Firm Dynamics and the Macroeconomy: Basics

Toshihiko Mukoyama
Georgetown University

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From today, we focus on L

- If the capital is fixed,

$$A_i(K_i^{\alpha} L_i^{1-\alpha})^{\gamma} = B_i L_i^{\beta}$$

where

$$B_i = A_i K_i^{\alpha\gamma}$$

and

$$\beta = \gamma(1-\alpha) \in (0,1).$$

From today, we focus on L

- If the rental market for capital is perfectly competitive,

$$\max_{K_i} \; A_i(K_i^{\alpha} L_i^{1-\alpha})^{\gamma} - rK_i$$

imply

$$K_i = \left(\frac{\alpha\gamma}{r}\right)^{\frac{1}{1-\alpha\gamma}} A_i^{\frac{1}{1-\alpha\gamma}} L_i^{\frac{\gamma-\alpha\gamma}{1-\alpha\gamma}}$$

Plugging this solution into the production function

$$A_i(K_i^{\alpha} L_i^{1-\alpha})^{\gamma} = \left(\frac{\alpha\gamma}{r}\right)^{\frac{\alpha\gamma}{1-\alpha\gamma}} A_i^{\frac{1}{1-\alpha\gamma}} L_i^{\frac{\gamma-\alpha\gamma}{1-\alpha\gamma}}$$

Thus we can write a new production function

$$B_i L_i^{\beta}$$

where

$$B_i = \left(\frac{\alpha\gamma}{r}\right)^{\frac{\alpha\gamma}{1-\alpha\gamma}} A_i^{\frac{1}{1-\alpha\gamma}}$$

and

$$\beta = \frac{\gamma - \alpha\gamma}{1 - \alpha\gamma} \in (0, 1)$$

Misallocation

First, continuing with the discussion in the last class, let us talk about the misallocation. An example:

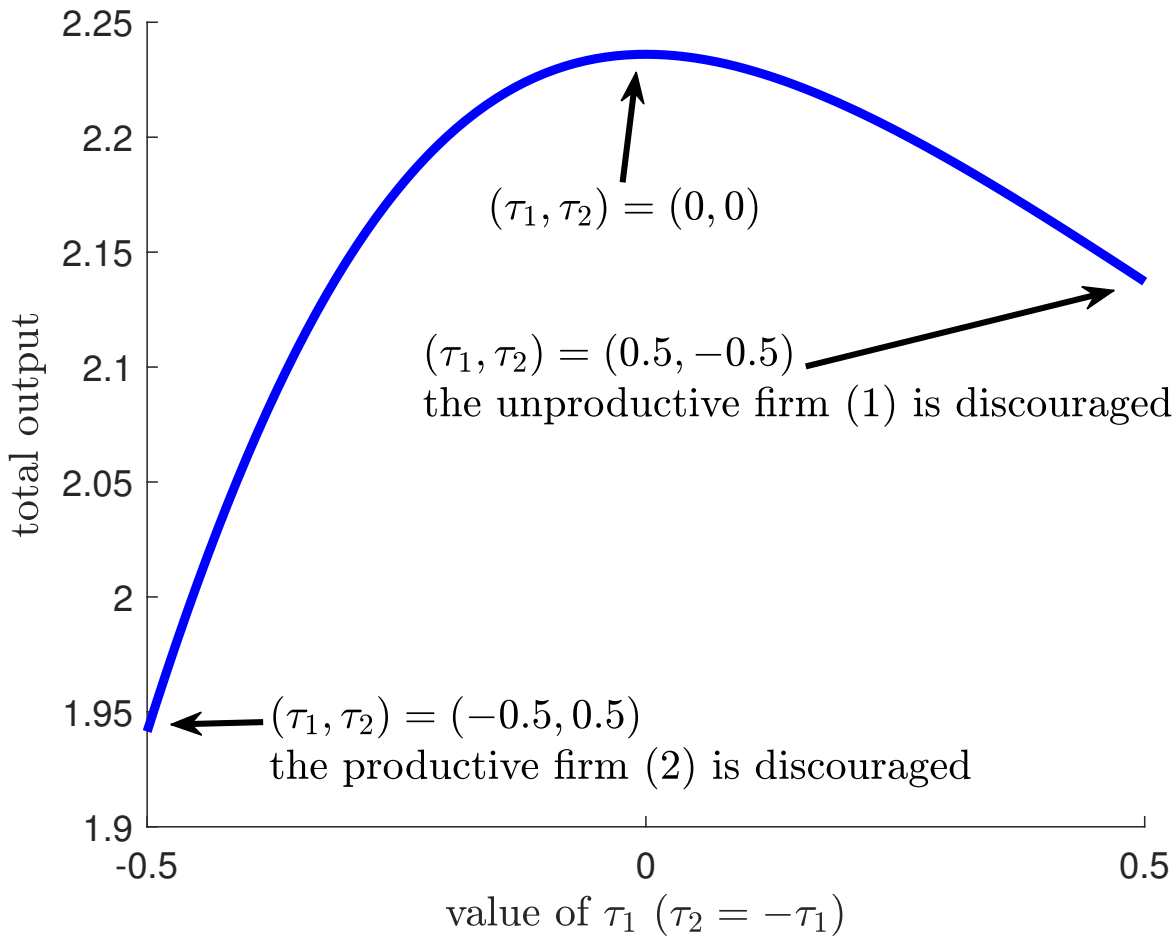
- There are two firms, firm 1: $Y_1 = A_1 L_1^\alpha$ and firm 2: $Y_2 = A_2 L_2^\alpha$ where $\alpha \in (0, 1)$.
- Let $A_1 = 1$ and $A_2 = 2$. $\alpha = 1/2$.
- Assume that there are firm-specific distortions τ_i $(i = 1, 2)$. We can think of τ_i as a tax.
- Firm i maximizes the profit

$$(1 - \tau_i) A_i L_i^\alpha - w L_i.$$

  Because the actual output is $A_i L_i^\alpha$, the firm's decision problem is distorted.
- Assume that the total labor is fixed at 1. Thus w is deterimined by $L_1 + L_2 = 1$.
- The total output is computed as

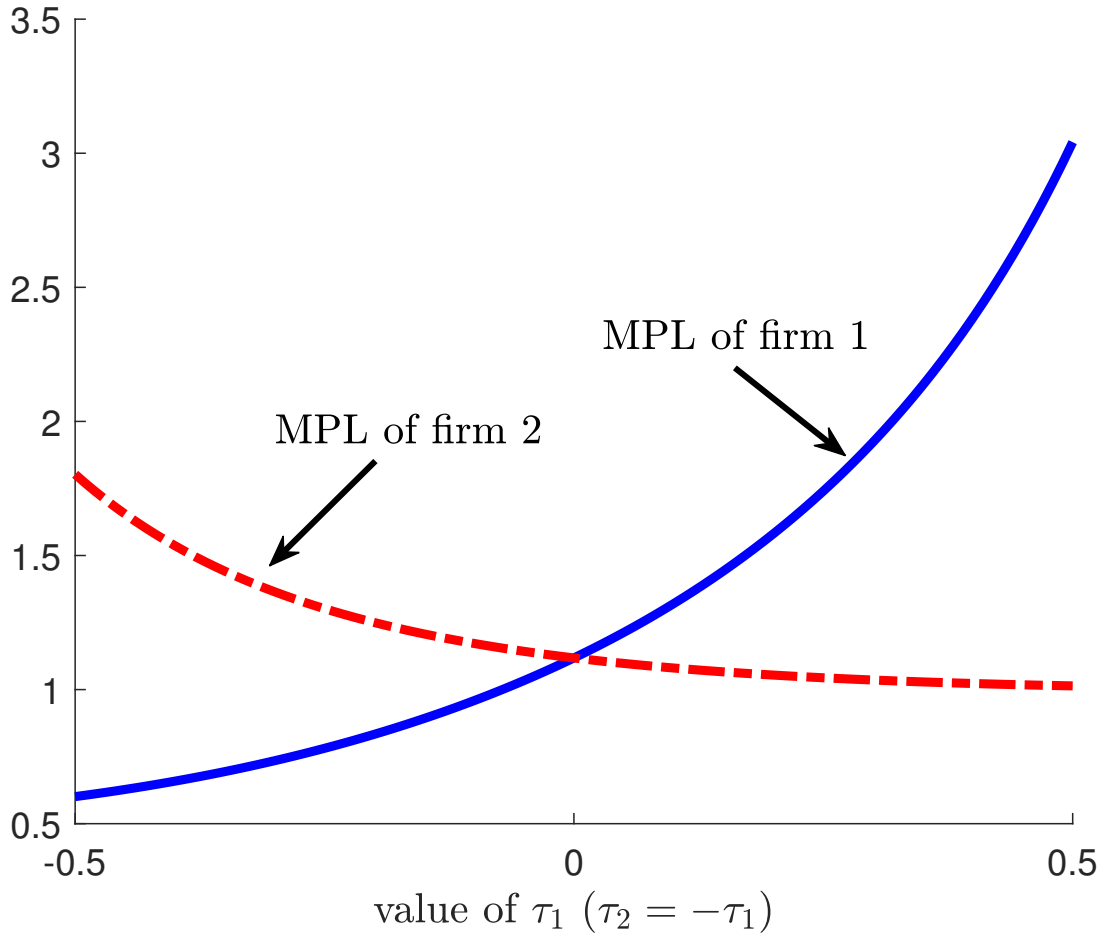
$$Y = Y_1 + Y_2 = A_1 L_1^\alpha + A_2 L_2^\alpha$$

Misallocation



- The total output is reduced the most with positive correlation between the distortion (discouragement) and productivity (Restuccia and Rogerson, 2008)

Misallocation



- MPL ($\alpha A_i L_i^{\alpha-1}$) dispersion is the source of the productivity loss.

Situations where misallocations can occur: Examples

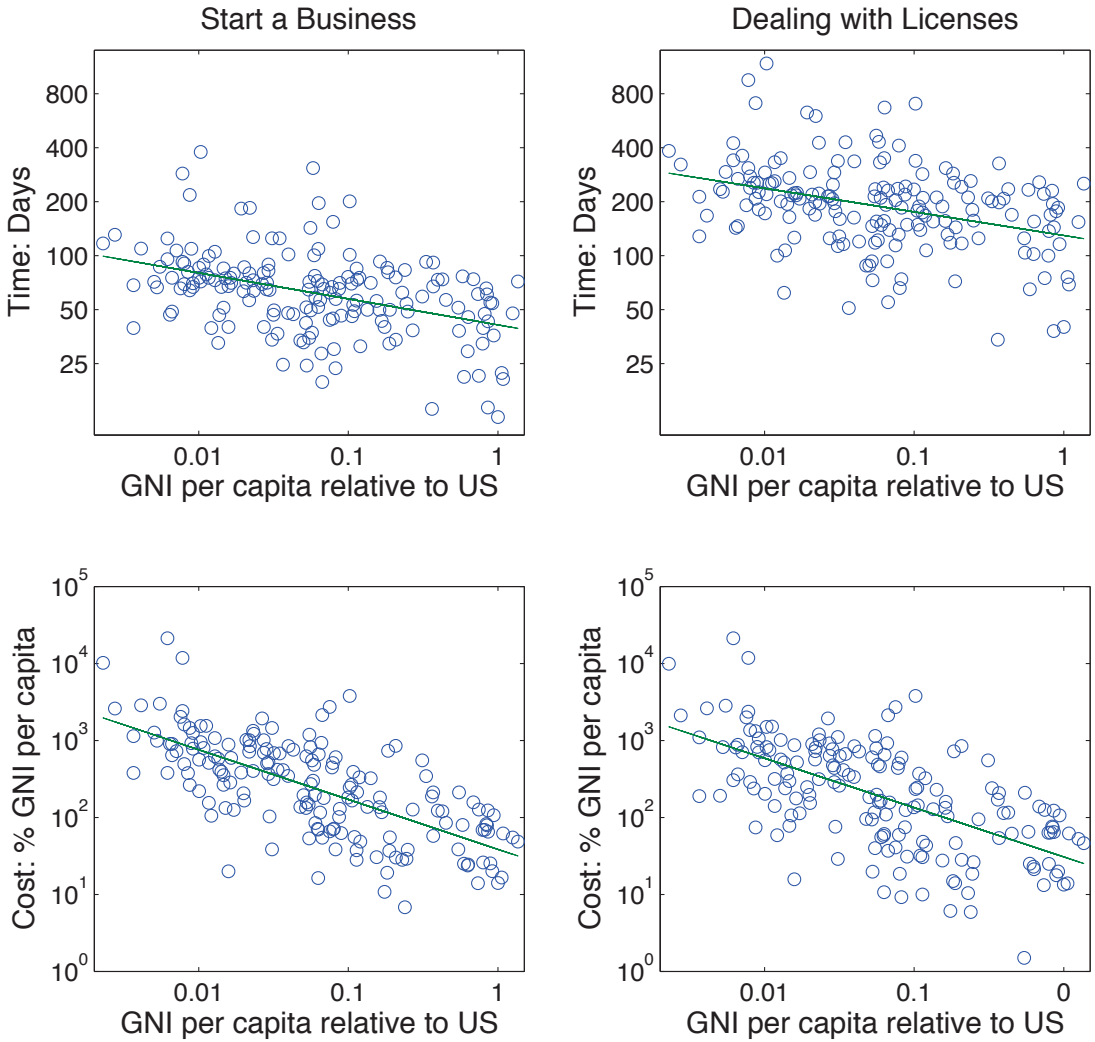
- Tax rates are different depending on firm identity/characteristics
- Regulations that depend on firm size
- Firing/hiring taxes/subsidies
- Entry/exit taxes/subsidies, some other frictions
- Financial frictions
- Contract enforcement

Notes:

- The cost of reduced entry depends on the post-entry importance of entrants.
- The importance of financial frictions depends on the persistence of shocks (whether the firm can overcome the friction by self-financing); see Moll (2014). The shock does seem to be persistent; see Lee and Mukoyama (2015). There still can be effects for young firms and potential entrants.
- The importance of contract enforcement at the industry level positively correlates with industry productivity (Mukoyama and Popov, 2020)

Entry barriers

From Moscoso Boedo and Mukoyama (2012)



- Why? Political economy considerations (Mukoyama and Popov, 2014)

Misallocation as a theory of TFP

- Misallocation can change the measured TFP (measured by Y/L^{α}, for example) without changing A_1 and A_2.
- The effect can be sizable but not as much as 10-folds differences between rich and poor countries.
- For the development questions, the determination of A_i (growth of productivity at the firm level) is still important.

Firm growth

On firm growth

Two small points first:

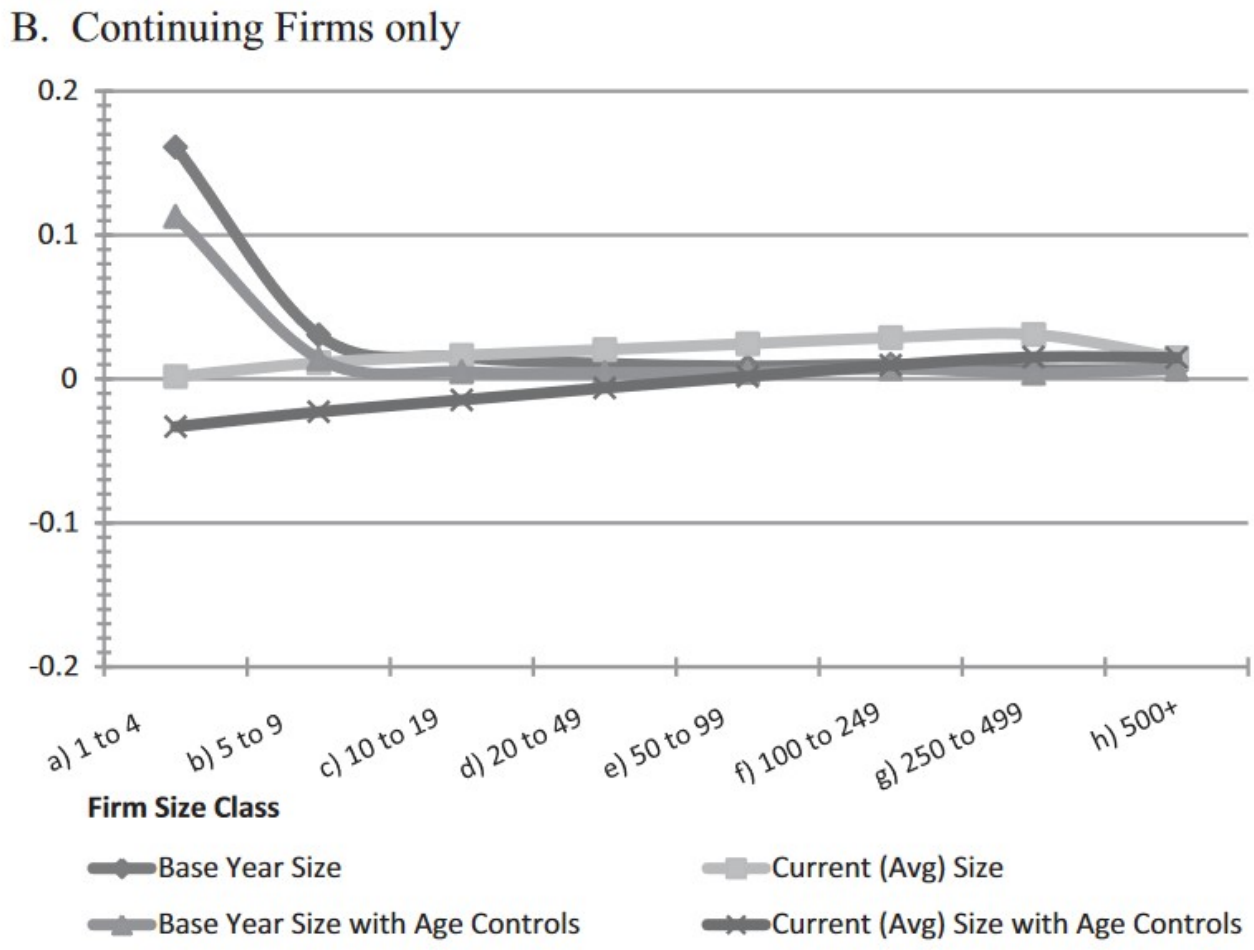
- First, note that individual firm growth is not necessary or sufficient for aggregate growth.
- Second, the loss from missing entry can be large if we take firm growth into account.

An example:

- Labor supply is elastic (employment is demand-determined). One firm hires one worker.
- The production of a firm who enters at time τ and age a (today is $t = a + \tau$) is $A_\tau e^{\gamma a}$. $\gamma > 0$ is the firm growth rate. Assume that $A_\tau = A_0 e^{g\tau}$.
- The surviving firms at age a is $e^{-\delta a}$. Assume $\delta > \gamma$.
- The mass of entrants is 1.
- Outcome: The total employment is $\int_0^\infty e^{-\delta a} da = 1/\delta$. The aggregate production is $A_0 e^{gt}/(\delta + g - \gamma)$.
- If Δ units of entrants are lost, the immediate loss is $\Delta A_\tau dt$ but the present value of loss is $\Delta A_\tau/(\rho + \delta - \gamma)$, where ρ is the discount rate.

Some facts on firm growth

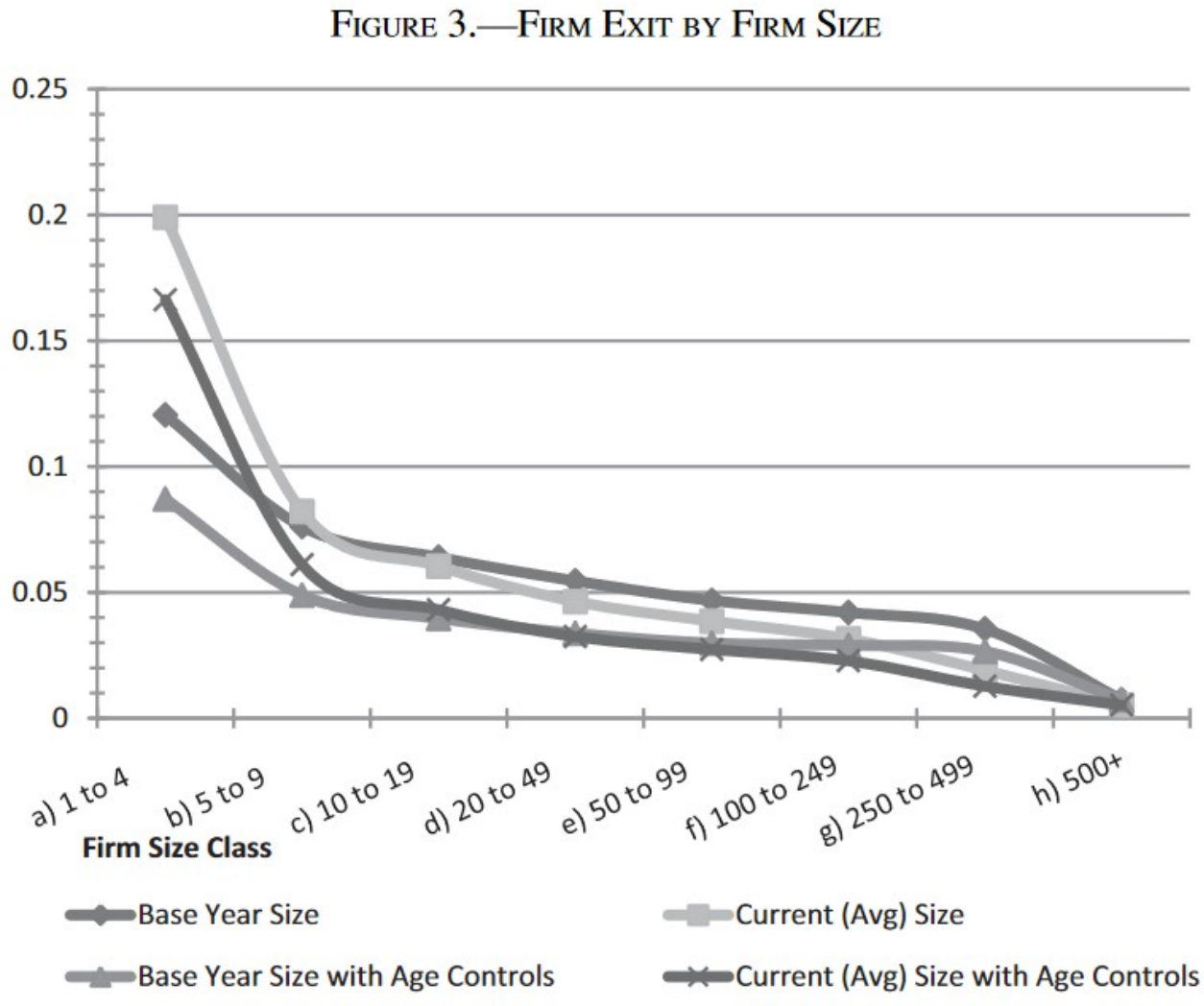
Figures from Haltiwanger et al. (2013)



- The growth rate of a firm is independent of size: "Gibrat's Law" (mixed supports in the data)

Some facts on firm growth

Figures from Haltiwanger et al. (2013)



Some facts on firm growth

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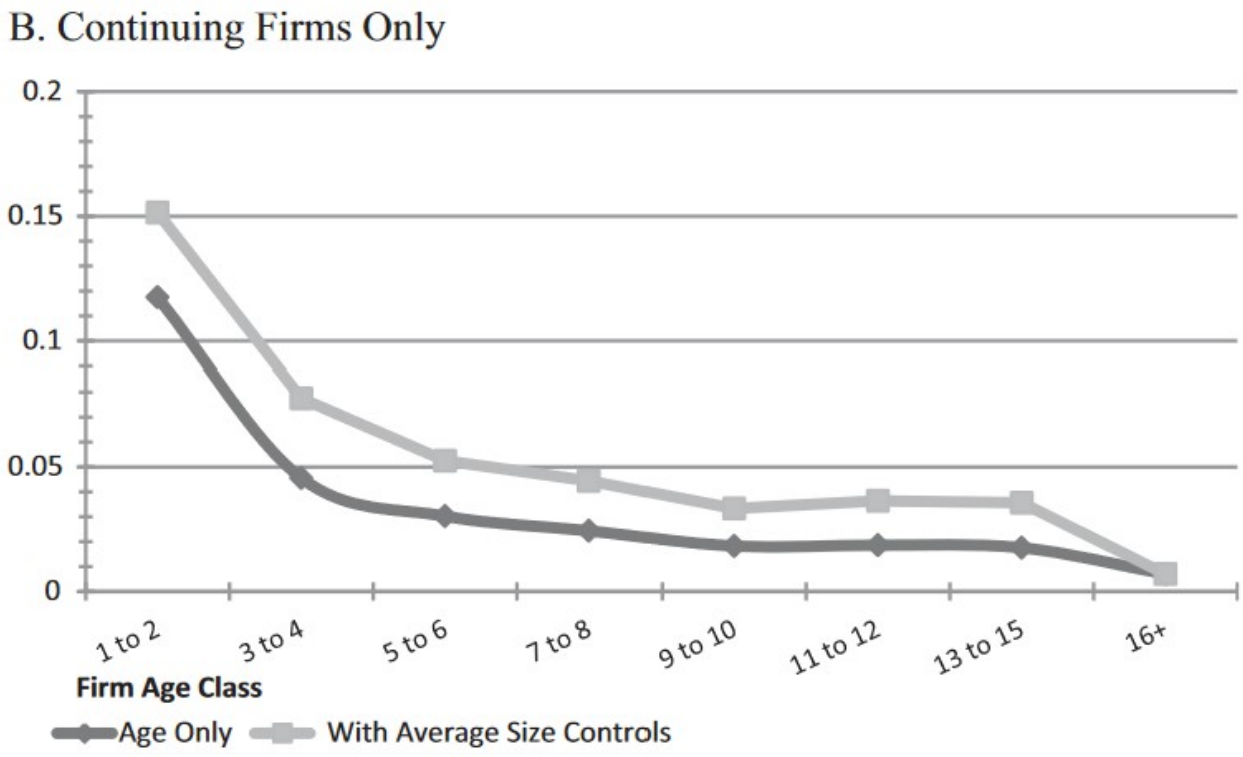
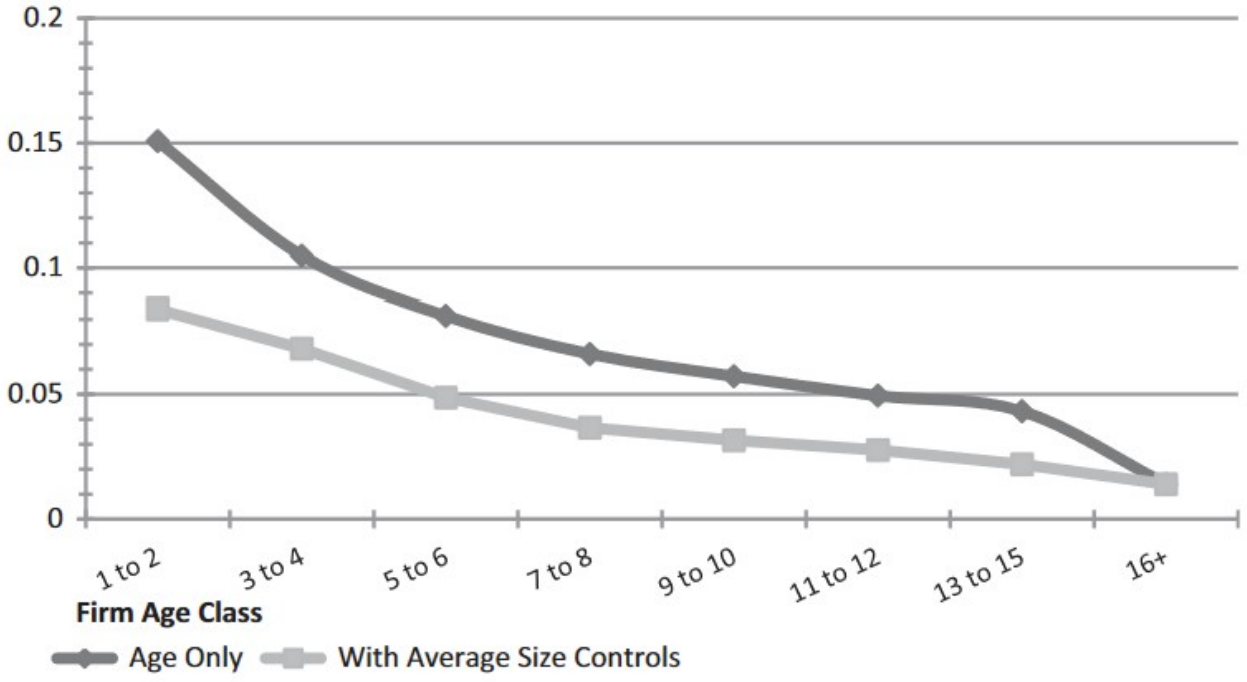


Some facts on firm growth

Figures from Haltiwanger et al. (2013)

FIGURE 5.—FIRM EXIT BY FIRM AGE



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