Labor Market Concentration in a Ricardian World

Mayara Felix

November 14, 2022

Motivation

- Increasing interest on how labor market concentration affects wages.
  - Berger, Herkenhoff and Mongey 2022; Benmelech, Bergman and Kim 2022; Schubert, Stansbury and Taska 2021; Marinescu, Ouss and Pape 2021; Azar et al. 2020
- Felix 2022 examines link between trade, labor market concentration, and wages in the context of Brazil's trade liberalization.
  - Theoretical motivation. Melitz 2003: Small firms exit, large firms expand.
  - Design: Oligopsony in labor markets + trade shocks from liberalization.
  - Show: Effect on concentration is necessary (not sufficient) for effects on wage markdowns.
  - Find: Trade $\uparrow$ concentration, but did not meaningully reduce wages via markdowns.

Motivation

- Increasing interest on how labor market concentration affects wages.
  - Berger, Herkenhoff and Mongey 2022; Benmelech, Bergman and Kim 2022; Schubert, Stansbury and Taska 2021; Marinescu, Ouss and Pape 2021; Azar et al. 2020
- Felix 2022 examines link between trade, labor market concentration, and wages in the context of Brazil's trade liberalization.
  - Theoretical motivation. Melitz 2003: Small firms exit, large firms expand.
  - Design: Oligopsony in labor markets + trade shocks from liberalization.
  - Show: Effect on concentration is necessary (not sufficient) for effects on wage markdowns.
  - Find: Trade $\uparrow$ concentration, but did not meaningully reduce wages via markdowns.
- **Today**: Revisit the theoretical motivation for link between trade and concentration.
  - Melitz: Key force is **within-sector** cross-firm reallocations (productivity differences)
  - Typical liberalization: Key force is **cross-sector** reallocations (comparative advantage)

Motivation

- Increasing interest on how labor market concentration affects wages.
  - Berger, Herkenhoff and Mongey 2022; Benmelech, Bergman and Kim 2022; Schubert, Stansbury and Taska 2021; Marinescu, Ouss and Pape 2021; Azar et al. 2020
- Felix 2022 examines link between trade, labor market concentration, and wages in the context of Brazil's trade liberalization.
  - Theoretical motivation. Melitz 2003: Small firms exit, large firms expand.
  - Design: Oligopsony in labor markets + trade shocks from liberalization.
  - Show: Effect on concentration is necessary (not sufficient) for effects on wage markdowns.
  - Find: Trade $\uparrow$ concentration, but did not meaningully reduce wages via markdowns.
- **Today**: Revisit the theoretical motivation for link between trade and concentration.
  - Melitz: Key force is **within-sector** cross-firm reallocations (productivity differences)
  - Typical liberalization: Key force is **cross-sector** reallocations (comparative advantage)

Key question: What does Ricardian trade imply for labor market concentration?

Goal: Trade $\rightarrow$ Labor Market Concentration in a (simple) Ricardian World

Goal: Trade $\rightarrow$ Labor Market Concentration in a (simple) Ricardian World

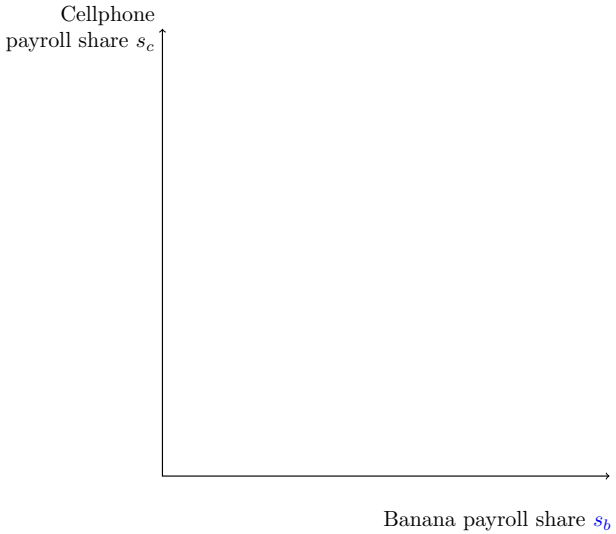
Home economy:

1. 2-sectors: Bananas and cellphones
2. Labor only, CRS, sector-spec prod.
3. Unit-cont. homog. firms per sector
4. Fixed entry
5. CES prod demand and labor supply
6. Comparative advantage in bananas

Goal: Trade → Labor Market Concentration in a (simple) Ricardian World

Home economy:

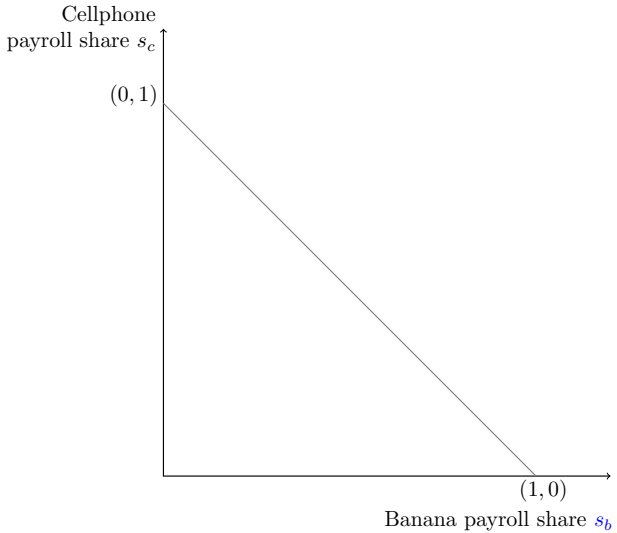
1. 2-sectors: Bananas and cellphones
2. Labor only, CRS, sector-spec prod.
3. Unit-cont. homog. firms per sector
4. Fixed entry
5. CES prod demand and labor supply
6. Comparative advantage in bananas



Goal: Trade → Labor Market Concentration in a (simple) Ricardian World

Home economy:

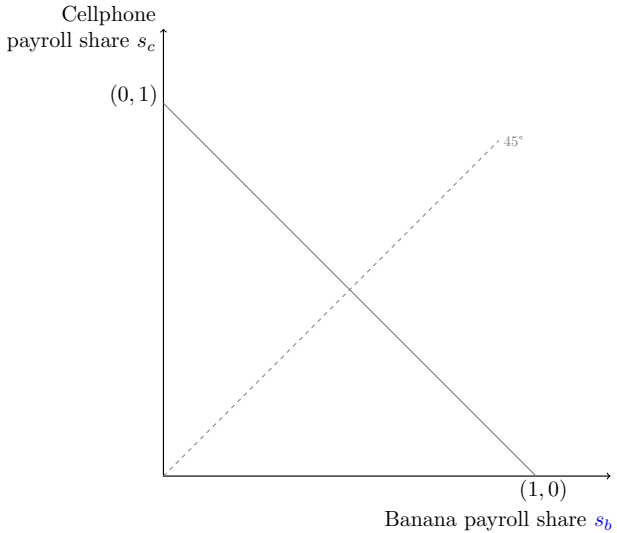
1. 2-sectors: Bananas and cellphones
2. Labor only, CRS, sector-spec prod.
3. Unit-cont. homog. firms per sector
4. Fixed entry
5. CES prod demand and labor supply
6. Comparative advantage in bananas



Goal: Trade → Labor Market Concentration in a (simple) Ricardian World

Home economy:

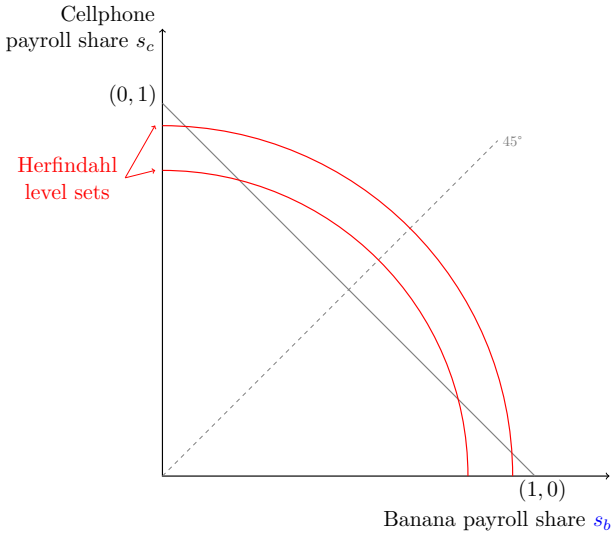
1. 2-sectors: Bananas and cellphones
2. Labor only, CRS, sector-spec prod.
3. Unit-cont. homog. firms per sector
4. Fixed entry
5. CES prod demand and labor supply
6. Comparative advantage in bananas



Goal: Trade → Labor Market Concentration in a (simple) Ricardian World

Home economy:

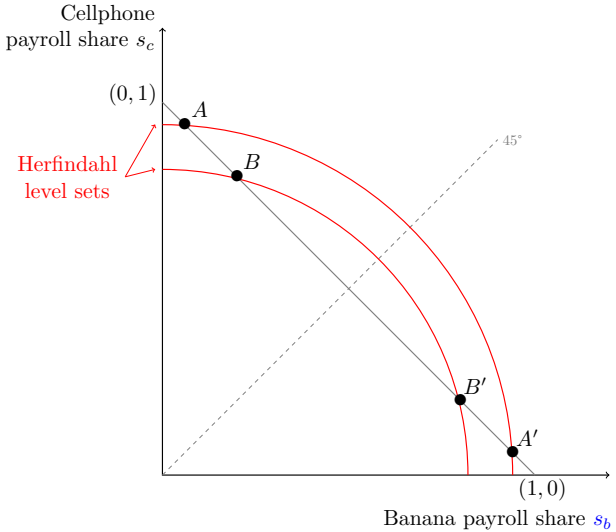
1. 2-sectors: Bananas and cellphones
2. Labor only, CRS, sector-spec prod.
3. Unit-cont. homog. firms per sector
4. Fixed entry
5. CES prod demand and labor supply
6. Comparative advantage in bananas



Goal: Trade → Labor Market Concentration in a (simple) Ricardian World

Home economy:

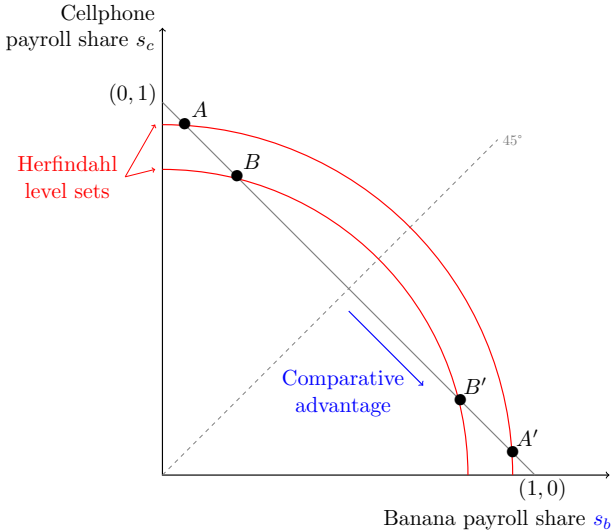
1. 2-sectors: Bananas and cellphones
2. Labor only, CRS, sector-spec prod.
3. Unit-cont. homog. firms per sector
4. Fixed entry
5. CES prod demand and labor supply
6. Comparative advantage in bananas



Goal: Trade → Labor Market Concentration in a (simple) Ricardian World

Home economy:

1. 2-sectors: Bananas and cellphones
2. Labor only, CRS, sector-spec prod.
3. Unit-cont. homog. firms per sector
4. Fixed entry
5. CES prod demand and labor supply
6. Comparative advantage in bananas

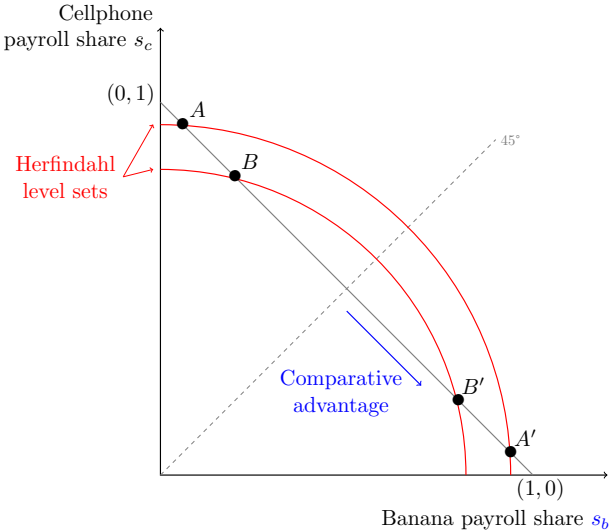


Goal: Trade → Labor Market Concentration in a (simple) Ricardian World

Key Questions:

1. When does HHI increase? Sufficient conditions for:
   - Autarky to free trade
   - Import tariff reductions in a small protected economy
2. How does this change with
   - Unit cont. → Finitely many firms
   - Homog firms → Het firms
   - Fixed entry → Entry à la Melitz
   - 2 sectors → N sectors

To answer, let's formalize...



Autarky Equilibrium: Households

Representative household solves:

$$\max_{\mathbf{q},\mathbf{l}} \quad \left[\sum_{i\in\{b,c\}} (\alpha_i q_i)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} - \left[\sum_{i\in\{b,c\}} \int l_{ij}^{\frac{\eta+1}{\eta}} dj\right]^{\frac{\eta}{\eta+1}}$$

$$\text{s.t.} \quad \sum_{i\in\{b,c\}} p_i q_i \leq \sum_{i\in\{b,c\}} \int w_{ij} l_{ij} dj + Z$$

where Z is unearned income (i.e., profits), $\sigma > 1, \eta > 0$. FOCs give:

$$l_{ij} = L\left(\frac{w_{ij}}{W}\right)^{\eta} \qquad \textbf{Labor supply}$$

$$q_i = Q\left(\frac{p_i}{P}\right)^{-\sigma} \alpha_i^{\sigma-1} \qquad \textbf{Product demand}$$

Details

Autarky Equilibrium: Firms

Perfectly comp. product market. Monopsonistically comp. labor market. Firm j solves

$$\begin{aligned} \max_{l_{ij}} \quad & p_i \gamma_i l_{ij} - w_{ij}\left(l_{ij}\right) l_{ij} \\ \text{s.t.} \quad & l_{ij} = L\left(\frac{w_{ij}}{W}\right)^{\eta} \quad \text{Labor supply} \end{aligned}$$

where γ_i is sector i's producticity. FOC gives:

$$w_{ij} = \frac{p_i \gamma_i}{1+\eta} \quad \forall j, i \in \{b, c\}$$

which pins down firm j's size (and output, via prod function) given labor supply:

$$\begin{aligned} l_{ij}^d &= l_{ij|w_{ij}=p_i\gamma_i/(1+\eta)} && \textbf{Labor demand} \\ q_i &= \gamma_i l_{ij}^d && \textbf{Product supply} \end{aligned}$$

Autarky Equilibrium: Market clearing

- Recall what we need to place the autarky equilibrium above or below the 45° line:
  - An expression for $\frac{s_b}{s_c} = \frac{w_b l_b}{w_c l_c}$ in terms of exogenous parameters
  - Can focus on relative quantities. If want levels, fix aggr. labor endowment.

- **Labor market clearing**. Equating labor supply to labor demand gives:

$$\frac{w_b l_b}{w_c l_c} = \left(\frac{p_b \gamma_b}{p_c \gamma_c}\right)^{1+\eta}, \quad \text{with } \frac{w_b}{w_c} = \frac{p_b \gamma_b}{p_c \gamma_c} \tag{1}$$

- **Product market clearing**. Equating product supply to product demand gives:

$$\frac{\gamma_b l_b}{\gamma_c l_c} = \left(\frac{p_b}{p_c}\right)^{-\sigma} \left(\frac{\alpha_b}{\alpha_c}\right)^{\sigma-1} \tag{2}$$

Autarky Equilibrium: Market clearing

- Combining product and labor market clearning, solve for p_b/p_c:

$$\frac{p_b}{p_c} = \left[\left(\frac{\gamma_c}{\gamma_b} \right)^{1+\eta} \left(\frac{\alpha_b}{\alpha_c} \right)^{\sigma-1} \right]^{\frac{1}{\sigma+\eta}} \tag{3}$$

- Plug back into labor market clearing to get:

$$\frac{w_b l_b}{w_c l_c} = \left(\frac{\gamma_b}{\gamma_c} \right) \left[\frac{\alpha_b^{\sigma-1}/\gamma_b^{\eta+1}}{\alpha_c^{\sigma-1}/\gamma_c^{\eta+1}} \right]^{\frac{1}{\sigma+\eta}} \tag{4}$$

- Intuition?

Autarky Equilibrium: Market clearing

- Combining product and labor market clearning, solve for p_b/p_c:

$$\frac{p_b}{p_c} = \left[\left(\frac{\gamma_c}{\gamma_b} \right)^{1+\eta} \left(\frac{\alpha_b}{\alpha_c} \right)^{\sigma-1} \right]^{\frac{1}{\sigma+\eta}} \tag{3}$$

- Plug back into labor market clearing to get:

$$\frac{w_b l_b}{w_c l_c} = \left(\frac{\gamma_b}{\gamma_c} \right) \left[\frac{\alpha_b^{\sigma-1}/\gamma_b^{\eta+1}}{\alpha_c^{\sigma-1}/\gamma_c^{\eta+1}} \right]^{\frac{1}{\sigma+\eta}} \tag{4}$$

- Intuition?

Key Question: When is autarky below the 45° line? That is, when is $\frac{w_b l_b}{w_c l_c} > 1$?

Proposition 1: Labor Market Concentration in Autarky $\rightarrow$ Free trade

In a 2-sector Ricardian economy (e.g., bananas b, cellphones c) with

- *Fixed entry, unit-continuum of homogenous firms in each sector;*
- *CES product demand and labor supply; and*
- *CRS technology, labor only input, sector-specific productivity*

If Home has a comparative advantage in sector b, a move from Autarky to Free Trade ***unambiguously increases labor market concentration*** *if*

$$\alpha_b^{\frac{1}{\sigma}} \gamma_b > \alpha_c^{\frac{1}{\sigma}} \gamma_c \tag{5}$$

Proof. Solve equation 4 for $\frac{w_b l_b}{w_c l_c} > 1$. *When 5 holds, the autarky equilibrium is below the* 45° *line in the economy's payroll shares* (b, c)*-frontier. Comparative advantage in b pushes the economy further into b production, placing it at a higher HHI level set.*

Proposition 1: Labor Market Concentration in Autarky $\rightarrow$ Free trade

In a 2-sector Ricardian economy (e.g., bananas b, cellphones c) with

- *Fixed entry, unit-continuum of homogenous firms in each sector;*
- *CES product demand and labor supply; and*
- *CRS technology, labor only input, sector-specific productivity*

If Home has a comparative advantage in sector b, a move from Autarky to Free Trade ***unambiguously increases labor market concentration*** *if*

$$\alpha_b^{\frac{1}{\sigma}} \gamma_b > \alpha_c^{\frac{1}{\sigma}} \gamma_c \tag{5}$$

Proof. Solve equation 4 for $\frac{w_b l_b}{w_c l_c} > 1$. *When 5 holds, the autarky equilibrium is below the* 45° *line in the economy's payroll shares* (b, c)*-frontier. Comparative advantage in b pushes the economy further into b production, placing it at a higher HHI level set.*

Intuition?

What about import tariff reductions in a Small Protected Economy (SPE)?

- Suppose Home is the same as before, but in addition:
  - Home is a small protected economy: open to trade, but with import tariffs
  - Home protects the sector in which it has a comparative disadvantage (i.e., cellphones)
- Since Home is small & Home firms are price takers, prices in the protected equilibrium are

$$\begin{aligned} p_b &= p_b^* \\ p_c &= p_c^* (1+\tau), \quad \tau > 0 \end{aligned}$$

- Plugging these into Home's labor market clearing condition gives:

$$\frac{w_b l_b}{w_c l_c} = \left(\frac{p_b^* \gamma_b}{p_c^* (1+\tau) \gamma_c} \right)^{1+\eta} \tag{6}$$

What about import tariff reductions in a Small Protected Economy (SPE)?

- Suppose Home is the same as before, but in addition:
  - Home is a small protected economy: open to trade, but with import tariffs
  - Home protects the sector in which it has a comparative disadvantage (i.e., cellphones)
- Since Home is small & Home firms are price takers, prices in the protected equilibrium are

$$\begin{aligned} p_b &= p_b^* \\ p_c &= p_c^* (1+\tau), \quad \tau > 0 \end{aligned}$$

- Plugging these into Home's labor market clearing condition gives:

$$\frac{w_b l_b}{w_c l_c} = \left(\frac{p_b^* \gamma_b}{p_c^* (1+\tau) \gamma_c} \right)^{1+\eta} \tag{6}$$

Key Question: When is Home's $\tau-$protected equilibrium below the 45° line?

Proposition 1: Labor Market Concentration when $\tau \downarrow$ in SPE

In a 2-sector Ricardian economy (e.g., bananas b, cellphones c) with

- *Fixed entry, unit-continuum of homogenous firms in each sector;*
- *CES product demand and labor supply; and*
- *CRS technology, labor only input, sector-specific productivity*

If Home protects sector c, in which it as a comparative disadvantage, with an import tariff τ, then reducing this import tariff ***unambiguously increases labor market concentration*** *if*

$$1 + \tau < \frac{p_b^* \gamma_b}{p_c^* \gamma_c} = \frac{MRPL_{b|p*}}{MRPL_{c|p*}} \tag{7}$$

Proof. Solve equation 6 for $\frac{w_b l_b}{w_c l_c} > 1$. When 7 holds, the pre-tariff-reform SPE equilibrium is below the 45° line in the economy's payroll shares (b, c)-frontier. Comparative advantage in b pushes the economy further into b production, placing it at a higher HHI level set.

Proposition 1: Labor Market Concentration when $\tau \downarrow$ in SPE

In a 2-sector Ricardian economy (e.g., bananas b, cellphones c) with

- *Fixed entry, unit-continuum of homogenous firms in each sector;*
- *CES product demand and labor supply; and*
- *CRS technology, labor only input, sector-specific productivity*

If Home protects sector c, in which it as a comparative disadvantage, with an import tariff τ, then reducing this import tariff ***unambiguously increases labor market concentration*** *if*

$$1 + \tau < \frac{p_b^* \gamma_b}{p_c^* \gamma_c} = \frac{MRPL_{b|p*}}{MRPL_{c|p*}} \tag{7}$$

Proof. Solve equation 6 for $\frac{w_b l_b}{w_c l_c} > 1$. When 7 holds, the pre-tariff-reform SPE equilibrium is below the 45° line in the economy's payroll shares (b, c)-frontier. Comparative advantage in b pushes the economy further into b production, placing it at a higher HHI level set.

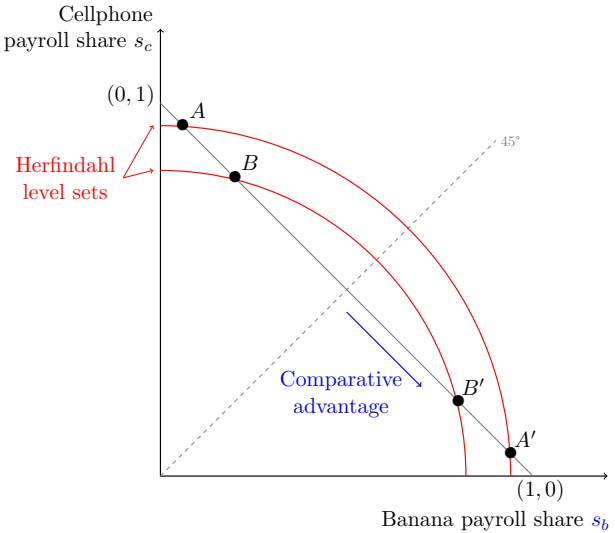
Intuition?

Revisiting our Goals...

Key Questions:

1. When does HHI increase? Sufficient conditions for:
   - Autarky to free trade ✓
   - Import tariff reductions in a small protected economy ✓
2. How does this change with
   - 2.1 Unit cont. → Finitely many firms
   - 2.2 Homog firms → Het firms
   - 2.3 Fixed entry → Entry à la Melitz
   - 2.4 2 sectors → N sectors

Trickiest issues are 2.3 and 2.4. Let's discuss...



Taking stock...

- We revisited the theoretical motivation for link between trade and concentration.
  - Melitz: Key force is **within-sector** cross-firm reallocations (productivity differences)
  - Typical liberalization: Key force is **cross-sector** reallocations (comparative advantage)
- **Key question**: What does Ricardian trade imply for labor market concentration?

- We studied a simple two-sector Ricardian economy. **Key results**:
  1. Autarky $\rightarrow$ Free Trade: HHI increases if Home has higher utility-adjusted productivity in its comparative advantage sector (e.g., super productive or Home consumers love it).
  2. In a Small Protected Economy: for low pre-reform protection levels, tariff reductions increase HHI if Home protects the sector in which it has a comparative disadvantage.
- **Next**: How do these change with deviations from the simple model?

Autarky Equilibrium: Households - Details

- CES quantity indices are defined as

$$Q \equiv \left[\sum_{i \in \{b,c\}} (\alpha_i q_i)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \quad L \equiv \left[\sum_{i \in \{b,c\}} \int l_{ij}^{\frac{\eta+1}{\eta}} dj \right]^{\frac{\eta}{\eta+1}}$$

- The price and wage indices for which $PQ = \sum_i p_i q_i$ and $WL = \sum_i \int w_{ij} l_{ij} dj$ are

$$P = \left[\sum_i (p_i/\alpha_i)^{1-\sigma} \right]^{\frac{1}{1-\sigma}}, \qquad W = \left[\sum_i \int w_{ij}^{1+\eta} dj \right]^{\frac{1}{1+\eta}}$$

Back

Azar, José, Ioana Marinescu, Marshall Steinbaum, and Bledi Taska. 2020. "Concentration in US labor markets: Evidence from online vacancy data." *Labour Economics*, 66: 101886.

Benmelech, Efraim, Nittai K Bergman, and Hyunseob Kim. 2022. "Strong Employers and Weak Employees How Does Employer Concentration Affect Wages?" *Journal of Human Resources*, 57(S): S200–S250.

Berger, David, Kyle Herkenhoff, and Simon Mongey. 2022. "Labor market power." *American Economic Review*, 112(4): 1147–93.

Felix, Mayara. 2022. "Trade, Labor Market Concentration, and Wages." Job Market Paper.

Marinescu, Ioana, Ivan Ouss, and Louis-Daniel Pape. 2021. "Wages, hires, and labor market concentration." *Journal of Economic Behavior & Organization*, 184: 506–605.

Melitz, Marc J. 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica: Journal of the Econometric Society*, 71(6): 1695–1725.

Schubert, Gregor, Anna Stansbury, and Bledi Taska. 2021. "Employer concentration and outside options." *Available at SSRN 3599454*.