PEDL-STEG Course on Private Enterprises, Productivity, and Economic Growth

Lecture 3: Distortions and Measurement

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Introduction

- **Two views of economic underdevelopment:**
  1. Due to poor technology and/or endowments ("bad PPFs")
  2. Due to distortions that cause *misallocation* of endowments to most beneficial uses ("inside own PPF")

- **This lecture:**
  - A brief (and inevitably selective) overview of how existing work has sought to define and quantify distortions/misallocation

- **Additional motivation for study of misallocation:**
  - Core to Econ: a field often defined by the view that markets promote (and market failures limit) the allocation of scarce resources to their best uses
  - Core to Dev Econ: a field often defined by the study of relatively distorted economies
  - At the root of "big picture" view of development/growth (e.g Acemoglu, Johnson, Robinson; and Aghion, Howitt, Mokyr Nobel Prizes): good institutions minimize misallocation

Great reference material

- **Pioneering discussions of misallocation:**
  - Hopenhayn and Rogerson (1993)
  - Banerjee and Duflo (2005)
  - Restuccia and Rogerson (2008)
  - Hsieh and Klenow (2009)
  - (And e.g. Mas-Colell, Whinston and Green (1995))
- **Surveys of misallocation literature:**
  - Hopenhayn (2014)
  - Restuccia and Rogerson (2017)
  - Atkin and Donaldson (2022)
  - Buera, Kaboski and Townsend (2023)
  - de Loecker and Eckhout (2025)
  - Ghatak and Mookherjee (2025)
  - Bergquist, Lashkari and Verhoogen (2026)

What do we mean by misallocation of production?

- Set of goods i enter "national utility" (i.e. ignoring distributional considerations):

$$U = U(\mathbf{y})$$

- Each good i is produced by a firm i using input x_i via arbitrary technology:

$$y_i = F_i(x_i)$$

- NB: Think broadly about how x_i can enter $F_i(\cdot)$
  - Lots of "techniques" for turning x into y beyond simply "production"
  - Examples: R&D, IT, "upgrading", re-organizing, searching, marketing/advertising, transporting, training, learning, using multiple establishments etc.

- Nation has fixed/inelastic amount ("endowment") of the input

$$\sum_i x_i \leqslant X$$

- Consumers always optimizing when facing prices $\mathbf{p}$, so $p_i \propto \frac{\partial U(\mathbf{y})}{\partial y_i}$

How could a country optimally organize production?

- Answered by the program:

$$\max_{\mathbf{x} \geqslant \mathbf{0}} U(\mathbf{y}) \quad s.t. \quad y_i \leqslant F_i(x_i) \;\; \forall i, \quad \sum_i x_i \leqslant X$$

- Achieved at allocation $(\mathbf{y}^*, \mathbf{x}^*)$, that satisfies necessary conditions:

$$\frac{\partial U(\mathbf{y}^*)}{\partial y_i} \frac{\partial F_i(x_i^*)}{\partial x_i} = \lambda^* > 0 \quad \text{for all } i \text{ with } \; x_i^* > 0 \tag{1}$$

- What we are doing here:
  - Holding the PPF (i.e. the endowment X and technologies $\{F_i(\cdot)\}_i$) fixed
  - And then characterizing the input mix $\mathbf{x}^*$ that will deliver a particular point $\mathbf{y}^*$ on the PPF (in fact, the best point on it, according to $U(\cdot)$)

How does this country actually organize production?

- Definition: Suppose an economy has the input allocation $\mathbf{x}$, households face linear prices $\mathbf{p}$, and the input sells at price w. Then the *wedge* for good i is

$$\mu_i(x_i, p_i, w) \equiv \frac{p_i}{w} \frac{\partial F_i(x_i)}{\partial x_i}$$

- Here, note several things:
  - We have no idea what these goods are, so the p_i is super important
  - Efficiency is about the marginal product $\frac{\partial F_i(x_i)}{\partial x_i}$ not the average
  - Dividing by w isn't really necessary, but makes μ_i nicely unit-free

- So if we denote the actual allocation and prices as $(\bar{\mathbf{x}}, \bar{\mathbf{p}}, \overline{w})$, the wedges at the *actual* allocation are

$$\overline{\mu}_i \equiv \mu_i(\overline{x}_i, \overline{p}_i, \overline{w}) = \frac{\overline{p}_i}{\overline{w}} \frac{\partial F_i(\overline{x}_i)}{\partial x_i}$$

When does the actual allocation feature misallocation?

- If the optimal allocation has $(\mathbf{x}^*, \mathbf{p}^*, w^*)$ then it has wedges $\mu_i^* \equiv \mu_i(x_i^*, p_i^*, w^*)$
- So from (1) we see that the optimal allocation has:

$$\mathbb{V}ar[\mu_i^*] = 0$$

- Hence the actual allocation $(\overline{\mathbf{x}}, \overline{\mathbf{p}}, \overline{w})$ features *misallocation* when

$$\mathbb{V}ar[\overline{\mu}_i] > 0$$

- Why is misallocation about $\mathbb{V}ar[\overline{\mu}_i]$ rather than the level $\mathbb{E}[\overline{\mu}_i]$?
  - You may be used to seeing the necessary condition for no misallocation as: "$\overline{\mu}_i = 1$ for all i"
  - This is true when there is (at least) one good $i = 0$ where we believe that $\overline{\mu}_0 = 1$ always occurs; so then $\mathbb{V}ar[\overline{\mu}_i] = 0$ can only be true if $\overline{\mu}_i = 1$ for all $i \neq 0$
  - Common ass'n in IO/Trade: some "outside good" 0 is undistorted (i.e. $\overline{\mu}_0 = 1$)
  - Common ass'n in Macro: X is households' time budget, and leisure is a good 0 that is produced with no distortions (i.e. $\overline{\mu}_0 = 1$)

Why might misallocation occur?

- **Generic answer:** *market failures* (i.e. First Welfare Theorem violated)
  - Taxes, subsidies, regulations
  - Corruption, bribes, expropriation
  - Asymmetric information (e.g. credit constraints, adverse selection, moral hazard)
  - Incomplete contracts (e.g. hold-up. limited commitment, limited liability)
  - Market power (e.g. oligopoly in output market, oligopsony in input market)
  - Pure externalities (e.g. knowledge spillovers, pollution)
  - (See Greenwald and Stiglitz, 1986, for an insightful unification of many of these.)
- **Can also add case of non-optimizing firms** ("internalities")
  - Chosen $\overline{x}_i$ may not even be privately profit-maximizing for the firm
  - E.g. due to mistakes, or certain types of agency problems within the firm
- **Key point:** regardless of the microfoundation(s) above that are at work, the wedges $\{\overline{\mu}_i\}_i$ summarize the total/net effect(s) of market failures and/or internatlities for misallocation

Examples of market failure microfoundations

- Consider a firm facing 4 different sources of market failure: linear output taxes τ_i^Y, input taxes τ_i^X, and market power on its output and input markets (i.e. faces finite residual elasticities of demand and/or supply).
- Firm's profit-maximization problem is:

$$\max_{x_i}(1-\tau_i^Y)p_i y_i - (1+\tau_i^X)wx_i \quad \text{s.t.} \quad y_i = F_i(x_i), y_i = RD_i(p_i), x_i = RS_i(w)$$

- Firm's privately optimal choice(s) characterized by FOC that can be written as (where $MC_i \equiv \frac{\partial C_i(w,y_i)}{\partial y_i} = w\left(\frac{\partial F_i(x_i)}{\partial x_i}\right)^{-1}$)

$$p_i = \left(\frac{1+\tau_i^X}{1-\tau_i^Y}\right)\left(\frac{1+\epsilon_{RS_i}^{-1}}{1-\epsilon_{RD_i}^{-1}}\right)MC_i \quad \Longleftrightarrow \quad \mu_i = \frac{1+\tau_i^X}{1-\tau_i^Y}\frac{1+\epsilon_{RS_i}^{-1}}{1-\epsilon_{RD_i}^{-1}}$$

- So 4 separate market failure sources contribute to the single wedge μ_i. But μ_i still summarizes the consequences of all 4 of them for misallocation.
    - Intuition: with one input, only one margin can be distorted (and μ_i summarizes that)

Extensions

- **Multiple types of inputs (“m”):**
  - (E.g. labor, capital, materials, human capital, management, intangibles...)
  - Everything works with $\mu_{im}(\mathbf{x}_i, p_i, w_m) \equiv \frac{p_i}{w_m}\frac{\partial F_i(\mathbf{x}_i)}{\partial x_{im}}$ and $\mathbb{V}ar(\mu^*_{im}) = 0 \ \forall m$
  - But when some inputs X_m are produced from some outputs y, things get more complicated (due to “double-marginalization”)
- **Multi-product (“j”) firms, with joint production:**
  - Firms now have transformation functions $F_i(\mathbf{y}_i, x_i) = 0$ not production functions
  - Everything works with $\mu_{ij}(\mathbf{y}_i, x_i, p_{ij}, w) \equiv -\frac{p_{ij}}{w}\frac{\partial F_i(\mathbf{y}_i, x_i)/\partial x_i}{\partial F_i(\mathbf{y}_i, x_i)/\partial y_{ij}}$ and $\mathbb{V}ar(\mu^*_{ij}) = 0$
  - Important for studying externalities (e.g. firm makes both “widgets” and pollution)
- **What are the goods and inputs anyway?**
  - Could be indexed by space, time, state of the world, etc.
- **What if there are multiple households?**
  - Everything above describes *production efficiency*, which is generically necessary for Pareto efficiency
  - But can also generalize $U(\cdot)$ to a SWF that puts desired (and known) marginal welfare weights on different agents. Exact same framework can then be used for speaking about distribution as well as efficiency.

Necessary and sufficient conditions for no misallocation

- **Warning**:
  - In general, the condition of $\mathbb{V}ar(\overline{\mu}_i|\overline{x}_i > 0) = 0$ (i.e. no dispersion in wedges among "active firms", those with $\overline{x}_i > 0$) is necessary but not sufficient for no misallocation
- **If technologies are convex:**
  - No misallocation $\iff$ (i) $\mathbb{V}ar(\overline{\mu}_i|\overline{x}_i > 0) = 0$ and (ii) the wedge for any inactive firm ($\overline{x}_i = 0$) is lower than the common level of wedges among active firms.
- **But if some technologies non-convex:**
  - Suppose $F_i(\cdot)$ still differentiable at $x_i = 0$ (e.g. S-shape production function). Then conditions (i) and (ii) could be true, but this interior allocation is only a local optimum.
  - Or, suppose $F_i(\cdot)$ not differentiable at $x_i = 0$ (e.g. due to fixed costs or indivisibilities). Then condition (ii) doesn't even make sense. Can have (i) holding yet wrong number/set of active firms.

How costly is misallocation?

- If $Var(\overline{\mu}_i) > 0$ then the allocation $\bar{\mathbf{x}}$ features misallocation. But how bad is loss (how much richer at optimum than at actual?):

$$\mathcal{L} \equiv U(\mathbf{y}^*)/U(\bar{\mathbf{y}}) - 1$$

- This question is harder to answer since need to know:
  - Technologies and $U(\cdot)$ in order to solve for $\mathbf{y}^*$
  - And again $U(\cdot)$ in order to then evaluate $U(\mathbf{y}^*)$ and $U(\bar{\mathbf{y}})$
- One approach: long tradition associated with Harberger (1964), studies second-order approximation (around $\mathbf{y}^*$) under assumptions about "local" (to $\mathbf{y}^*$) nature of technologies and $U(\cdot)$.
- Useful case (but see Baqaee and Farhi (2020) for richer settings): if $U(\cdot)$ is locally CES with elasticity σ, all $F_i(\cdot)$ are locally CRS, and entry is fixed, then

$$\mathcal{L} \approx \frac{1}{2}\sigma \mathbb{V}ar_{\overline{\lambda}}[\overline{\mu}_i] \qquad \text{with } \mathbb{V}ar_a[b] \equiv \mathbb{E}_a[b^2] - (\mathbb{E}_a[b])^2 \text{ and } \overline{\lambda}_i \equiv \frac{\overline{p}_i \overline{y}_i}{\sum_j \overline{p}_j \overline{y}_j}$$

Measurement of wedges

- How can we estimate objects like $\overline{\mu}_i \equiv \frac{\overline{p}_i}{\overline{w}} \frac{\partial F_i(\overline{x}_i)}{\partial x_i}$ and hence $\mathbb{V}ar_{\overline{\lambda}}[\overline{\mu}_i]$?
- Two broad directions in the literature:
  1. **"Production" approach:** try to learn $\frac{\partial F_i(\overline{x}_i)}{\partial x_i}$ from data
  2. **"Model the market failure" approach:** specify more complete model that features a specific market failure and use model+ data to estimate the implied $\overline{\mu}_i$
- These categories are analogous to how the IO literature has pursued two broad approaches to measuring markups (what they call "production function" and "demand" based approaches).
  - See, e.g., de Loecker and Scott (2025)

Method #1 The “production” approach

- Goal: try to learn $\frac{\partial F_i(\overline{x}_i)}{\partial x_i}$ from data
- Two paths towards this goal:
  (a) **Estimate production functions $F_i(\cdot)$ and take derivative** (e.g. Hsieh and Klenow, 2009)
  (b) **Estimate derivatives from “perturbations” in the allocation** (e.g. Carrillo et al, 2023)

Method #1(a): estimate production functions

- Alternative formulation of wedges based on scale elasticity (which is defined as $\gamma_i(x_i) \equiv \frac{x_i}{y_i}\frac{\partial F_i(x_i)}{\partial x_i}$):

$$\mu_i(x_i, p_i, w) \equiv \frac{p_i}{w}\frac{\partial F_i(x_i)}{\partial x_i} = \frac{p_i y_i}{w x_i}\gamma_i(x_i)$$

- So if assume that all firms share a common production function (up to TFP/quality/units-of-account shifter A_i):

$$y_i = A_i G(x_i)$$

- Then can hope to use data on firms to first estimate $G(\cdot)$ and hence $\gamma(x_i) \equiv \frac{x_i}{G(x_i)}\frac{\partial G(x_i)}{\partial x_i}$. And then calculate wedges at actual allocation via:

$$\overline{\mu}_i = \frac{\overline{p}_i \overline{y}_i}{\overline{w x}_i}\gamma(\overline{x}_i)$$

Results: Hsieh and Klenow (2009)

- Assumed $G(x_i)$ is CRS for all firms, so $\gamma(x_i) = 1$ for all i and x_i—hence marginal products are equal to average products
- Implied So $\mathcal{L}$ (at $\sigma = 3$) is 128% for India and 43% for US
- (In practice, $G(\cdot)$ was a value-added function using K and L as inputs in Cobb-Douglas form. Then what is shown here is $TFPR_i \equiv (\overline{\mu}_{i,L})^{1-\alpha}(\overline{\mu}_{i,K})^{\alpha}$. But HK (2009) reports similar results under a single-input version.)

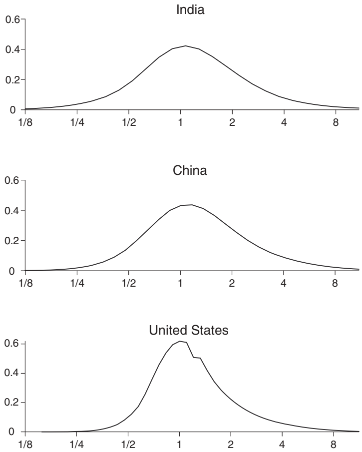
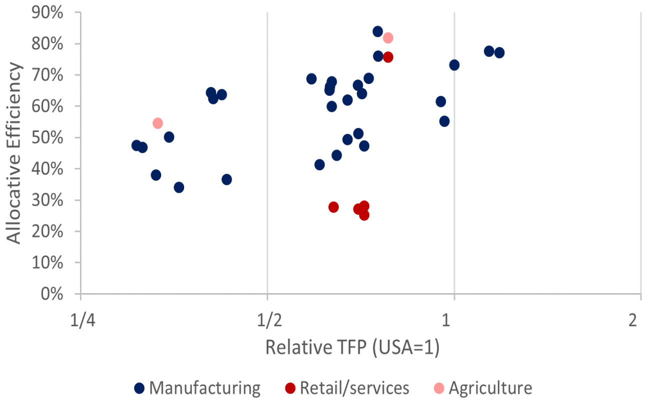


FIGURE II
Distribution of TFPR

(NB: everything normalized relative to country-sector means.)

Can this account for TFP differences across countries?

- HK 2009 exercise repeated in 37 countries c
- "Allocative Efficiency" $\equiv \frac{U_c(\overline{\boldsymbol{y}}_c)}{U_c(\boldsymbol{y}_c^*)}$



(Source: Pete Klenow's BREAD-IGC lecture, 2023.)

Critiques of the production function approach

- **Why would all firms have the same $G(\cdot)$?**
  - (As in Chad Syverson's Lecture #2, firms seem very heterogeneous in many ways. Why not this one?)
  - Good reply is that CRS ($\gamma_i = 1$ for all i) might be expected, in the long run, due to a replication argument—if everything in a firm is replicable (nothing is scarce other than x_i)
  - Raises interesting questions about the nature of the derivative in $\frac{\partial F_i(\overline{x}_i)}{\partial x_i}$
- **Estimating production functions is hard**
  - Identification: typically invoke a timing assumption to get IV for use of certain inputs
  - Data: ideal data on quantities of outputs and inputs is rare to find
- **Measurement error**
  - Noisy data on $p_i y_i$ and/or wx_i probably bias upwards estimated $\mathbb{V}ar[\overline{\mu}_i] = \mathbb{V}ar[\frac{\overline{p}_i \overline{y}_i}{wx_i}]$
  - E.g. Bils et al (2021), Gollin and Udry (2021), Rotemberg and White (2021)
- **Some inputs can be hard to measure:**
  - Capital, human capital, intangibles in particular
  - de Loecker and Syverson (2021) discuss modern best practice

Method #1(b): estimate derivatives from perturbations

- Suppose we have data on allocation $(\bar{\mathbf{y}}, \bar{\mathbf{x}}, \bar{\mathbf{p}}, \overline{w})$ *and* $(\mathbf{y}_t, \mathbf{x}_t)$ at later date t
- Then first-order approx. to change in allocations over time (e.g. $\Delta y_i \equiv y_{i,t} - \overline{y}_i$) is

$$\Delta y_i = \frac{\partial F_i(\bar{x}_i)}{\partial x_i} \Delta x_i + \tilde{\varepsilon}_i$$

where $\tilde{\varepsilon}_i$ collects effects of any change in $F_i(\cdot)$ itself, and any higher-order terms

- Multiply by $\overline{p}_i$, use the definition of $\bar{\mu}_i$, define $\varepsilon_i \equiv \overline{p}_i \tilde{\varepsilon}_i$, and we have:

$$\bar{p}_i \Delta y_i = \bar{\mu}_i \bar{w} \Delta x_i + \varepsilon_i \qquad (2)$$

- Equation (2) looks a bit like a regression equation!
  - That is, $Y_i = \beta_i X_i + \epsilon_i$, with $Y_i \equiv \bar{p}_i \Delta y_i$, $X_i \equiv \bar{w} \Delta x_i$, and $\beta_i \equiv \bar{\mu}_i$
  - Would expect $\mathbb{C}ov(\Delta x_i, \varepsilon_i) \neq 0$, so need an instrument Z_i [more below]
  - Can we use an IV regression to estimate wedges $\bar{\mu}_i$ (i.e price-adjusted derivatives since $\bar{\mu}_i \equiv \frac{\overline{p}_i}{\overline{w}} \frac{\partial F_i(\overline{x}_i)}{\partial x_i}$) of interest?

Aside: Econometrics of $Y_i = \beta_i X_i + \epsilon_i$

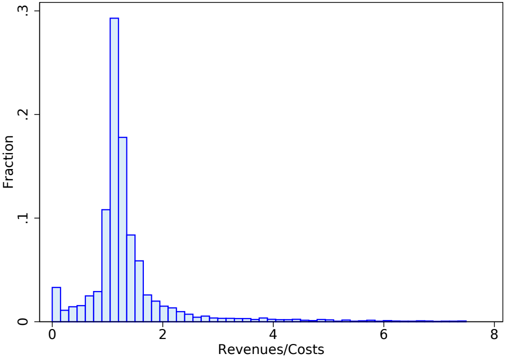
- This is a "random coefficients" (RC) regression model, since all units i have their own β_i. What can be said about estimating such a regression?
- *Bad news*: no good estimator of any *single* β_i (unsurprisingly)
- *Good news*: Masten and Torgovitsky (2017) provide conditions under which a-weighted moments $\mathbb{E}_a\left[\beta_i^k\right]$ (for $k > 0$) *can* be estimated
  - Requires IV Z_i that is independent of β_i and ϵ_i, and is relevant and excludable in the usual senses
  - Requires Z_i to have $k+1$ points of support (e.g. binary RCT: only estimate first moment of β_i)
  - Requires a restriction on the type of first-stage equation heterogeneity
  - But easy to apply (Stata command!)

Back to estimating derivatives from perturbations

- M&T's result means that, armed with a valid IV, can estimate things like $\mathbb{V}ar_{\overline{\lambda}}[\overline{\mu}_i]$ without placing any restrictions on firms' technologies, behavior, or demand conditions
- Here, a valid IV Z_i would be anything that shifts firms' inputs (i.e correlated with Δx_i) but not firms' technologies (i.e. uncorrelated with ε_i). Possible examples:
  - Demand shocks: e.g. Atkin et al (2017), Amiti et al (2023)
  - Resid. demand shocks: e.g. Bergquist & Dinerstein (2020), Jensen & Miller (2018)
  - Input supply shocks: e.g. de Mel et al (2009), Goldberg et al (2010); or, just use same timing assumptions as used in the prod. fun. literature
- Many potential IVs connect to vast RCT literature in development!
- Intuition of what is going on here:
  - Z_i creates a "perturbation" to the input allocation around $\overline{\mathbf{x}}$ that leaves the technology unchanged. This would have no effect on $U(\cdot)$ at the optimum
  - But away from it, regression can detect signs of some firms having higher price-adjusted marginal products than others

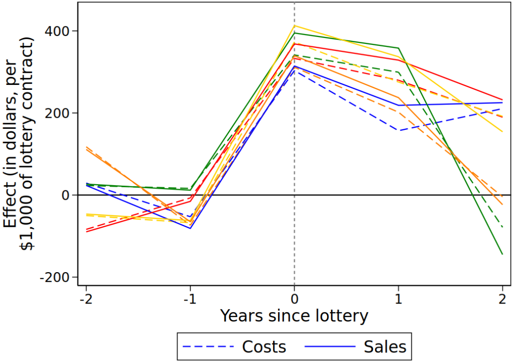
Results: Carrillo et al (2023), part I

- Use admin data from Ecuador construction industry
- This figure: similar distribution of $\frac{\overline{p}_i \overline{y}_i}{\overline{wx}_i}$ (i.e. revenues divided by total costs) in this sector to that in HK (2009) data
- If assumed that $\gamma_i = 1$ for all firms, get implied $\mathcal{L}$ =92% (at $\sigma = 3$)



Results: Carrillo et al (2023), part II

- Attractive demand-based IV here: govt. procurement done by lottery
- This figure: strikingly similar ratio of treatment effect of lottery winning on sales ($\Delta p_i y_i$) to the effect on costs ($\Delta w x_i$) across 5 groups (based on quintiles of baseline size).
  - This is exactly what you'd expect in a no-misallocation economy!
- Indeed, if apply Masten and Torgovitsky (2017) to this setting, get estimated $\mathbb{V}ar_{\overline{\lambda}}[\overline{\mu}_i] = 0.014$ and hence implied $\mathcal{L} = 2\%$ (at $\sigma = 3$)
- So clearly a common $G_i(\cdot)$ for all firms i is wrong in this context



Critiques of the "perturbation" approach

- **Only (weighted) moments are identified**
  - Fine for $\mathcal{L}$ in locally CES economy, but may limit other applications
- **Requires valid IVs**
  - May limit contexts where can be applied
  - But production function estimation of course also requires similar IVs
- **Requires data on price and quantity of outputs and inputs**
  - Theory wants (e.g.) $\overline{p}_i \Delta y_i$ not $\Delta(p_i y_i)$
  - Same as production function estimation, but resulting biases may differ
- **May need relatively large sample sizes to be precise**
  - Hughes and Majerovitz (2023) develop related method based on *observable* heterogeneity (get lower bound on $\mathbb{V}ar_{\overline{\lambda}}[\overline{\mu}_i]$, but may improve precision)
- **Some inputs can be hard to measure**
  - Unmeasured inputs are problematic when their changes are correlated with the IV
  - Carrillo et al (2023) use the presumed sign of this correlation to bound $\mathbb{V}ar_{\overline{\lambda}}[\overline{\mu}_i]$

Method #2: The "model the market failure" approach

- Extensive coverage of this in Bergquist et al (2026), so will be brief here
- Basic idea is well illustrated by seminal example of Hopenhayn and Rogerson (1993); see also Hopenhayn (2014):
  - Rich model of (dynamic, heterogeneous firm) competitive industry equilibrium
  - But in the presence of hiring and firing costs due to specific government policies
  - Hence, an institutionally-aware model of the (quantity restrictions equivalent of an) endogenous input tax τ_i^X, which equals $\overline{\mu}_i$ in the researchers' model
- NB: This is different from an alternative procedure that would first use the production approach to estimate $\overline{\mu}_i$ and then *interpret* that estimate as coming only from, say, input taxes/regulations (by assuming all other sources of market failure are absent)

Other examples of “model the market failure” approach

- **Taxes/regulations**
  - Ad-valorem *de jure* rates often easily map into the marginal rates τ_i^Y and τ_i^X, but one challenge is that *de facto* marginal rates often more complicated (e.g. due to firms' evasion/avoidance)
  - Active area of research on specific case of informality (see Ulyssea (2020) and Penny Goldberg's Lecture #1)
  - Quantity restrictions harder as need wider model to convert to equivalent marginal τ
- **Bribes/theft**
  - Some attempts (e.g. Besley and Mueller (2018) and Atkin and Donaldson (2022)) to convert firm survey questions into as-if marginal rates
- **Price dispersion**
  - Frontier micro datasets contain price of plausibly homogenous good for sale at heterogeneous prices, which is evidence for wedge heterogeneity
  - E.g. Cavalcanti et al (2024) on interest rates and Cajal-Grossi et al (2023) and Burstein et al (2024) on firm-to-firm sales

Other examples of "model the market failure" approach

- **Output market power**
  - Basic template is core tool of IO (e.g. Berry et al (1995)): posit and estimate an industry demand system $y_i = D_i(\mathbf{p})$ for all i in the industry; posit a given market "conduct" (e.g. Bertrand competition); calculate the residual demand function for firm i, $RD_i(\mathbf{p})$, implied by $D_i(\mathbf{p})$ and the conduct assumption; set $\overline{\mu}_i = [1 - \varepsilon_{RD_i}^{-1}(\overline{\mathbf{p}})]^{-1}$
- **Input market power**
  - Analogous, but with an input supply system
  - E.g. Felix (2022) for labor market oligopsony in Brazil
- **Financial inputs**
  - Dev Econ enjoys long tradition of rich models of market failures in finance/credit
  - E.g. Midrigan and Xu (2014) use estimated model of collateral-backed loans to estimate $\overline{\mu}_{i,K}$

“Production ”Approach vs “Model the Market Failure” Approach

- **Main advantage of model the market failure approach:**
  - Model of market failure often suggests, as a bonus, policy interventions that could help fix the misallocation
- **Main advantage of production approach:**
  - Remains agnostic about the underlying structure(s) of the economy (e.g. avoids risk of modeling one market failure wrong, and the risk of emphasizing one market failure at the omission of all others)
- **Tests of relative accuracy?**
  - Would be great to see more widespread comparisons between the two approaches (e.g. something analogous to what de Loecker and Scott (2025) did for markups)
  - Though many analyses (e.g. HK 2009) project estimated wedges from the production approach on policy changes and thereby conduct a “sign test” of the estimated wedges (under the null that we know the effect that policy changes should have on wedges)
- **Certainly many under-exploited complementarities between the approaches**

A final (hard) question: "Is it really a wedge (or non-wedge)?"

- This comes up a lot, and for good reason. I think there are 3 types of concerns:

1. **Mis-measurement:** estimate of $\overline{\mu}_i$ is wrong because missing (or erroneously pooling) some outputs/inputs
   - E.g. a static model applied to dynamic reality (missing future goods)
   - E.g. wrong model of externalities (missing "production" of goods that affect others)
   - E.g. wrong model of labor across spatial labor markets (erroneously pooling them)
   - E.g. consumers actually face non-linear pricing (many "goods" treated as one)
   - E.g. firm's markup/profit actually the "fair" return on owner's risk or effort
2. **Second-best issues:** some other constraint binds
   - E.g. markups necessary to cover fixed costs (can't make transfers)
   - E.g. markdowns necessary to sustain relationships (can't enforce dynamic contracts)
   - E.g. distortionary taxes necessary to fund public goods (can't use lump-sum taxes)
3. **The "non-sufficiency" points discussed earlier**
   - E.g. with S-shaped technologies, could see zero $\overline{\mu}_i$ dispersion yet only be at a local optimum

- Ongoing work is enriching measurement so as to address these points, but much more research needed

Concluding Remarks

- "Is [my economy of interest] using its resources and technologies optimally?" $\Rightarrow$ seems hard to imagine a more important question when we study the economies around us (especially lower-income ones)
- This lecture has described some of the tools that can help
- Great time to get involved:
  - Still no consensus on many key themes
  - Broadening array of methods (theory, measurement, quasi-experiments, structural estimation) and their complementarites
  - Scope to draw on expertise in many adjacent fields (e.g. IO, Public Finance, Labor, Spatial, Macro, Organizations, Finance)
  - Thousands of open questions...