

Productivity and Reallocation

Motivation

- Recent studies highlight role of reallocation for productivity growth. Market economies exhibit:
 - Large pace of output and input reallocation with substantial role for entry/exit.
 - Large differences in measured productivity across producers
 - Productivity enhancing market selection and reallocation from less to more productive businesses
 - Magnitude depends upon sector, country, measure (labor vs. TFP) – open questions:
 - Impact on workers vs. Impact on firms
 - Role of institutions/market structure

DECOMPOSITION OF PRODUCTIVITY IN LITERATURE

Simple industry index:

P_{it} / index of industry productivity

$$P_{it} = \sum_j \omega_{et} S_{et} \omega_{et} \quad (1)$$

S_{et} / share of plant e in industry i (e.g., output share)

ω_{et} / index of plant-level productivity (*typically*
 $\log TFP_{et}$ or $\log LP_{et}$)

Method 1

(Like Baily, Hulten, and Campbell (1992)):

$$\Delta P_{it} \Big|_{e0C} s_{et+1} \Delta \omega_{et} \quad (\text{WITHIN})$$

$$\%j \Big|_{e0C} (\omega_{et+1} \& P_{it+1}) \Delta s_{et} \quad (\text{BETWEEN})$$

$$\%j \Big|_{e0C} \Delta \omega_{et} \Delta s_{et} \quad (\text{CROSS}) \quad (1)$$

$$\%j \Big|_{e0N} s_{et} (\omega_{et} \& P_{it+1})$$

$$\&j \Big|_{e0X} s_{et+1} (\omega_{et+1} \& P_{it+1}) \quad (\text{NET ENTRY})$$

C / continuing plants, N / entrants, X / exiters

ISSUES:

- Integrated treatment of entry/exit.
- Frequency

Comments on Decomposition in Literature

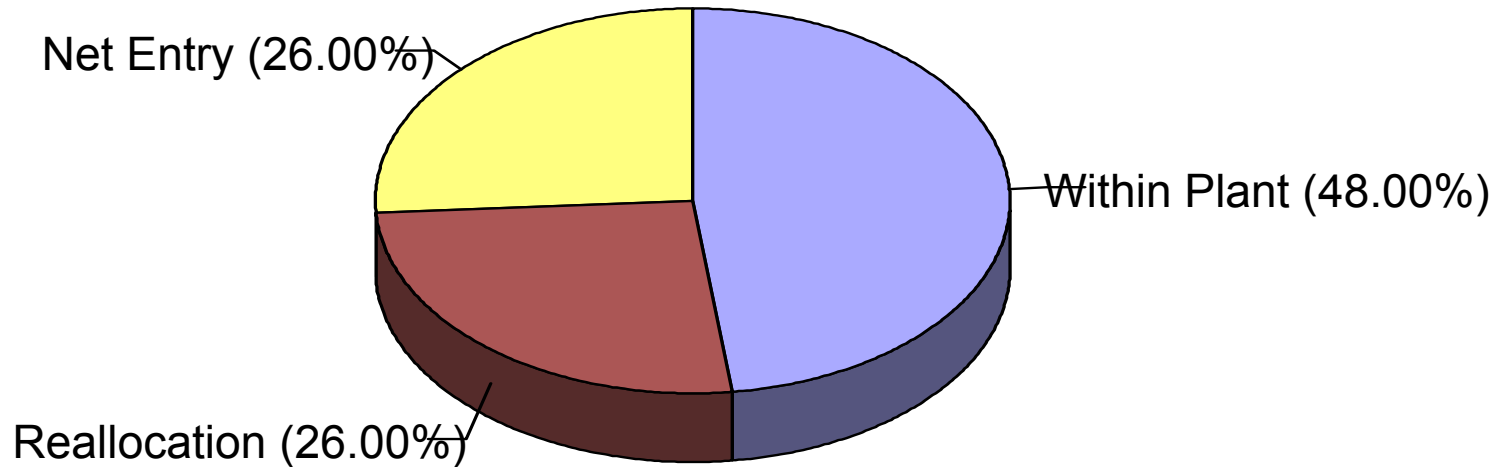
- Some questions about how to interpret aggregate index defined in this manner
 - Typical check (e.g., BHC and FHK) to see how this index performs relative to standard aggregate measures
 - Common result – magnitudes very similar and correlations high
 - Not clear what correct aggregate index is
 - Standard aggregate indexes not well-justified on theoretical grounds (e.g., Fisher – conditions under which aggregate production function exists are very stringent)
 - Standard decomposition summarizes changes in activity weighted micro distribution

Measurement of Plant-level Productivity

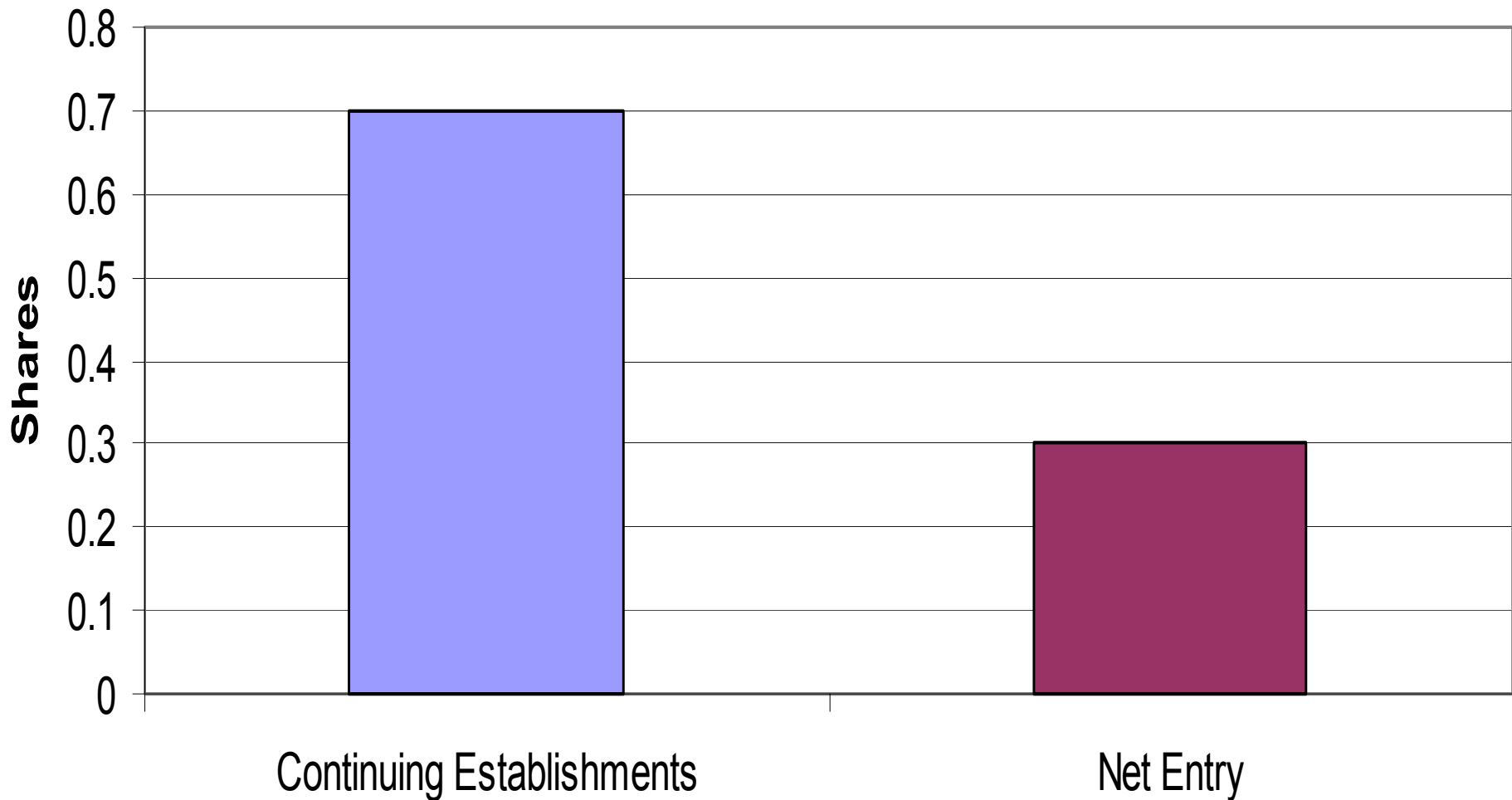
$$tfp_i = y_i - \alpha_l l_i - \alpha_k k_i - \alpha_m m_i - \alpha_e e_t$$

All variables in logs, difficult measurement Issues on outputs and inputs and factor elasticities

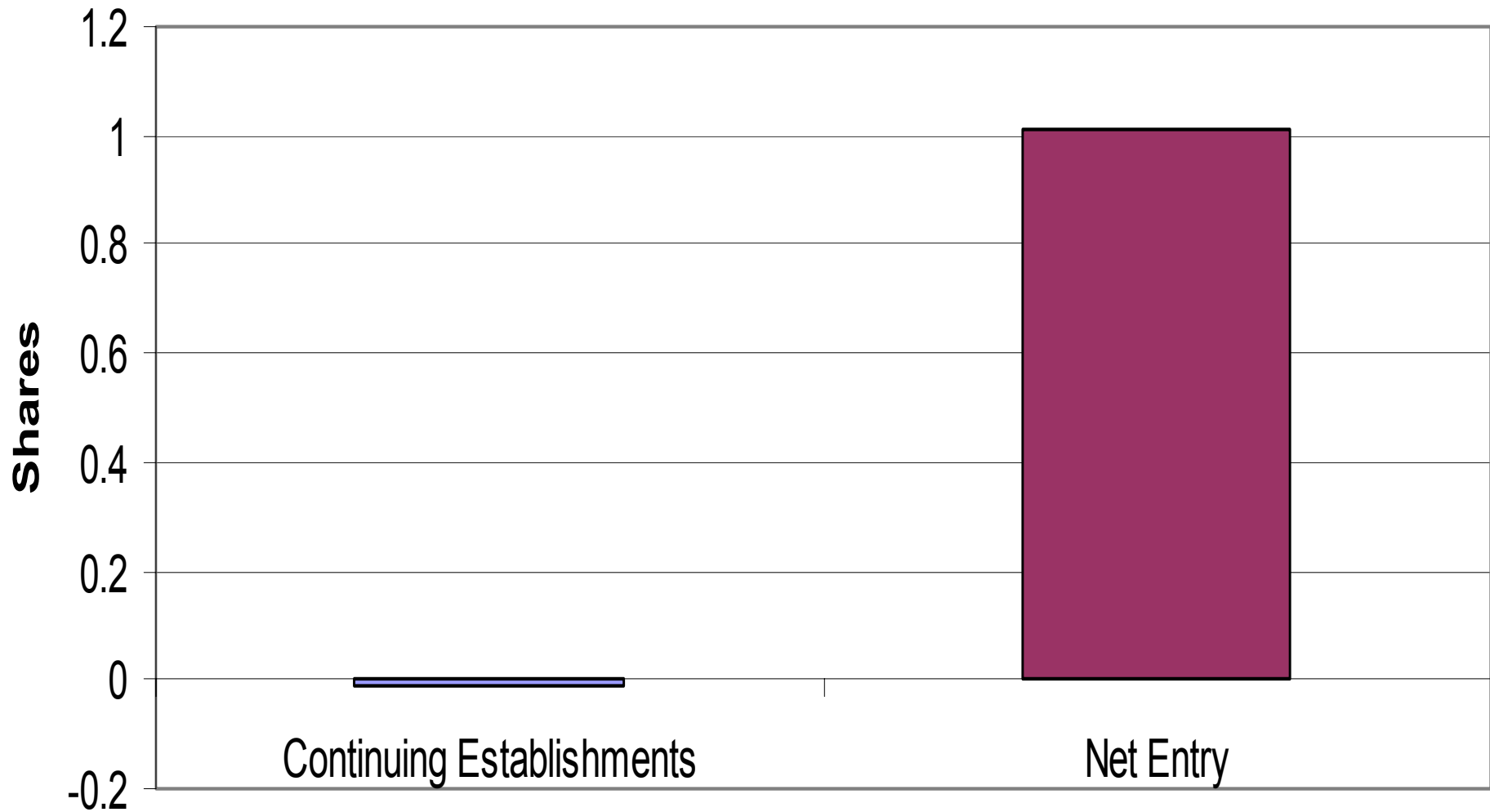
Decomposition of TFP in U.S. Mfg 1977-1987



Contribution of Continuing Establishments vs. Net Entry to U.S. Manufacturing Labor Productivity Growth, 1977-87



Contribution of Continuing Establishments vs. Net Entry to U.S. Retail Trade Labor Productivity Growth, 1987-97



Producer Heterogeneity: What are we measuring?

- Limitation of most studies of productivity and reallocation:
 - Plant-level output measured as deflated revenue using industry deflator
 - More than just a measurement problem
 - Differences in measured productivity may be capturing differences in market power so results on productivity and reallocation may be capturing demand factors
 - Market selection should be on profitability but positive/normative aspects of selection depend critically on whether selection is on efficiency or market power

Policy Implications

- Many reforms in transition/emerging economies aimed at making markets more competitive
 - And obviously plays role in all countries (e.g., antitrust, deregulation, etc. in U.S.)
- Which and how much do product, credit, labor market distortions matter?
- Focus in this paper – market power

Outline of Paper

- Theory: Differentiated product model
 - Prices depend upon both cost/efficiency (-) and demand factors (+)
 - Selection on efficiency (costs/productivity) and demand factors
 - Raises some questions regarding welfare (why demand elasticities vary across producers)
- Empirical analysis:
 - Unique data on businesses with measures of physical quantities and prices (Direct approach as opposed to indirect approach of Melitz, Tybout, etc.)
 - Productivity, prices and reallocation with “corrected” measure of productivity

$$U = y + \alpha \int_{i \in I} q_i di - \frac{1}{2} \left(\eta + \frac{\gamma}{N} \right) \left(\int_{i \in I} q_i di \right)^2 + \int_{i \in I} \delta_i q_i di - \frac{1}{2} \gamma \int_{i \in I} (q_i - \bar{q})^2 di$$

$$q_i = \frac{\alpha}{\eta N + \gamma} + \frac{\eta N}{\eta N + \gamma} \frac{1}{\gamma} \bar{p} + \frac{1}{\gamma} \delta_i - \frac{1}{\gamma} p_i$$

$$q_i = \omega_i x_i$$

$$\pi_i = \left(\frac{\alpha}{\eta N + \gamma} + \frac{\eta N}{\eta N + \gamma} \frac{1}{\gamma} \bar{p} + \frac{1}{\gamma} \delta_i - \frac{1}{\gamma} p_i \right) \left(p_i - \frac{w_i}{\omega_i} \right)$$

$$p_i = \frac{1}{2} \frac{\gamma\alpha}{\eta N + \gamma} + \frac{1}{2} \frac{\eta N}{\eta N + \gamma} \bar{p} + \frac{1}{2} \delta_i + \frac{1}{2} \frac{w_i}{\omega_i}$$

$$\phi_i \equiv \delta_i - \frac{w_i}{\omega_i} \qquad \phi^* = \frac{\gamma\alpha}{\eta N + \gamma} - \frac{\eta N}{\eta N + \gamma} \bar{p}$$

$\phi_i < \phi^*$ will not find operations profitable

$$V^e = \int_0^{w_u} \int_{\omega_l}^{\omega_u} \int_{\phi^* + \frac{w}{\omega}}^{\delta_e} \frac{1}{4\gamma} (\phi_i - \phi^*)^2 f(\delta, \omega, w) d\delta d\omega dw - s = 0$$

Data and Measurement

- Census of Manufactures for 1982, 1987, 1992, 1997
- Physical quantity/price data available for selected sectors:
 - This version uses concrete, roasted coffee, white pan bread
- TFPQ (physical) and TFPR (revenue) measured using std. index number approach (output less cost-share weighted inputs)
- Materials measured as cost of materials with industry materials deflator
 - Implications for interpretation of TFPQ:

Basic Facts

- Heterogeneity and persistence in prices, TFPQ, TFPR
- Prices and TFPQ inversely related
 - Makes sense – more efficient/low cost producers have lower prices
- $\text{Var}(\text{TFPQ}) > \text{Var}(\text{TFPR})$
- High rates of entry/exit

Three main exercises

- Selection equation:
 - Exit = $f(\text{TFPQ}, \text{prices})$
 - TFPQ is, in principle, a good index of cost/efficiency
 - Controlling for TFPQ implies controlling for cost/efficiency so can isolate demand factors
- Evolution of TFPR, TFPQ, prices (continuers, entry, exit)
- Productivity and reallocation decompositions using TFPQ and TFPR

Exit Regressions

Unweighted

Initial Conditions in Year $t-k$:	Specification 1	Specification 2	Specification 3	Specification 4
Log(TFPR)	-0.082 (0.021)			
Log(TFPQ)		-0.041 (0.019)		-0.055 (0.021)
Log(Price)			-0.150 (0.041)	-0.187 (0.045)

Weighted (Revenue Weights)

Initial Conditions in Year $t-k$:	Specification 1	Specification 2	Specification 3	Specification 4
Log(TFPR)	-0.048 (0.017)			
Log(TFPQ)		-0.030 (0.014)		-0.058 (0.015)
Log(Price)			-0.190 (0.021)	-0.153 (0.023)

Unweighted

Dependent Variable:

	Log(TFPR)	Log(TFPQ)	Log(Price)
Exit Dummy	-0.018 (0.005)	-0.013 (0.005)	-0.007 (0.002)
Entry Dummy	-0.003 (0.004)	0.017 (0.005)	-0.007 (0.002)

Weighted (Revenue Weights)

Dependent Variable:

	Log(TFPR)	Log(TFPQ)	Log(Price)
Exit Dummy	-0.018 (0.006)	-0.021 (0.007)	-0.034 (0.004)
Entry Dummy	-0.002 (0.006)	0.044 (0.007)	-0.023 (0.004)

Productivity Decomposition for 1982-87

Measure	Total	Within	Between	Cross	Entry	Exit	Net Entry
$\Delta\text{Log}(\text{TFPR})$	0.067	0.31	-0.04	0.34	0.28	0.11	0.39
$\Delta\text{Log}(\text{TFPQ})$	0.106	0.60	-0.08	0.27	0.18	0.01	0.20

Main Findings

- Exiting businesses have lower prices and lower productivity (either TFPQ or TFPR) than incumbents or entrants.
- Entering businesses have lower prices than incumbents.
- Entering businesses have higher TFPQ but not higher TFPR than incumbents
- Decompositions of aggregate TFPQ vs. TFPR suggests that the results in the existing literature may have overstated the contribution of net entry.

Demand vs. Efficiency in Selection?

- Lower productivity establishments and lower price establishments are more likely to exit.
- Controlling for both price and productivity effects simultaneously shows that both factors are important for survival as implied by the theory.

Where do we go from here?

- Theory:
 - Nature of product differentiation/market structure:
 - Welfare consequences?
 - Joint distribution of demand and cost/efficiency matters
 - how does this vary by sector, country, time?
- Evidence:
 - More sectors
 - More structure (estimate production/demand functions?)
- The World?
 - Distortions in product, credit, labor markets all are relevant for productivity and reallocation.