

Changing Patterns of Productivity and Business Dynamism: Is There a Connection?

February 2017

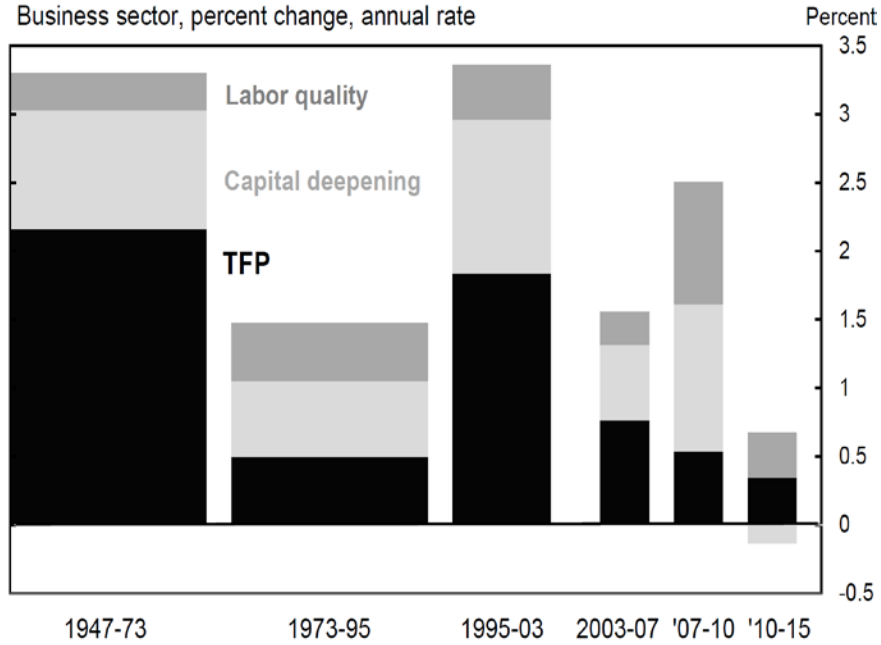
By

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This talk, without attribution, draws on joint work with Steven Davis, Ryan Decker, Jason Faberman, Lucia Foster, Cheryl Grim, Ron Jarmin, Javier Miranda, and Zoltan Wolf

Contributions to growth in U.S. output per hour

Business sector, percent change, annual rate



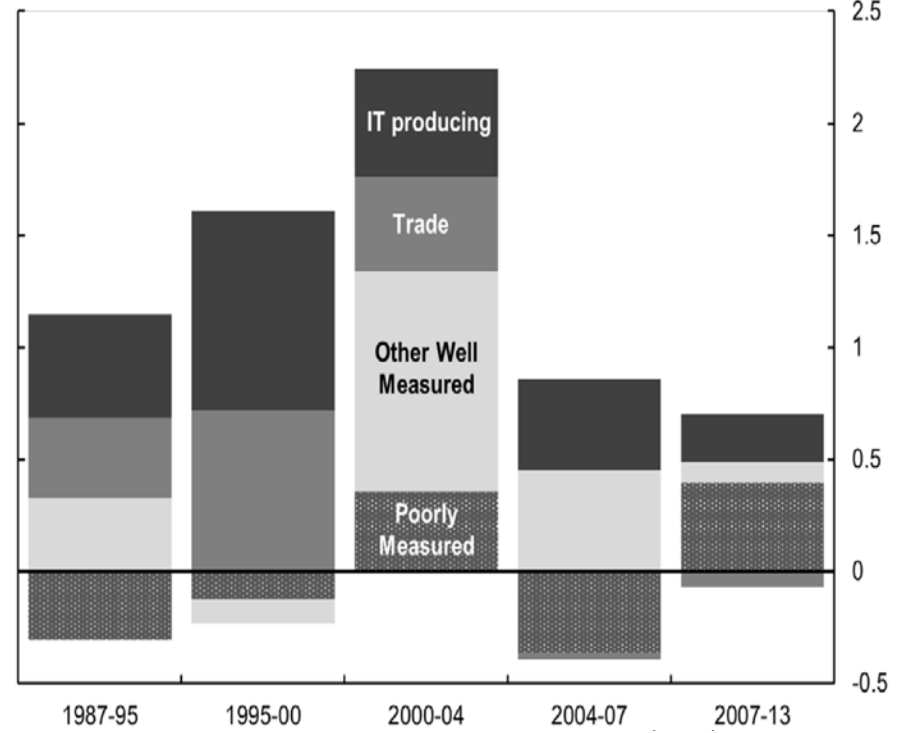
Source: Fernald (2014a). Quarterly; samples end in Q4 of years shown except 1973 (ends Q1). Capital deepening is contribution of capital relative to quality-adjusted hours. Total factor productivity is measured as a residual.

Source: Bryne et. al. (2016)

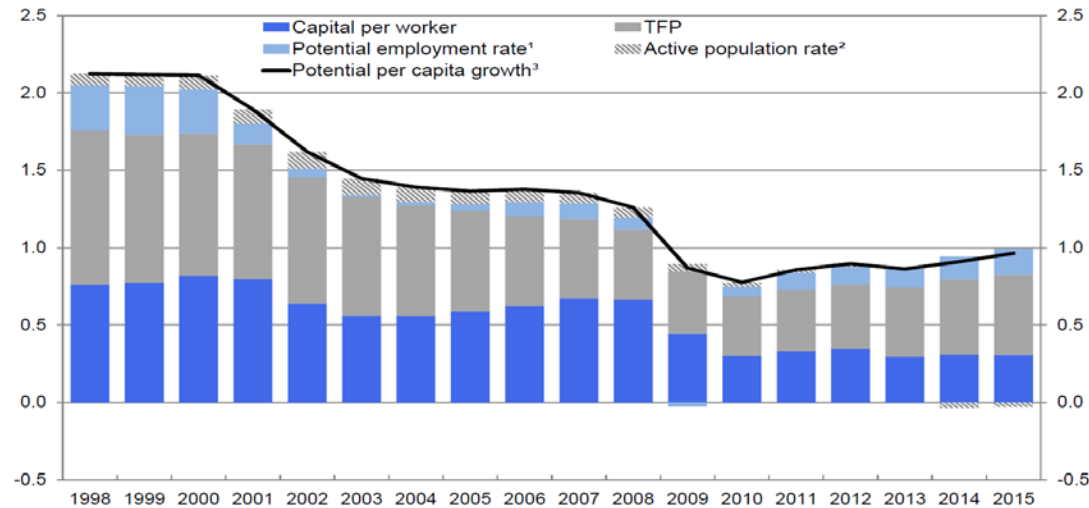
U.S. total factor productivity by industry subgroup

Contribution, annual percentage points

Percentage points



OECD Contribution to potential per capita growth (% points unless otherwise noted)

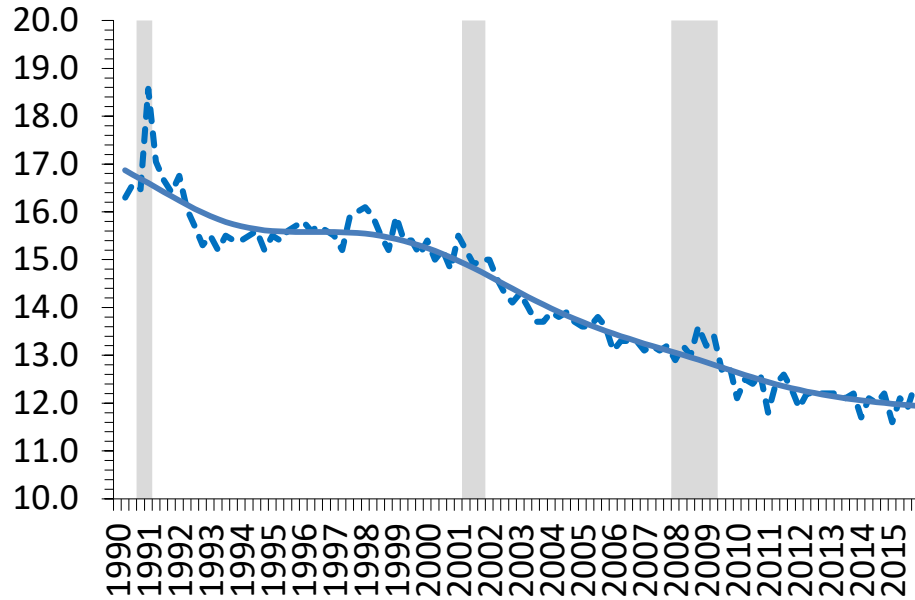


Source: Andrews et. al. (2016)

Declining Business Dynamism in U.S. is Evident from Multiple Data Sources

Job Reallocation Rate, U.S. Private Non-Farm (Quarterly)

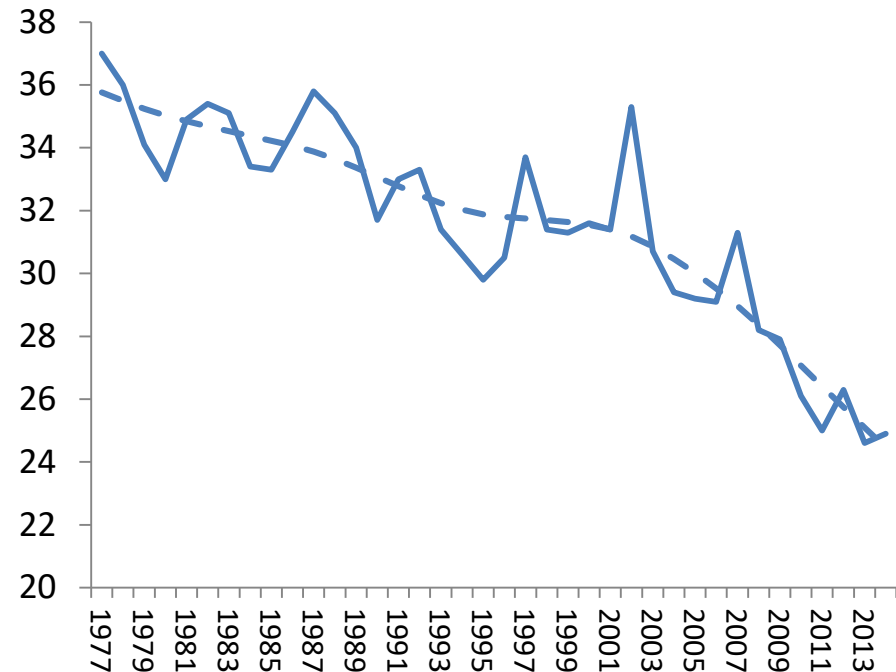
Source: BED



Declining Trend in Job Reallocation Accelerated in Post-2000 Period. Trend decline continues in post-Great Recession period.

Job Reallocation Rate, U.S. Private Non-Farm (Annual)

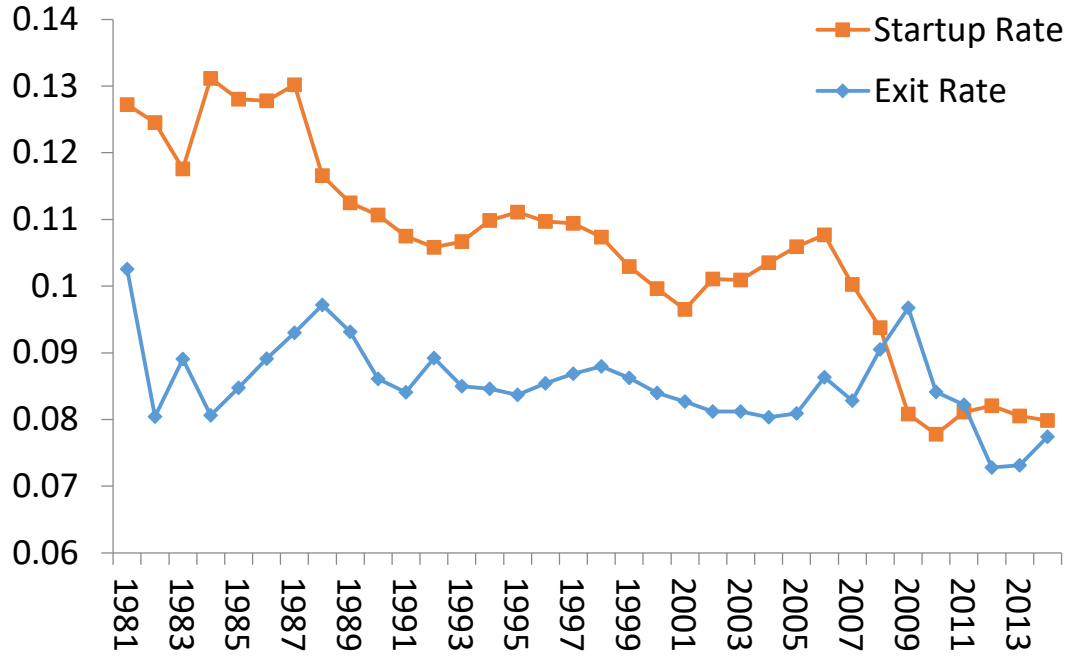
Source: BDS



Dashed lines are Hodrick-Prescott Trends

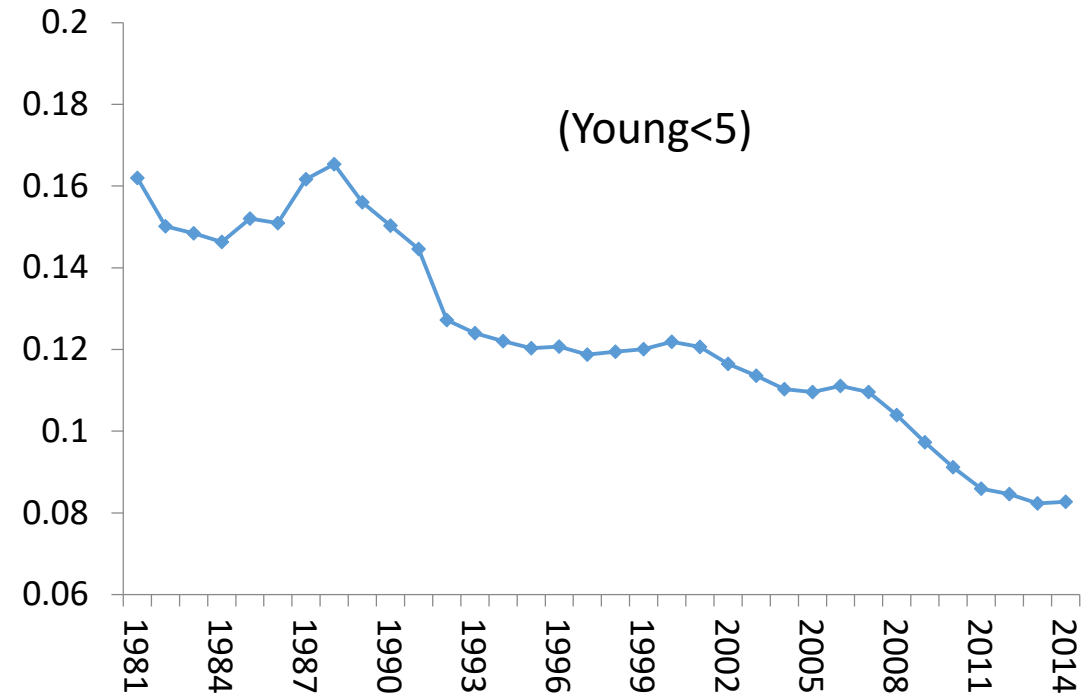
Startup and Exit Rates in Nonfarm Private Sector, 1981-2014

Startup and Exit Rates





Young businesses are much more volatile than mature businesses. The changing age distribution of businesses accounts for about 25% of the secular decline in dynamism from the late 1980s to mid 2000s (Decker et al. 2014).

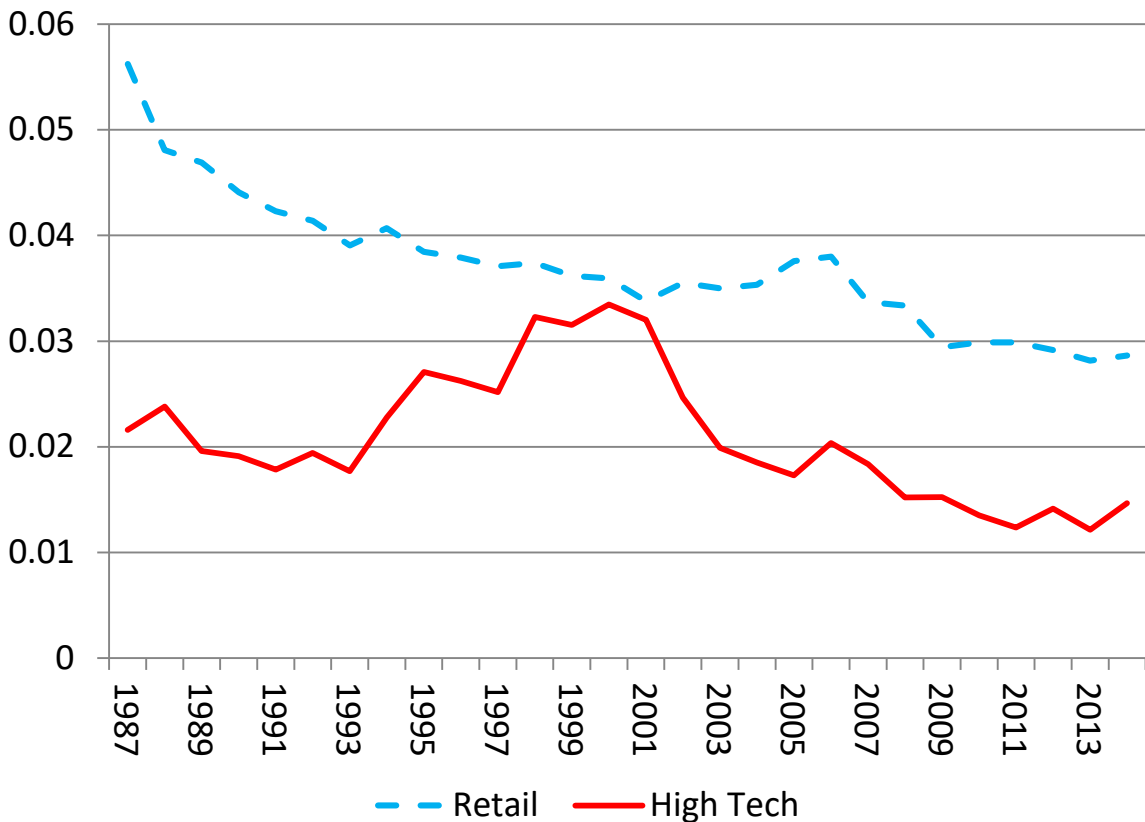
Share of Employment for Young Firms, 1981-2014, Nonfarm Private Sector



Possible connections between indicators of business dynamism and productivity ?

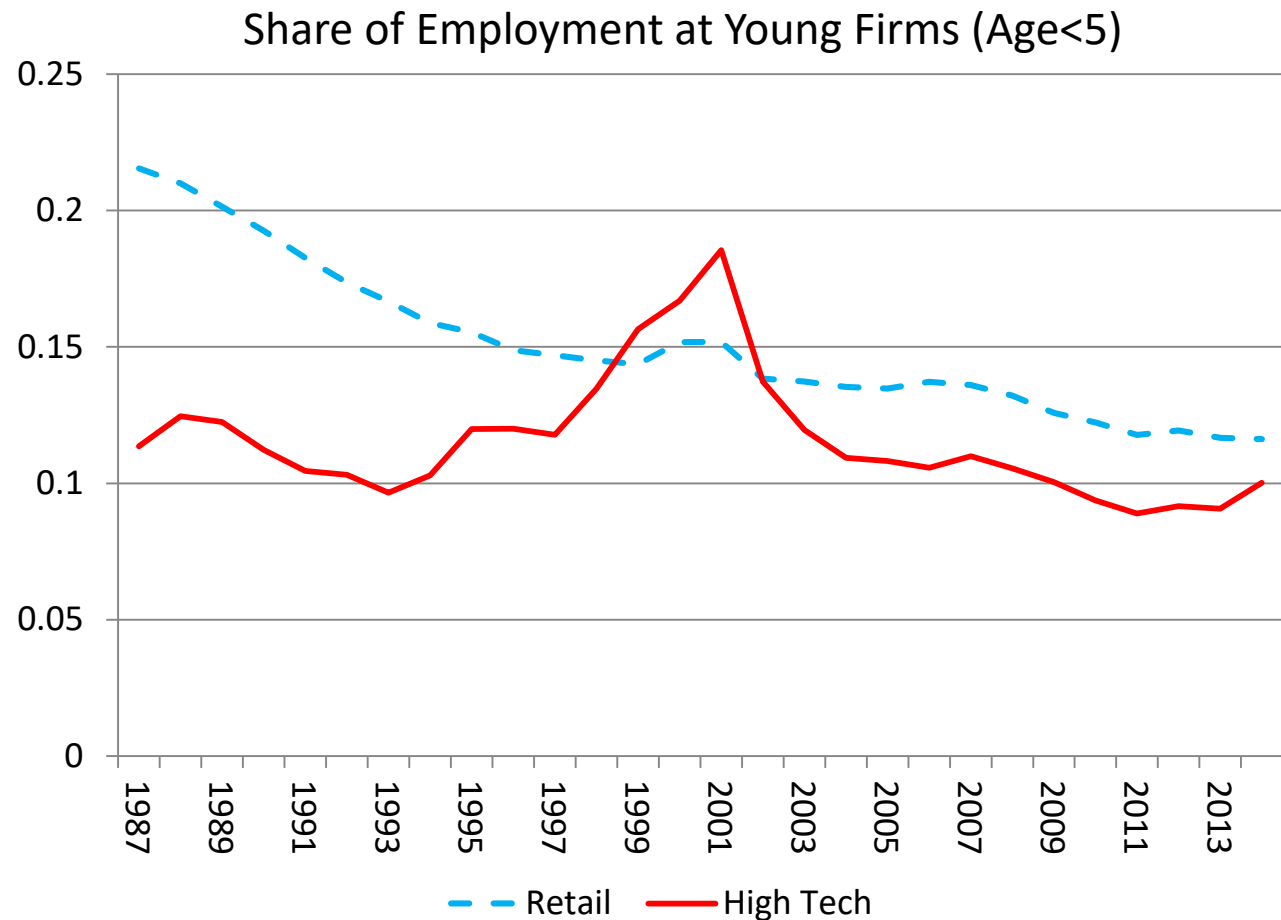
1. Increase in frictions and distortions has reduced pace of dynamism and entrepreneurship.
 - Ubiquitous finding: Large, within industry dispersion in productivity.
 - In healthy economy, reallocation moving resources from less productive to more productive.
 - An increase in frictions (e.g., Hopenhayn and Rogerson (1993)) will yield a decline in productivity
 - How to reconcile 1990s?
 - 2. Decline in pace of innovation/technological change (Gordon (2016)) has led to decline in dynamism/entrepreneurship (Gort and Klepper (1982) and Jovanovic (1982))
 - Innovation/entry  Experimentation/Dispersion  Reallocation/Productivity Growth
3. Structural changes due to demographics, changes in business model
 - Unclear prediction or even benign implications for productivity?

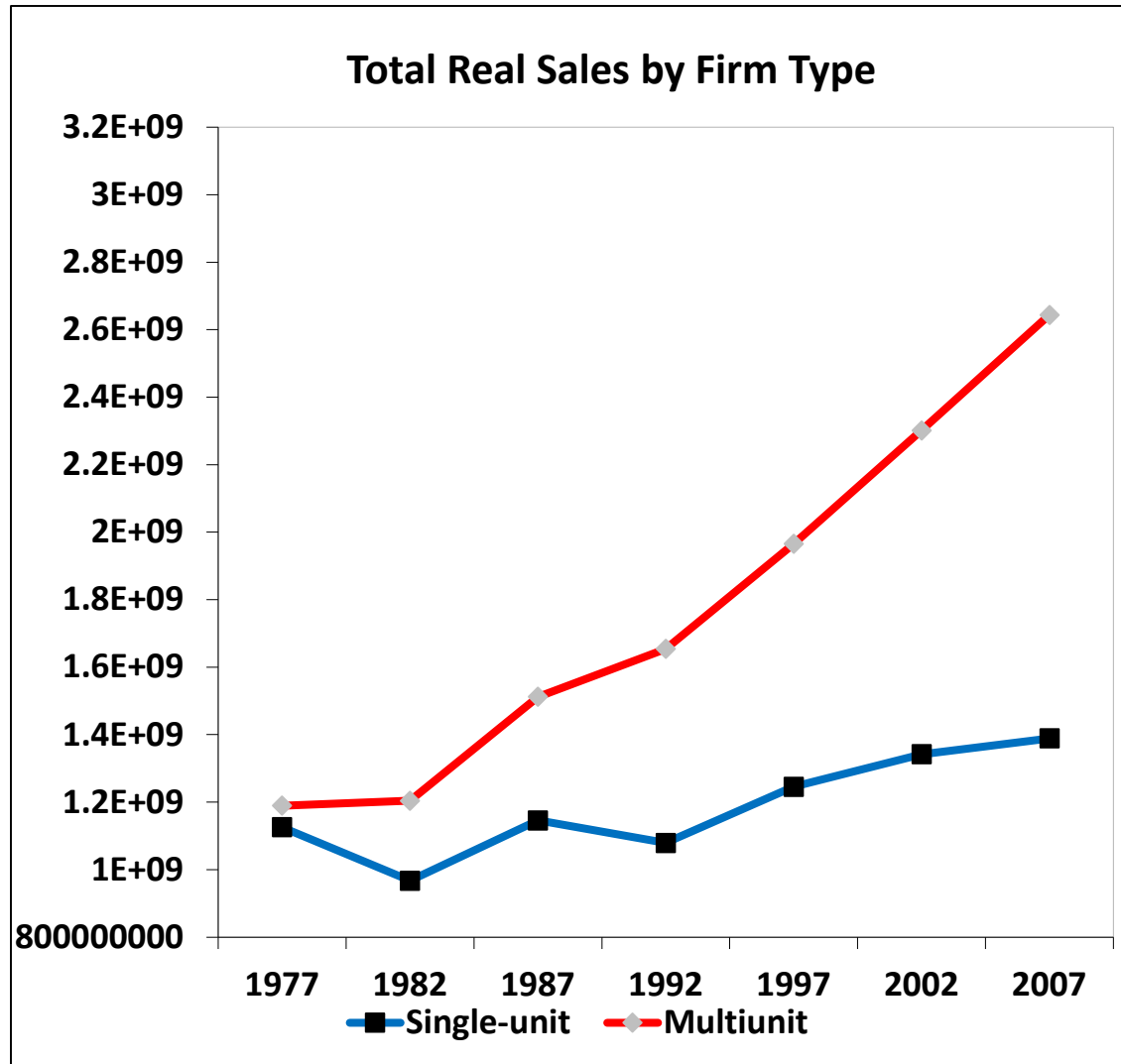
Employment-Weighted Startup Rates



High Tech are STEM intensive industries.
Includes ICT and Bio Tech.

A Tale of Two Sectors: Retail vs. High Tech





Source: Foster et. al. (2016)

Share of activity accounted for by Single Unit Establishment Firms (“Mom and Pop” Firms) has declined From 50 to 35 percent. Almost all of the increase in Multi-Unit Share is from Large, National Chains

Productivity Gap between Single-Unit Establishment Firms and Large, National Chains is 25 log points.

Employment-weighted annual exit Rate of Single-Units is about 8 percent. About one half of one percent for Large, National Chains.

Job Reallocation Rate for Single-Units is almost 3 times larger than for National Firms.

Shift to National Chains has been productivity enhancing and reduced volatility.

Increases in Frictions and Distortions?

- Hopenhayn and Rogerson (1993):
 - Canonical firm dynamics model where firms face idiosyncratic productivity shocks, endogenous entry and exit and adjustment frictions (extension of Hopenhayn (1992) with adjustment frictions).
 - Increased adjustment frictions imply:
 - Reduced dispersion of firm growth rates
 - Firms with higher realizations in productivity are less likely to grow, lower realizations in productivity are less likely to contract/exit.
 - Reduced aggregate productivity

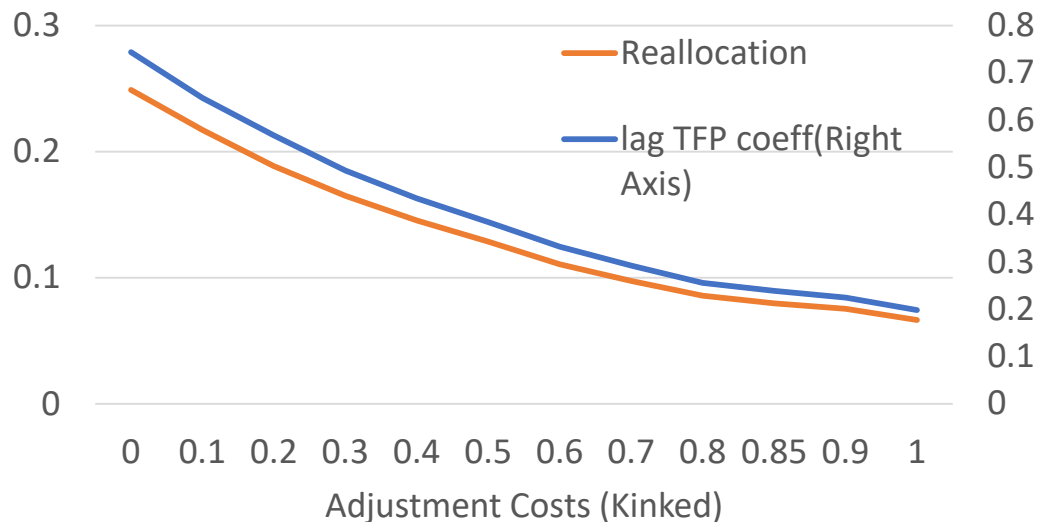
Illustrative Model of Increases in Adjustment Frictions

- Decker et al. (2017) consider an illustrative model of adjustment frictions (consistent with Cooper and Haltiwanger (2000, 2006), Cooper, Haltiwanger and Willis (2007, 2014) and Elsby and Michaels (2013)):

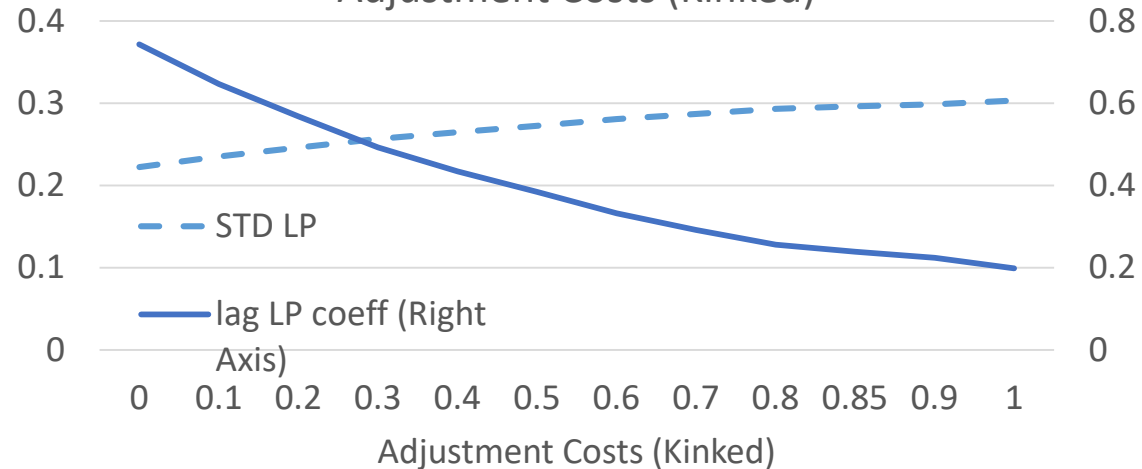
$$\begin{aligned}
 V(E_{it-1}; A_{it}) &= A_{it} E_{it}^\alpha - w_t E_{it} - C(H_{it}) + \beta V(E_{it}; A_{it+1}) \\
 C(H_{it}) &= \begin{cases} \frac{\gamma}{2} \left(\frac{H_{it}}{E_{it-1}} \right)^2 & + F_+ \max(H_{it-1}, 0) + F_- \max(-H_{it-1}, 0) \text{ if } H_{it} \neq 0 \\ 0, & \text{otherwise} \end{cases} \\
 a_{it} &= \rho a_{it} + \eta_{it} \\
 E_{it} &= E_{it-1} + H_{it}
 \end{aligned}$$

Where $\alpha < 1$ due to decreasing returns or product differentiation.
 Calibration of this model helps illustrate different mechanisms.

Responses of Key Moments to Changes in Adjustment Costs (Kinked)



Responses of Key Moments to Changes in Adjustment Costs (Kinked)



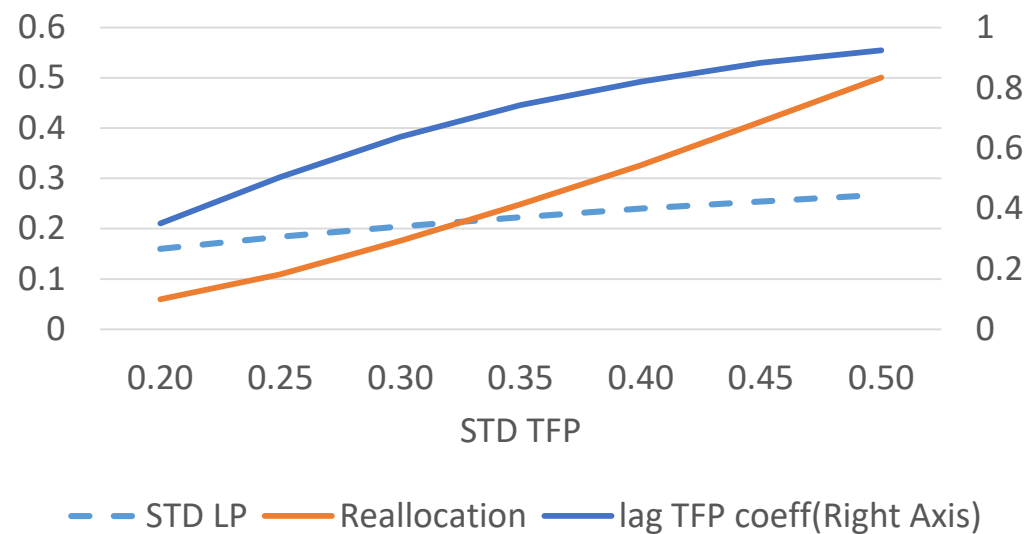
With increases in adjustment frictions:

1. Declining Reallocation and Responsiveness.
2. Rising Dispersion of LP.

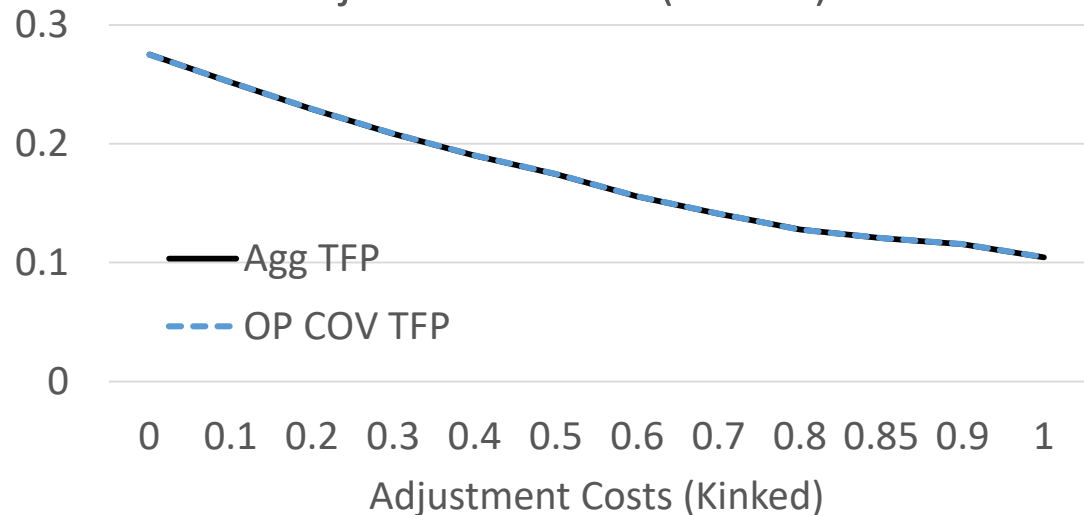
With decreases in shock dispersion:

1. Declining Reallocation and Responsiveness.
2. Declining Dispersion of LP.

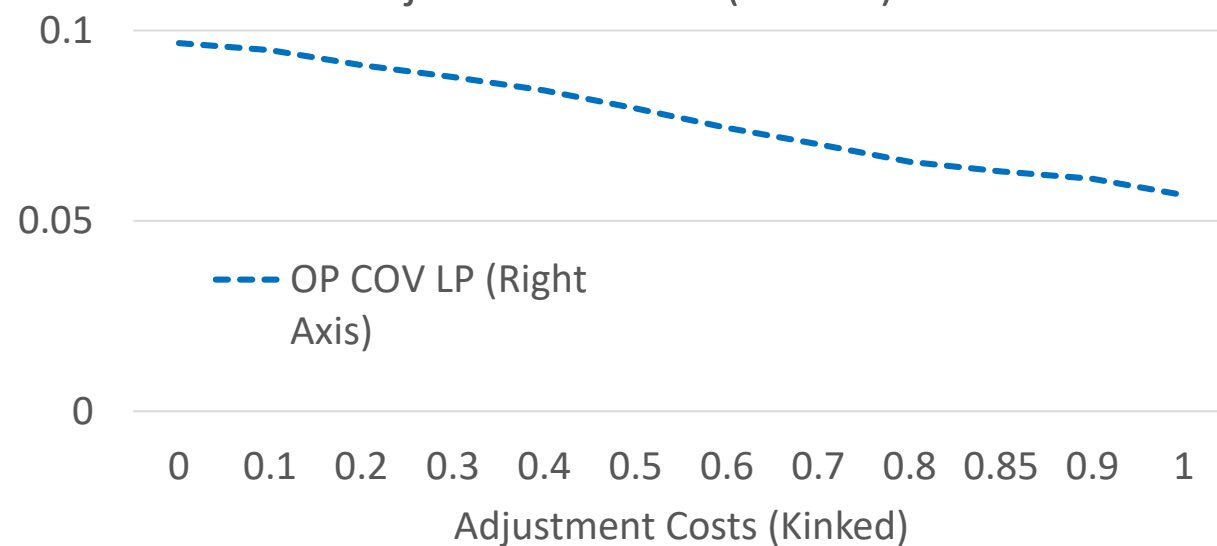
Responses of Key Moments to Changes in TFP Dispersion (Kinked Adjustment Costs)



Responses of Key Moments to Changes in Adjustment Costs (Kinked)



Responses of Key Moments to Changes in Adjustment Costs (Kinked)

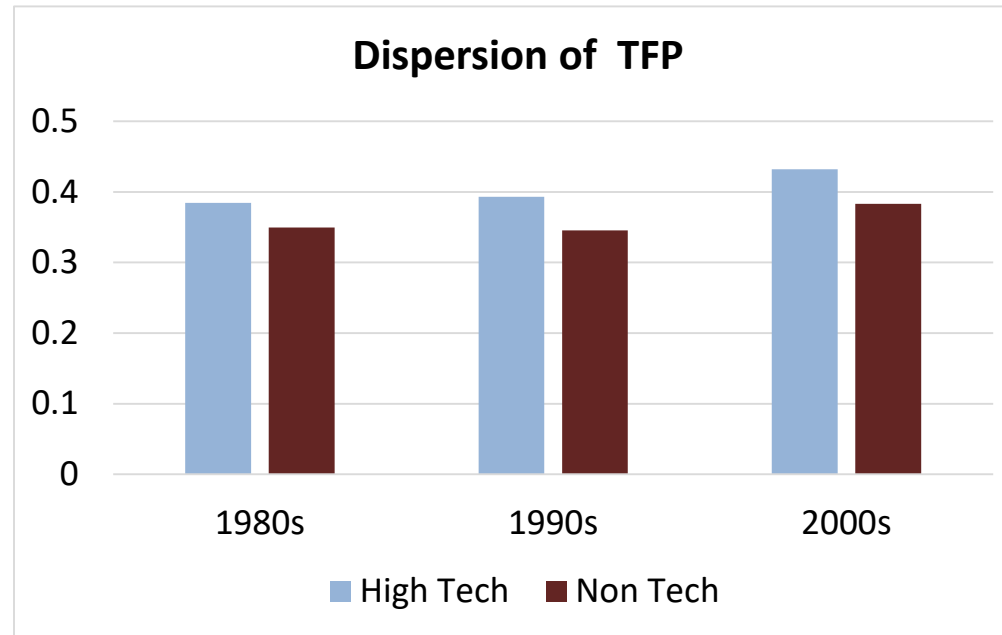


$P_i = \bar{p}_i + cov(\theta_f, p_f)$, Olley-Pakes (OP) Decomposition of industry-level productivity insightful here.
 OP covariance using either TFP or LP declines with increase in adjustment costs.

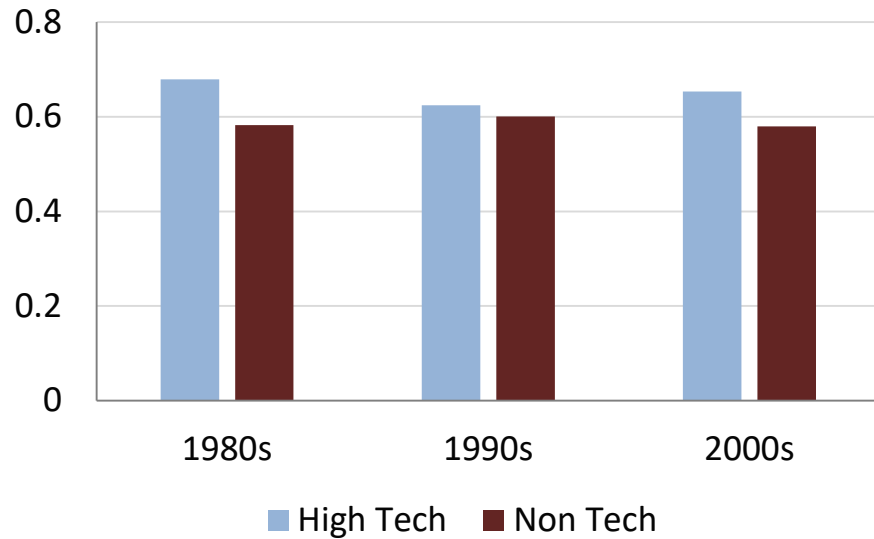
By Agg TFP we mean employment-weighted micro TFP. Since unweighted mean does not vary, variation in Agg TFP is isomorphic to the OP Covariance.

Dispersion and Persistence

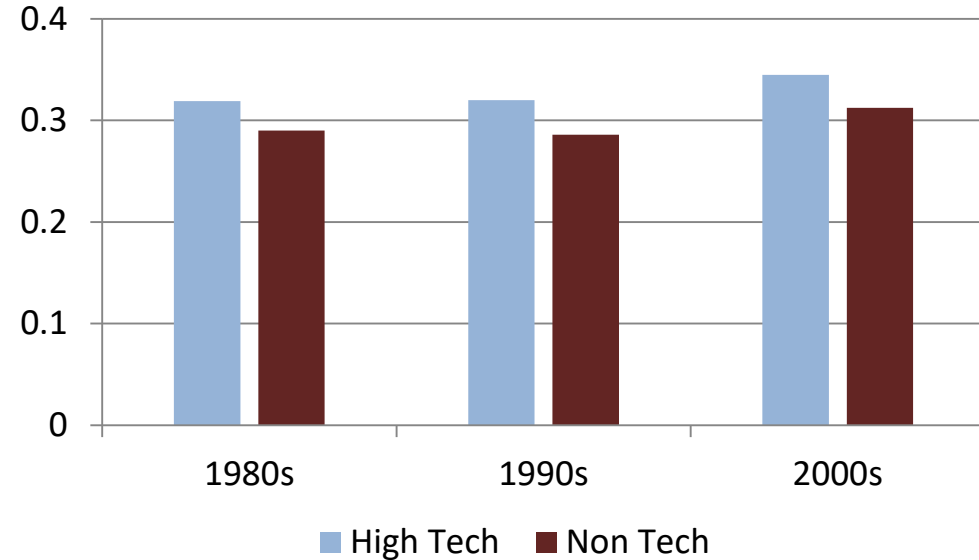
Shock Processes in Manufacturing



AR(1) Coefficient



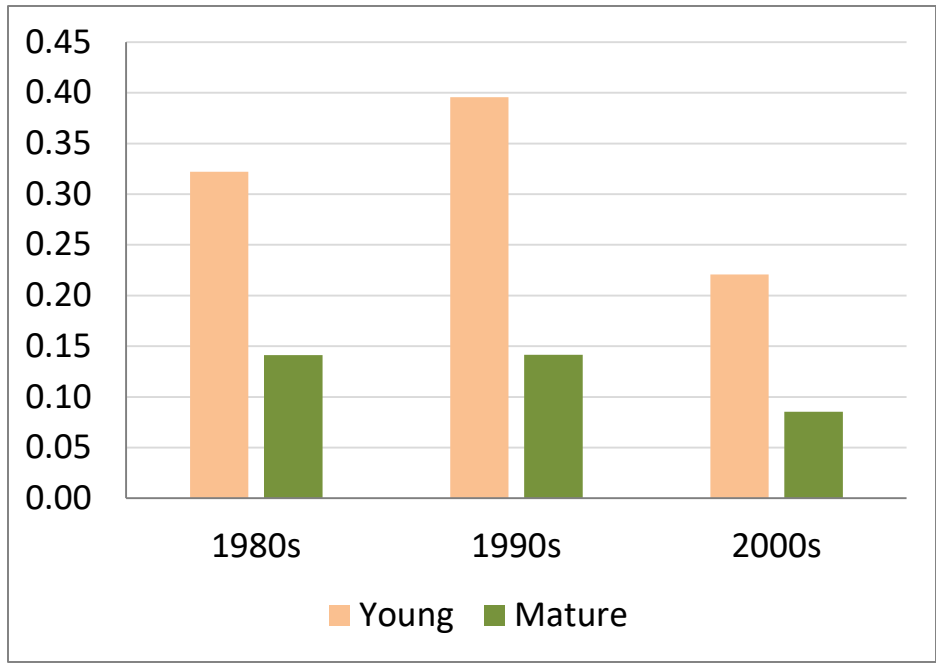
Std Deviation of Innovations



Little evidence that changes in persistence drive patterns of reallocation

Patterns for innovations mimic overall shocks

Employment Growth



- Increased responsiveness during 1990s for young firm plants in High Tech
- Decreased responsiveness during 2000s for both young and mature firm plants in High Tech

Marginal Response of Plant-Level Employment Growth and Investment to TFP for High Tech – Results from estimating plant-level regressions of outcomes on lagged TFP realizations

Investment in Capital Equipment



Implications for Aggregate (Industry-Level) Productivity

Start with (industry) aggregate productivity:

$$P_t = \sum_i \theta_{it} P_{it}$$

θ_{it} = employment weight, P_{it} = plant TFP, Correlation with traditional measures about 0.8

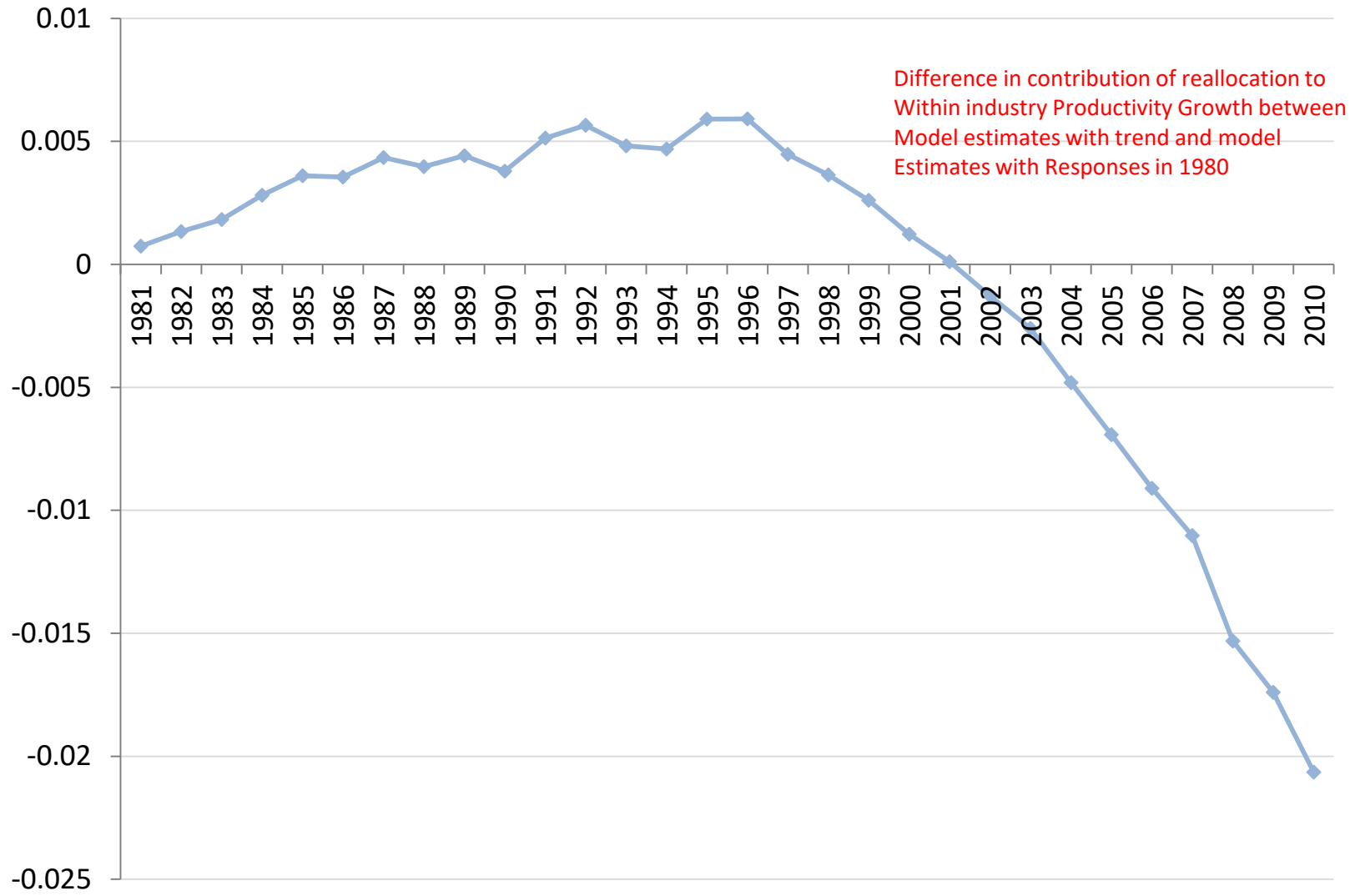
Reallocation contribution to prod. growth:

$$P_{t+1}^C = \sum_i \theta_{it+1} P_{it} \quad P_{t+1}^C - P_t$$

Agg. prod. growth accounted for by reallocation (essentially Change in OP covariance for fixed P_{it})

Model-based $\theta_{it+1} \Rightarrow$ counterfactual $P_{t+1}^C - P_t$ (with and without change in responsiveness) \Rightarrow Diff-in-diff

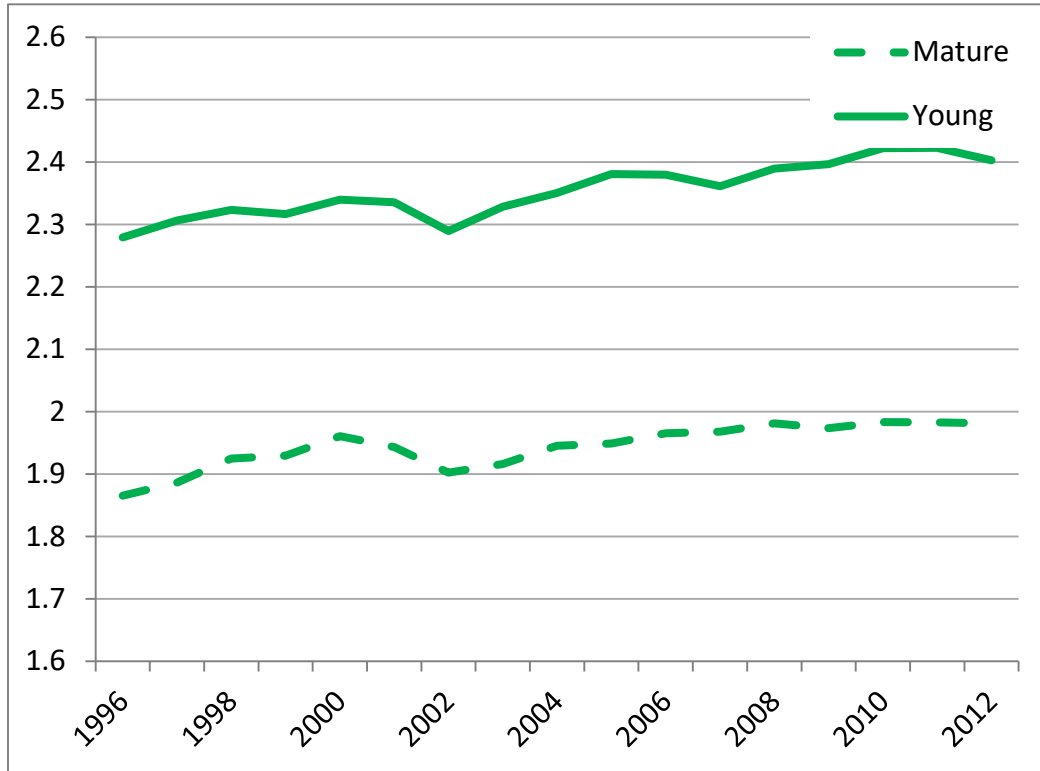
Diff-in-Diff Accounting Counterfactual for Changing Responsiveness in High Tech



Economy Wide

- Much more difficult to construct measures of shock processes
- Instead measure Revenue Labor Productivity (RLP)
 - New Comprehensive Firm-Level Database
 - Exclude the financial sector (private, non-farm, non-financial)
 - Distributions of RLP will reflect shocks and frictions (dispersion endogenous)
 - High (low) TFPR/RLP should grow (shrink) as they will have high (low) Marginal Revenue Products. Covariance between growth and these measures still informative.
 - Focus on relative productivity within detailed industries.
- Implication:
 - Both changes in dispersion of measured productivity *and* covariance between measured productivity and growth informative moments.

Within Industry Labor Productivity Dispersion, All Sectors



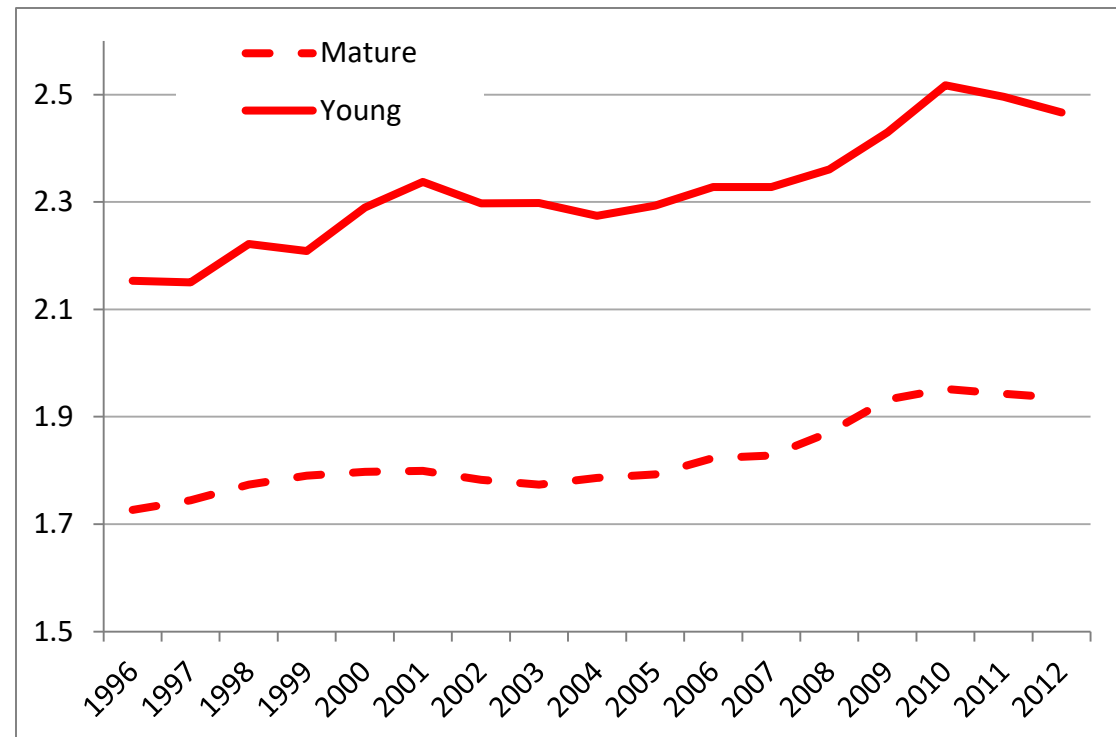
Young dispersion > Mature dispersion
Consistent with Young facing more frictions,
engaged in learning and experimentation.

Dispersion rises within age groups post 2000.
Difficult to reconcile with Gort-Klepper dynamics

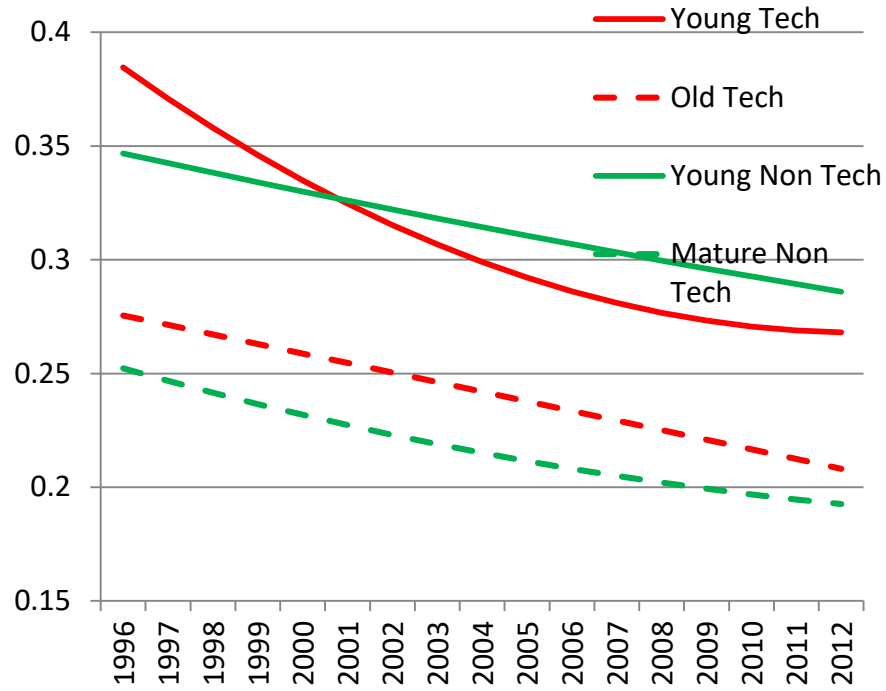
Rising Within Industry Labor
Productivity Dispersion (Gross Output
Per Worker) Within Age Groups

**Within 6 digit NAICS Industries, 90-10
Differential**

Within Industry Labor Productivity Dispersion, High Tech, by Firm Age



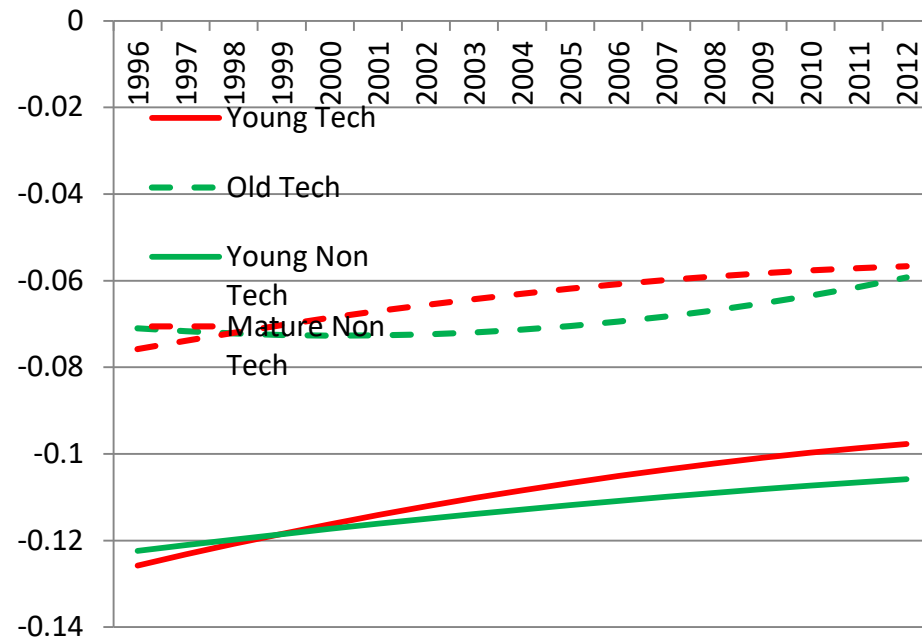
Reduced Responsiveness of Employment Growth to Productivity in 1997-2013 (Cov(growth,productivity) is declining)



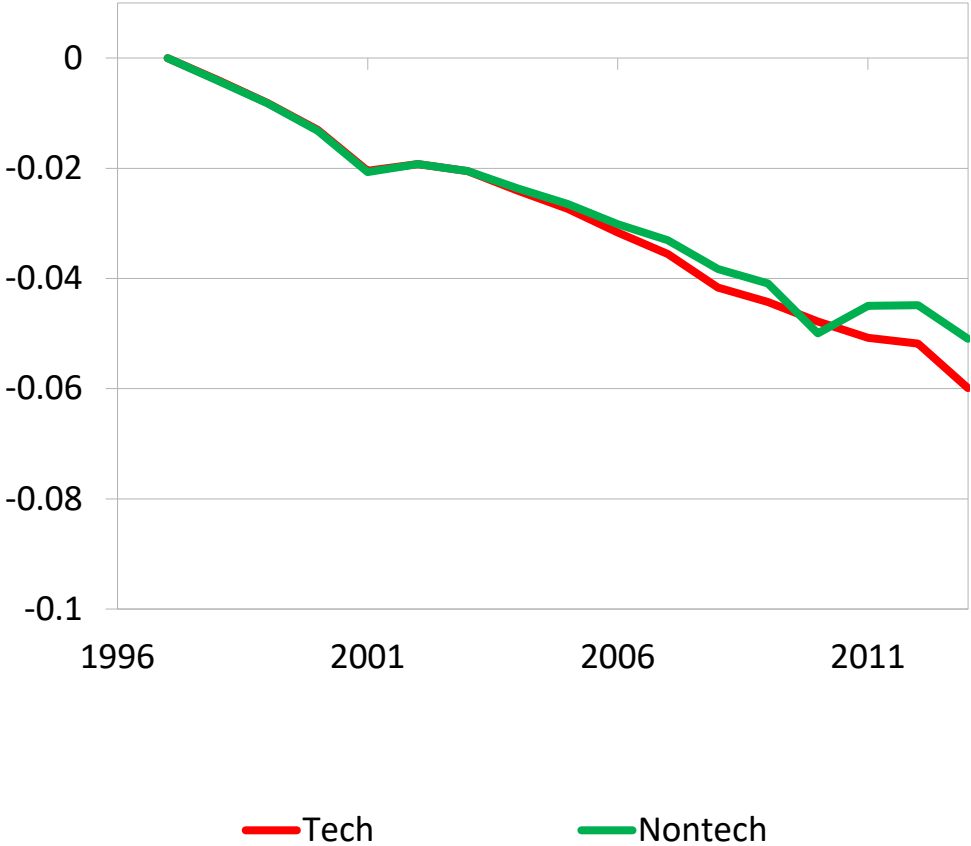
Declining responsiveness is consistent
With rising dispersion in Revenue
Labor Productivity

Exit has become less
Responsive to Productivity

Overall Net Employment Growth
(inclusive) of Exit has become less
Responsive to Productivity



Reduction in Contribution of Reallocation to Productivity from Reduced Responsiveness, Tech vs. Nontech (Diff-in-Diff counterfactual)

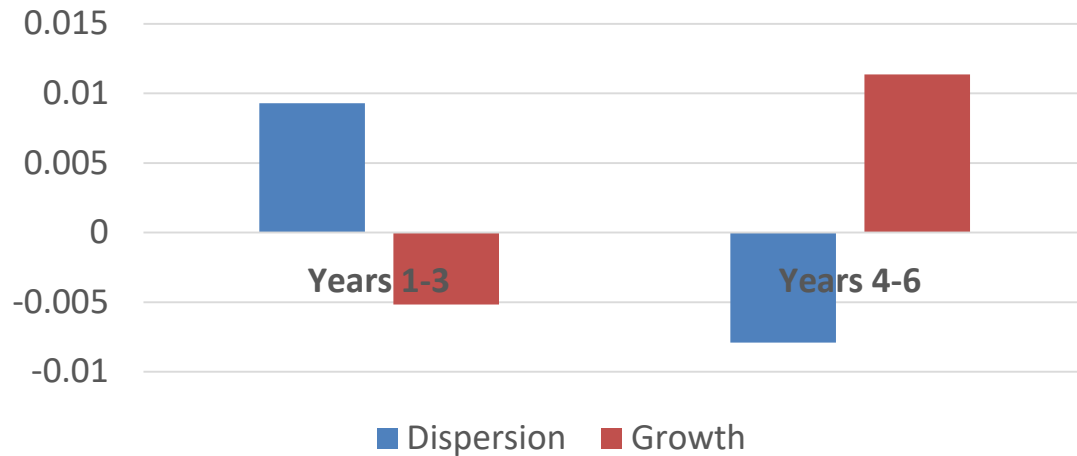


Each point reflects immediate gains in specified year if responsiveness returned to 1997 rates with current year dispersion (latter partly reflects accumulated effects of declining responsiveness)

Gort-Klepper Dynamics?



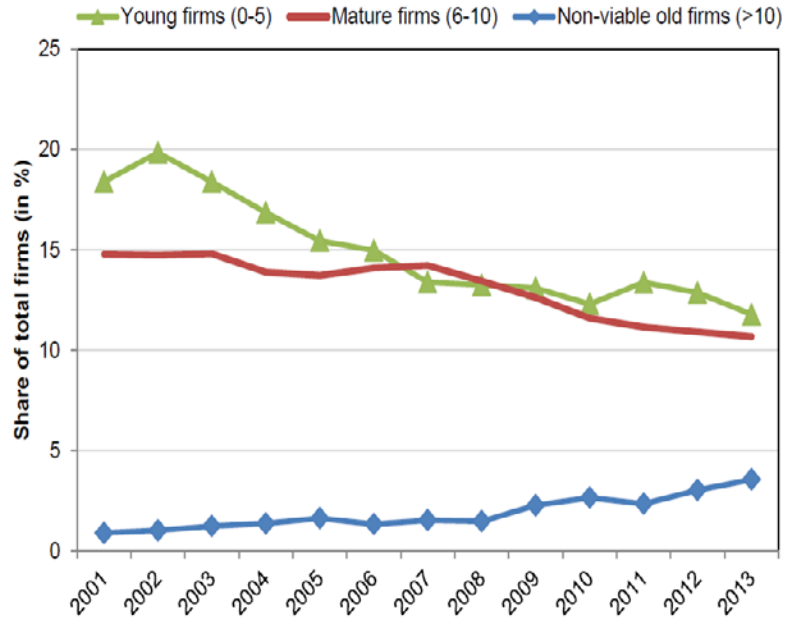
Changes in Productivity Dispersion and Growth from a 1% (one time) Increase in Entry Rate, High Tech



Some evidence of Gort and Klepper Dynamics in High Tech:

1. Surge of Entry (proxy for innovative period) leads to immediate rise in dispersion and lagged rise in productivity.
2. But these dynamics can't account for increase in within industry dispersion post 2000 (IQR increases by more than 10 log points for both young and mature firms in post 2000 period). Entry is declining over this same period. Based on Gort-Klepper dynamics we would have expected a decline in dispersion.

A: Share of total firms

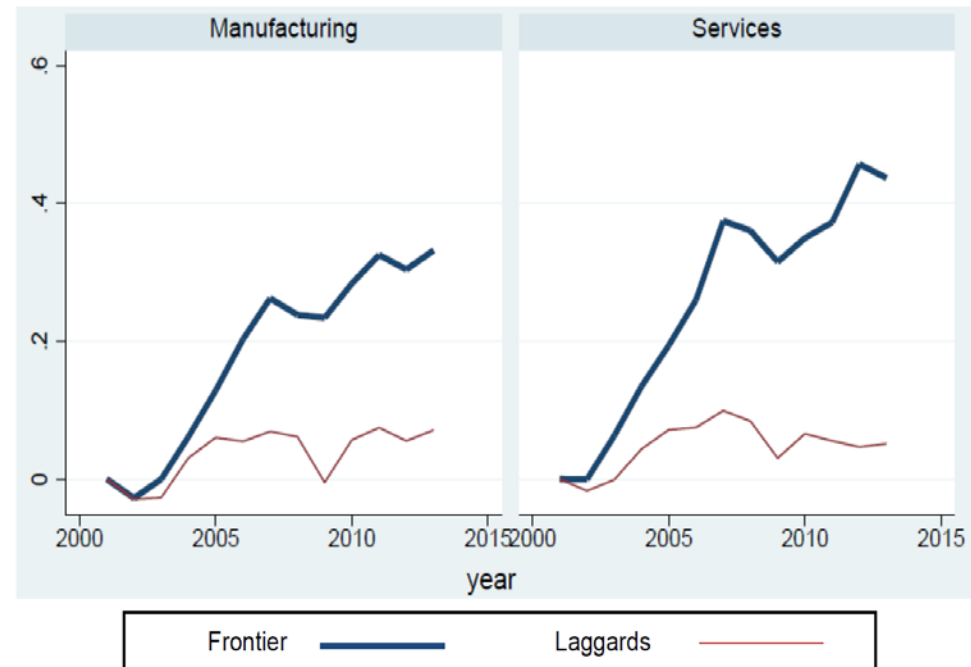


In OECD, declining dynamism with
Declining entrepreneurship

And

Rising Within Industry Dispersion of
Revenue Labor Productivity

Labour productivity: value added per worker (2001-2013)



Source: Andrews et. al. (2016)

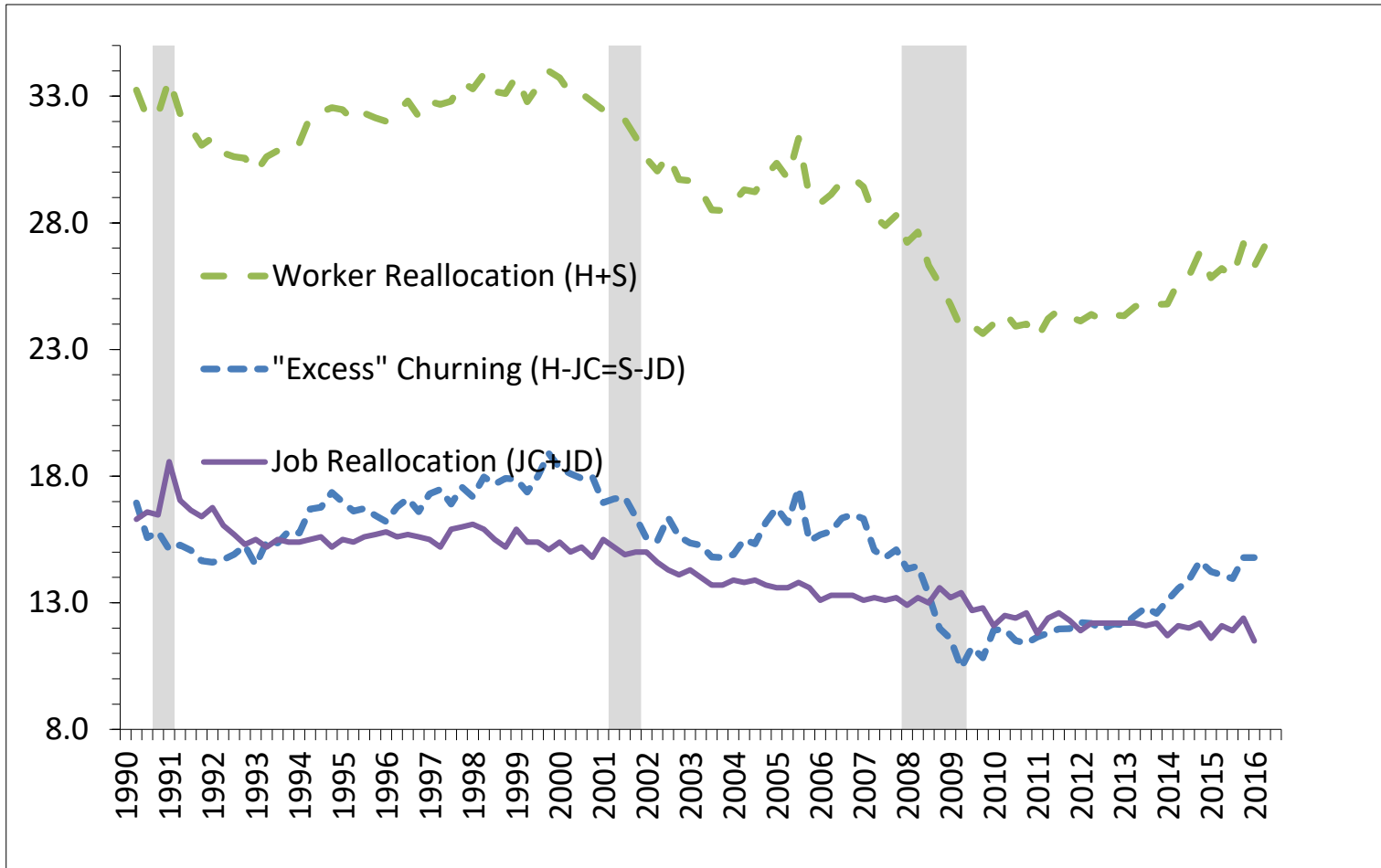
Taking Stock

- Different dynamics across sectors:
 - Retail Trade:
 - Structural change yielded decline in dynamism, entrepreneurship and rise in productivity.
 - High Tech:
 - Rise and decline in entrepreneurship, dynamism and productivity.
 - Which way does causality run?
 - Declining responsiveness and rising labor productivity dispersion in post 2000 period consistent with rising frictions/distortions.
 - Is there evidence of Gort-Klepper dynamics? Yes but dispersion rises rather than falls in post 2000 period with declining entry.

Rising Frictions/Distortions?

- Labor market (e.g., Occupational Licensing, Employment at Will)
- Decline in competition (e.g., winner takes all sectors make it more difficult to identify and enforce exclusionary practices)
- Financial market regulation (e.g., Sarbanes-Oxley, Dodd-Frank)
- Zoning restrictions in information-centric locations? (Hsieh and Moretti, 2015)

Other mechanisms/channels



Decline in indicators of dynamism (job reallocation/entry) part of broader decline in labor market fluidity.

The latter has implications beyond those discussed here for productivity:

1. Labor force participation
2. Earnings growth
3. If match quality has declined this also has implications for productivity.

See Davis and Haltiwanger (2014).