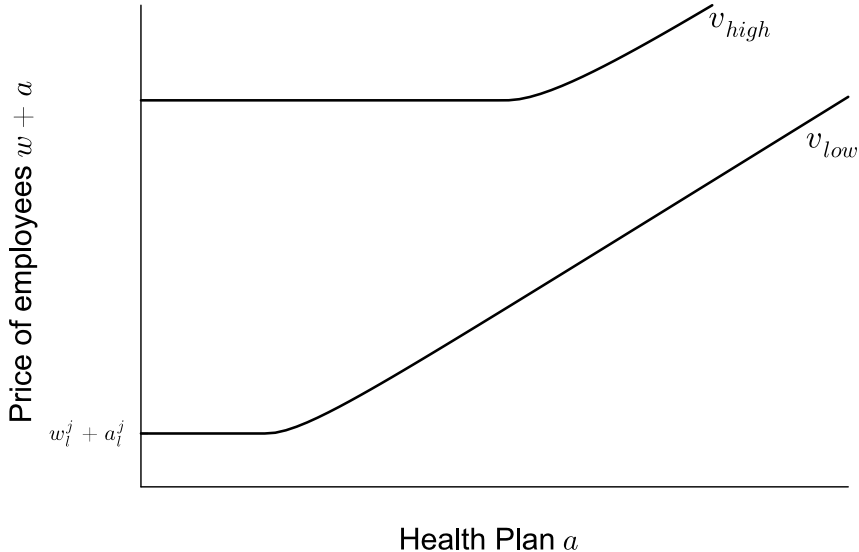


Without the AD laws, trends have no effect on ρ_{lt} and thus the outsourcing rate.

Employee Price Curves: Removing the tax advantage makes $\rho_{lt} = 1$



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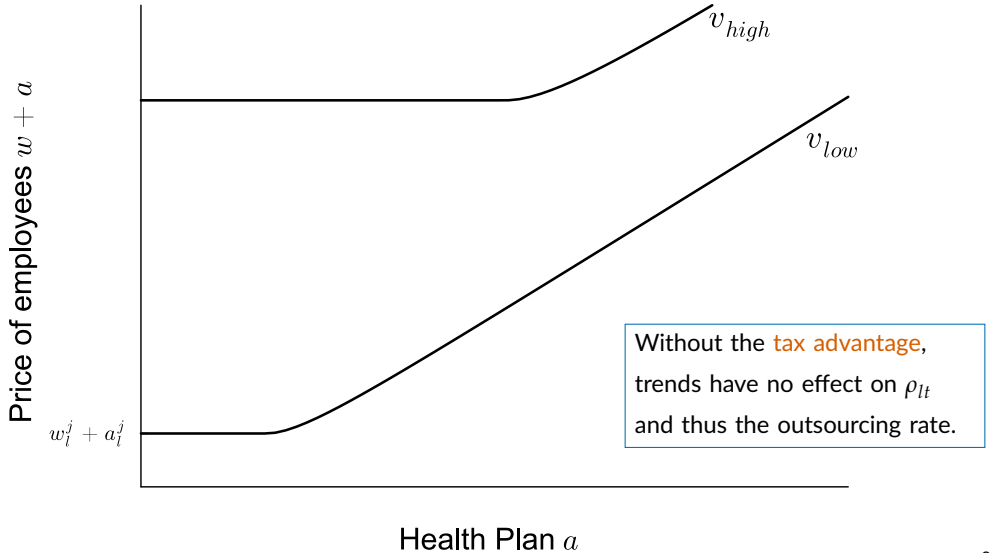

Without the tax advantage, trends have no effect on ρ_{lt} and thus the outsourcing rate.

Sum Up

$$\frac{n_l^o}{N_l} = \frac{\alpha_l \rho_l^{\theta_l}}{1 + \alpha_l \rho_l^{\theta_l}}.$$

- Outsourcing rate $\frac{n_l^o}{N_l}$ increases with relative price of employees ρ_l.
- With laws spreading out the saddle points increases ρ_l.
  - Price of medical care p_m
  - Income z
  - High-skill demand φ_h.
- Without laws, $\rho_l = 1$. Trends do not affect the outsourcing rate.

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Accounting exercise overview

$$\underbrace{\Delta \log \left(\frac{n_{lt}^{o}}{n_{lt}^{f}} \right)}_{\text{Increase in low-skill D.O.}} = \underbrace{\theta_l \Delta \log \rho_{lt}}_{\text{Increase in relative price of employees}} + \underbrace{\Delta \log \alpha_{lt}}_{\text{Everything else (residual)}}$$

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1. Estimate the share of the $\uparrow$ in low-skill D.O. due to $\Delta \log \rho_{lt}$.
   - Estimate $\Delta \log \rho_{lt}$ from micro-data. *Only parameter required is* θ_l.

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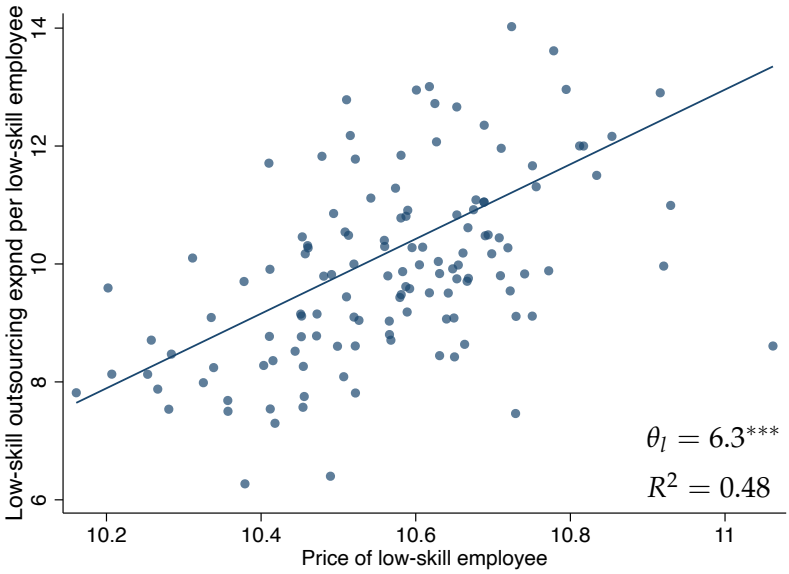
1. Estimate the share of the $\uparrow$ in low-skill D.O. due to $\Delta \log \rho_{lt}$.
   - Estimate $\Delta \log \rho_{lt}$ from micro-data. *Only parameter required is* θ_l.
2. Attribute $\Delta \log \rho_{lt}$, and thus the $\uparrow$ in low-skill D.O., to four factors:
   - The passage of the laws.
   - Rising price of medical care p_m.
   - Rising income (efficiency) z.
   - Shift in labor demand towards high skill φ_{ht}.

Estimating the EOS θ_l using cross-industry variation

$$\log \underbrace{\frac{p_l o_l^j}{n_l^j}}_{\substack{\text{low-skill outsourcing expnd} \\ \div \text{ low-skill employees}}} = \beta_0 + \theta_l \log(\underbrace{w_l^j + a^j}_{\substack{\text{price of low-skill} \\ \text{employee}}}) + \epsilon^j$$

- Use industry level data
  - Health plans a^j - ASM and SAS.
  - Employment n_l^j and wages w_l^j - OEWS.
  - Outsourcing expenditures $p_l o_l^j$ - IO Tables

EOS θ_l is large, positive, statistically significant



Accounting exercise results

Rise in Low-Skill Domestic Outsourcing, 1975-2012

	Δ p.p.	% explained
Data:	10.72	
Model: Price of employees $\rho_{lt} \uparrow$	1.18	11.1

Accounting exercise results

Rise in Low-Skill Domestic Outsourcing, 1975-2012

	Δ p.p.	% explained
Data:	10.72	
Model: Price of employees $\rho_{lt} \uparrow$	1.18	11.1
High-skill demand $\varphi_h \uparrow$ alone	0	0
Efficiency $z \uparrow$ alone	0	0
Price of medical care $p_m \uparrow$ alone	0	0
Passage of laws alone	0.53	4.9
Laws + $\varphi_h \uparrow$	0.53	4.9
Laws + $z \uparrow$	0.5	4.6
Laws + $p_m \uparrow$	1.26	11.8

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In baseline economy...

- Traditional firm chooses health plan that minimizes price of medium skill employees
  - Shifting $1 from health plans to wages would increase low-skill employee's utility
  - Shifting $1 from wages to health plans would increase high-skill employee's utility

In baseline economy...

- Traditional firm chooses health plan that minimizes price of medium skill employees
  - Shifting $1 from health plans to wages would increase low-skill employee's utility
  - Shifting $1 from wages to health plans would increase high-skill employee's utility
- Too many low-skill workers are outsourced, because outsourced labor is cheaper
  - In baseline economy: $\frac{\partial y}{\partial n_l^f} = w_l^f + a_l^f > w_l^o + a_l^o = \frac{\partial y}{\partial o_l^f}$
  - In efficient economy: $\frac{\partial y}{\partial n_l^f} = \frac{\partial y}{\partial o_l^f}$

In baseline economy...

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  - In efficient economy: $\frac{\partial y}{\partial n_l^f} = \frac{\partial y}{\partial o_l^f}$
- High-skill workers purchase a lot of medical care with after-tax wages

Policy can potentially increase welfare through 3 channels

1. Increase output: $\frac{\partial y}{\partial n_l^f} = \frac{\partial y}{\partial o_l^f}$
2. Increase utility while keeping labor prices constant
   - For low-skill, shift health plan to wages
   - For high-skill, shift wages to health plans
3. For high-skill, decrease medical care purchased at a tax disadvantage

Counterfactual welfare metric

$$v\left(a_s^f, (1 + x_s^{CF})w_s^f\right) = v_s^{CF}$$

- Find wage subsidy x that makes employees at the traditional firm indifferent between baseline economy with x and the counterfactual economy.

Results: effects of policy on welfare

Welfare effects in terms of wage subsidy to employees

	Skill		
Policy Counterfactual	Low	Medium	High
Remove anti-discrimination laws	4.4	0.0	3.5

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- Increases in output are tiny.

Results: effects of policies on inequality

	Ratio, high- to low-skill
Economy	Wage $\mathbb{E}[\frac{w_{jh}}{w_{jl}}]$
Baseline	3.4
Remove anti-discrimination laws	3.0
Remove tax advantage of employer health plans	3.4
Outsourced get same health plans as employees	3.4

Results: effects of policies on inequality

	Ratio, high- to low-skill	
Economy	Wage $\mathbb{E}[\frac{w_{jh}}{w_{jl}}]$	Utility $\frac{v_h}{v_l}$
Baseline	3.4	3.0
Remove anti-discrimination laws	3.0	3.0
Remove tax advantage of employer health plans	3.4	3.0
Outsourced get same health plans as employees	3.4	3.0

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Conclusion

- Explore the relationship between domestic outsourcing and employer health plans.
- Rising relative price of employees due to health costs explains 10% of the trend.
- Attribute the rising relative price of employees to the rising price of medical care.
- Policy counterfactuals: caution when forcing firms to offer generous benefits.

Conclusion

Thank you!

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Equilibrium Definition

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Given the price of medical care p_m an equilibrium is

- reservation utility levels $\{v_s\}_{s\in\mathcal{S}}$
- prices for outsourced labor $\{p_s\}_{s\in\mathcal{S}}$
- choices for the traditional firm $\{n_s^f, o_s^f, a_s^f, w_s^f\}_{s\in\mathcal{S}}$
- outputs and choices for each outsourcing firm $\{O_s, n_s^o, a_s^o, w_s^o\}_{s\in\mathcal{S}}$

that satisfy the following

1. given a compensation package workers maximize their utility.
2. all compensation packages for each skill level yield their respective reservation utility levels.
3. given prices and the reservation utility levels each firm maximizes profits.
4. labor markets for employees and outsourced labor clear.

Traditional firm optimal compensation package

$$a_f \approx \sum_s \frac{\omega_s^f}{\sum_{s'} \omega_{s'}^f} a_s^*,$$

$$\omega_s^f = \underbrace{\varphi_s^f}_{\substack{\text{skill} \\ \text{weight}}} \times \underbrace{\frac{(w_s^f + a_f) n_s^f}{(w_s^f + a_f) n_s^f + p_s o_s^f}}_{\substack{\text{share of } s\text{-expenditure} \\ \text{on employees}}} \times \underbrace{\frac{\partial^2}{\partial a^2} \Big(\log \big(a + w(a, v_s) \big) \Big) \Big|_{a = a_s^*}}_{\substack{\text{how expensive it is to move away from} \\ \text{the cost-minimizing package}}}.$$

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Outsourcing Approximation

$$\log\left(\frac{l_{fl}}{n_{fl}}\right) \approx \log(\alpha_l) + \theta_l \log\left(1 + \underbrace{\left(\frac{\partial^2 w(a, v_l)}{\partial a^2}\bigg|_{a=a_l^*}\right)}_{\text{Sensitivity of wage to change in health plan}} \times \underbrace{\left(\frac{\omega_{hf}}{\omega_{lf} + \omega_{hf}}\right)^2}_{\text{Weight on high-skill}} \times \underbrace{(a_h^* - a_l^*)^2}_{\text{Distance between cost-minimizing plans}} \times \underbrace{\frac{1}{w_l^* + a_l^*}}_{\text{Cheapest low-skill compensation cost}}\right).$$

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Calibration Strategy

- Internally calibrate the utility function $\{\psi, \eta, \epsilon\}$.
- Externally calibrate everything else. Notably θ_l.
- Validate model with untargeted moments.

Internally calibrating the utility function

$$\psi \left(\frac{c}{u}\right)^{1-1/\sigma} + (1-\psi)\left(\frac{m}{u^{\epsilon}}\right)^{1-1/\sigma} = 1.$$

- Health plan expenditures vary across industries and time.
- These speak to income and price effects.
- Simulate multiple time periods and industries, match health plan to wage ratios.

Calibration Results: Targeted and Untargeted Moments

Calibration Table

Moment	Model	Data	Source
Targeted			
$\frac{\text{health plan}}{\text{wage}}$, 2012	0.14	0.09	NIPA
$\Delta \frac{\text{health plan}}{\text{wage}}$, 1975 to 2012	0.05	0.05	NIPA
$\frac{\partial \text{ health plan}}{\partial \text{ wage}}$ across industries, 2012	0.1	0.1	ASM, SAS

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Untargeted			
Income elasticity of medical care	0.86	0.72	Acemoglu et al. (2013)
Relative price of low-skill employees, $\rho_{l,2012}$	1.06	1.07	CPS-ASEC
Δ Medical Care Expenditure Share, 1975-2012	0.15	0.14	FRED
Medical Care Expenditure Share, 2012	0.29	0.25	FRED

Summary of Parameters and Targeted Moments

Back

Parameter		Value	Moment	Model	Data
External, time-invariant					
N_s	Mass of workers of skill s	1			
T	Average tax on wages	0.34			
γ	Medical care price wedge	0.05			
ν	Returns to scale, traditional firms	0.95			
θ_l	EOS, low-skill employees vs outsourced	6.21			
External, time-varying					
$p_{m,1975}$	Price of medical care, 1975	1	Normalized		
$p_{m,2012}$	Price of medical care, 2012	2.15	Δprice of medical care, 1975-2012		
z_{1975}	Efficiency, 1975	1	Normalized		
z_{2012}	Efficiency, 2012	1.34	Δemployee compensation, 1975-2012		
$\varphi_{s,1975}$	Skill weights, 1975	[0.2,0.29,0.5]	Δskill-level wage shares, 1975-2012		
$\varphi_{s,2012}$	Skill weight, 2012	[0.19,0.27,0.54]	Skill-level expenditure shares, 2012		
α_{1975}	Weight on low-skill outsourcing, 1975	0.03	Low-skill outsourcing rate, 1975	0.03	0.03
Internal					
α_{2012}	Weight on low-skill outsourcing, 2012	0.11	Low-skill outsourcing rate, 2012	0.14	0.14
ψ	Weight on goods in utility	1.0	$\frac{\text{health plan}}{\text{wage}}$, 2012	0.14	0.09
η	EOS, goods vs medical care	0.06	$\Delta \frac{\text{health plan}}{\text{wage}}$, 1975 to 2012	0.05	0.05
ϵ	Non-homotheticity	0.81	$\Delta \frac{\text{health plan}}{\text{wage}}$ across industries, 2012	0.1	0.1

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Tax Advantage of Employer Health Plans

- Employer provided health plans are widespread.
  - In 2015, 90% of people with private plans had employer-provided plans (KFF, 2021).
- Why? Tax advantage.
  - Wages are taxed. Average marginal tax rate on wages = 34% (Heathcote et al., 2017).
  - Health plan contributions are not taxed by IRS Code Section 106.

Anti-discrimination statutes were passed in 1978 Back

- Senate's Committee on Finance in 1978:

  "In some cases uninsured medical reimbursement plans have been established by businesses under which the principal beneficiaries are ... its highest paid workers. These plans can tailor their benefits to fit the particular needs of these employees. Under present law, such a plan can exclude all rank-and-file workers."

- Section 105: Employer contributions are taxed if firms discriminate.
  - Generosity - Firms must provide all covered employees the same benefits.
  - Eligibility - A plan must benefit a majority of employees.

Anti-discrimination testing: Generosity criteria

- Firms must provide all covered employees the same benefits.
- Any benefit that is provided to only highly compensated individuals is included in gross taxable income.

Additionally: (Source: levitt)

- HCIs cannot be charged less than other employees for the same benefits
- HCIs cannot be charged less than other employees for the same coverage
- HCIs cannot receive shorter waiting periods than other employees.

Anti-discrimination testing: Eligibility criteria

- A plan must satisfy one of the following:
  1. 70% or more of all non-excludable employees participate
  2. 80% or more of all eligible employees participate, if 70% or more of all non-excludable employees are eligible to participate
  3. (If 1 and 2 fail, the IRS can let a plan pass the eligibility test on an ad hoc basis if it finds the plan covers a representative cross-section of employees.)
- If a plan fails this criteria, a percent of the benefits paid to highly compensated individuals is taxed. The percent is the share of all benefits paid to HCI.
- Highly compensated individuals (HCI) are
  1. any employee that is in the highest paid 25 percent of all employees
  2. the five highest-paid officers
  3. shareholder who owns more than 10 percent in value of the stock of the employer.

Section 105 only applies to self-funded plans Back

- Self funded - employer assumes direct financial responsibility for the costs of enrollees' medical claim
- Fully funded - the insurance company assumes this responsibility.
- Firms could potentially circumvent section 105 by offering fully funded plans, but
  - Fully funded plans have additionally costs as they are effected by state insurance laws, e.g. premium taxes. Self funded plans are exempt from these laws.
  - In practice, a majority of firms offer self-funded plans, especially large firms.
    - in 2010, 59% of covered employees had self funded plans.
    - In firms with 5,000 or more employees, this share was 93%.

What if firms offer multiple plans? Back

- A firm could seemingly fail the eligibility test if employees are split up among multiple plans, so no plan benefits a majority of employees.
- However, as long as high-wage and rank-and-file employees receive similar benefits, the firm will not violate the anti-discrimination regulation.
- Also, multiple plans can be considered as one plan for the purpose of discrimination testing.
- Also, they could pass by option 3.
-

Majority of variance in employer contributions in between firms

Back

- 1993 Robert Wood Johnson Foundation Employer Health Insurance Survey
  - Plan id, employer id, and employer premiums.
  - 22,000 plans, 15,000 employer.
- 25% of sampled firms offer more than one health plan.
- Variance decomposition of employer paid premiums:

$$\underbrace{Var(x_{ij} - \bar{x})}_{\text{Total dispersion}} = \underbrace{Var(x_{ij} - \bar{x}_j)}_{\text{Within firm}} + \underbrace{Var(\bar{x}_j - \bar{x})}_{\text{Between firm}}$$

  - 83% of the total variation of single plan employer premiums is between firms.
  - For family plans, 86%.

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Compensation Packages

- Tax advantage $\longrightarrow$ firms offer health plans.
- Define $\{a_s^*, w_s^*\} \equiv \underset{\{a,w\}\in R_+^2}{\text{argmin}} \{a + w \mid v(a,w) \geq \tilde{v}_s\}$.
- Each outsourcing firm demands only 1 type of labor.
  - Unaffected by the anti-discrimination laws. Offer $\{a_s^*, w_s^*\}$.
- Traditional firms use every skill level.
  - Constrained by the anti-discrimination laws. Health plan $a_j \approx \sum_{s\in\mathcal{S}} \widetilde{\omega}_s a_s^*$ Weights
- For low-skill workers, the traditional firm
  - offers a higher health plan $a^f > a_l^*$ than the outsourcing firm,
  - but lower wages $w_l^f < w_l^*$. Overall labor costs are higher $a^f + w_l^f > a_l^o + w_l^o$

Decomposing the relative price of employees

$$\rho_l \approx 1 + \underbrace{\left(a_h^* - a_l^*\right)^2}_{\text{Distance between cost-minimizing plans}} \times \underbrace{\left(\frac{\partial^2 w\left(a, v_l\right)}{\partial a^2}\bigg|_{a=a_l^*} \right)}_{\text{Sensitivity of } w_l^f \text{ to change in health plan}} \times \underbrace{\widetilde{\omega}_h^2}_{\text{Weight on } a_h^* \text{ in } a^f} \times \underbrace{\frac{1}{w_l^* + a_l^*}}_{\text{Cheapest low-skill compensation cost}}$$

- Any trend that increases the distance between a_s^*s will increase ρ_l and thus $\frac{n_l^o}{N_l}$.

Traditional firm's optimal health plan

Back

$$a^f \approx \sum_{s\in\mathcal{S}} \frac{\omega_s}{\sum_{s'}\omega_{s'}} a_s^* = \sum_{s\in\mathcal{S}} \widetilde{\omega}_s a_s^*,$$

$$\omega_s = \underbrace{\varphi_s}_{\substack{\text{skill}\\ \text{weight}}} \times \underbrace{\frac{(w_s^f + a^f)n_s^f}{(w_s^f + a^f)n_s^f + p_s o_s^f}}_{\substack{\text{share of } s\text{-expenditure}\\ \text{on employees}}} \times \underbrace{\frac{\partial^2}{\partial a^2}\Big(\log\big(a + w(a, v_s)\big)\Big)\Big|_{a=a_s^*}}_{\substack{\text{compensation package}\\ \text{cost curvature}}},$$