Demographic Origins of the Startup Deficit[1]

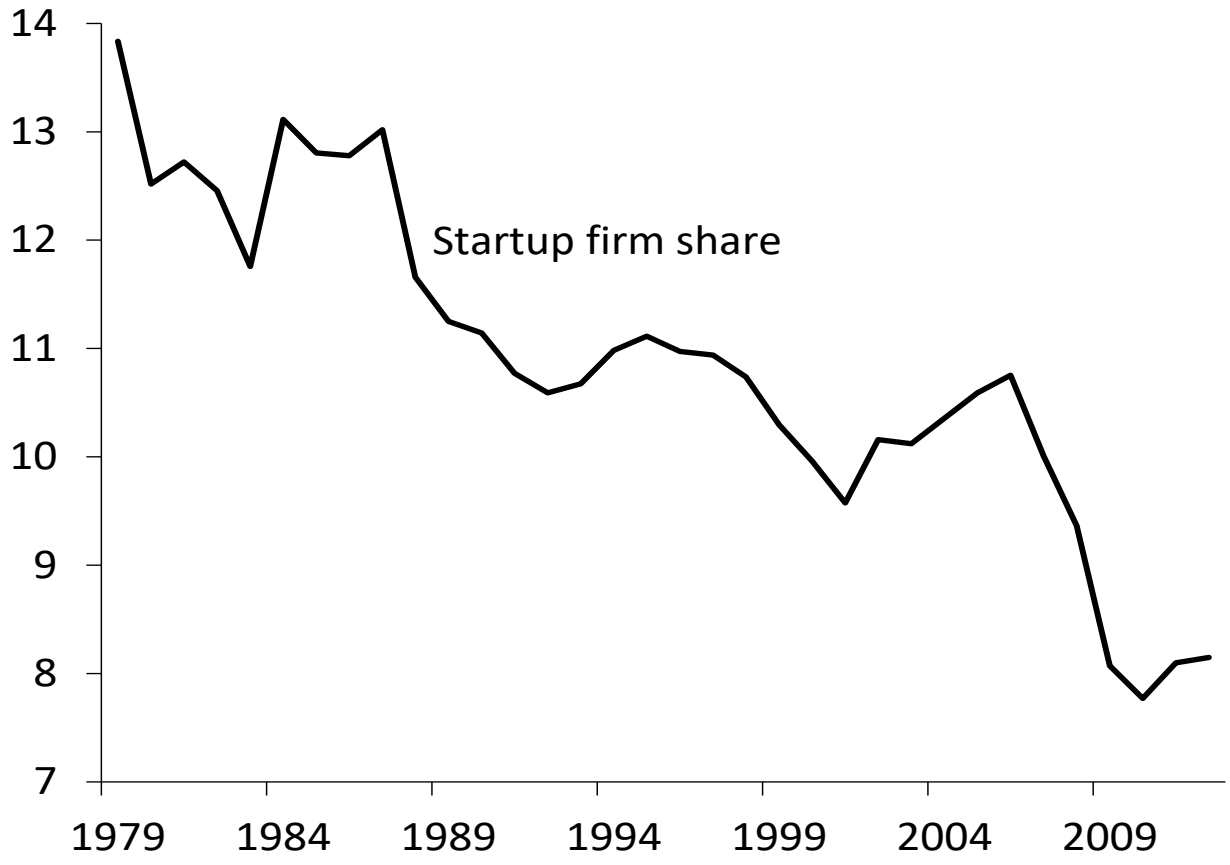
Fatih Karahan Benjamin Pugsley Ayşegül Şahin

EF&G Research Meeting

Cambridge
July 14, 2018

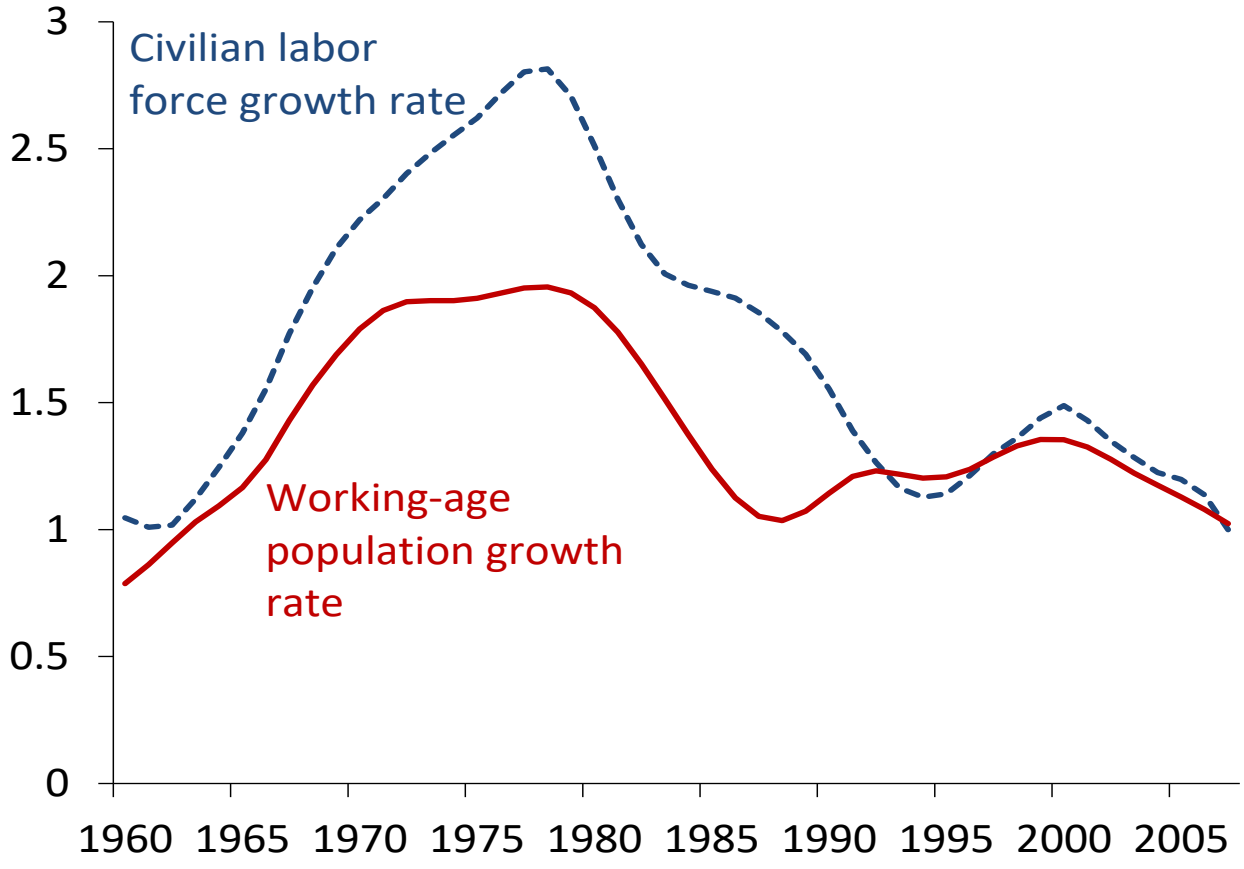
[1] Any opinions and conclusions expressed herein are those of the author(s) and do not necessarily represent the views of the U.S. Census Bureau, Federal Reserve Bank of New York or the Federal Reserve System. All results have been reviewed to ensure that no confidential information is disclosed.

U.S. startup rate

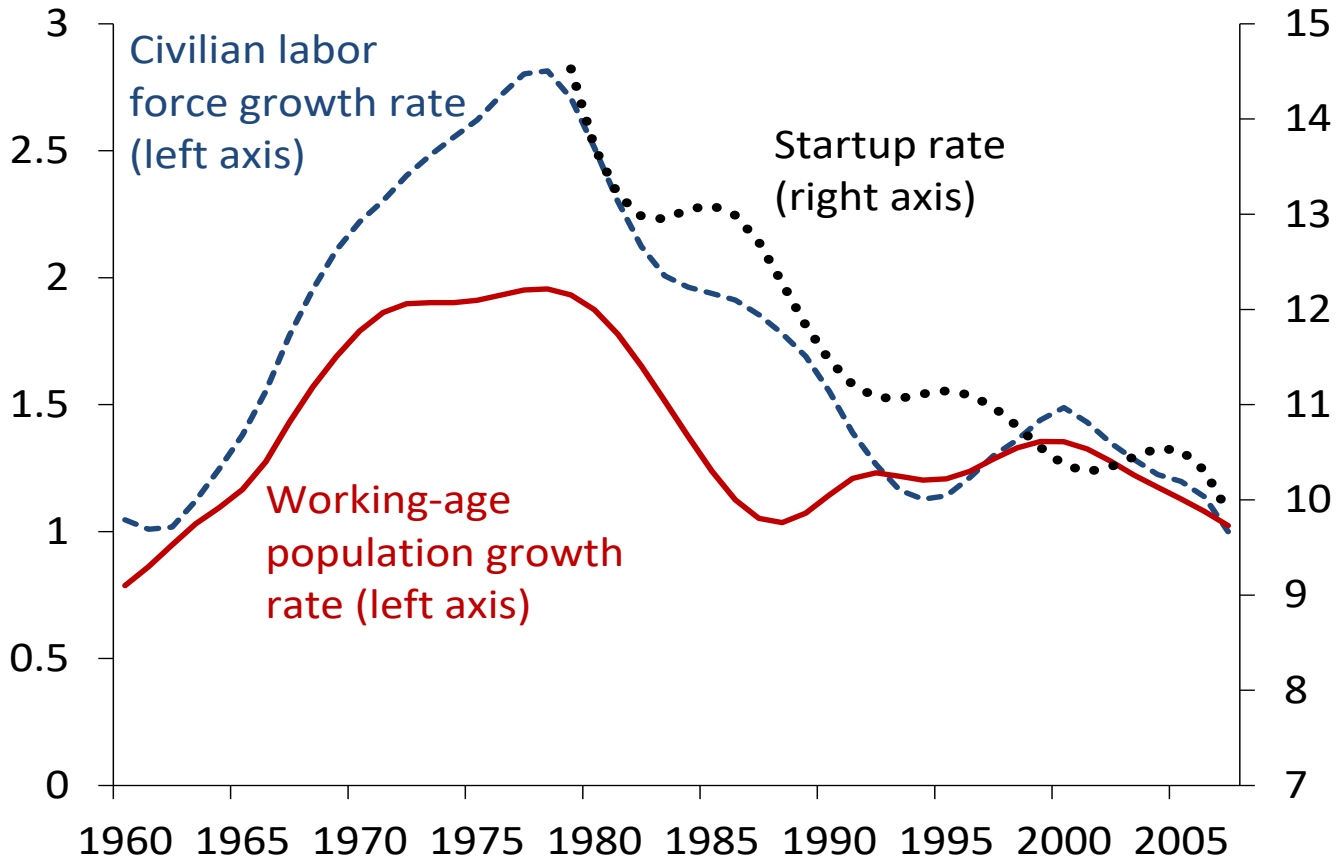


Source: U.S. Census Bureau Business Dynamics Statistics.

Annual labor supply growth rate trend, 1960-2007



Annual labor supply growth rate trend, 1960-2007



Demographic Channel: Decline in the labor supply growth rate is a key driver of the decline in firm entry.

Linking labor supply growth and firm entry

A stylized firm dynamics framework

Consider an economy with

- μ_t identically sized firms
- exogenous exit, x_t
- M_t firms enter
- labor supply, N_t, grows at rate η_t

A stylized firm dynamics framework

Consider an economy with

- μ_t identically sized firms
- exogenous exit, x_t
- M_t firms enter
- labor supply, N_t, grows at rate η_t

Number of firms evolves according to

$$\mu_{t+1} = (1 - x_t)\mu_t + M_{t+1}.$$

A stylized firm dynamics framework

Consider an economy with

- μ_t identically sized firms
- exogenous exit, x_t
- M_t firms enter
- labor supply, N_t, grows at rate η_t

Number of firms per worker $\bar{\mu}_t \equiv \mu_t / N_t$ evolves as

$$\bar{\mu}_{t+1} = \frac{1 - x_t}{1 + \eta_t} \bar{\mu}_t + \bar{M}_{t+1}.$$

A stylized firm dynamics framework

Consider an economy with

- μ_t identically sized firms
- exogenous exit, x_t
- M_t firms enter
- labor supply, N_t, grows at rate η_t

Along the balanced growth path

$$\text{Flow-balance SR}(\eta, x) = \frac{\eta + x}{1 + \eta}$$

A stylized firm dynamics framework

Consider an economy with

- μ_t identically sized firms
- exogenous exit, x_t
- M_t firms enter
- labor supply, N_t, grows at rate η_t

Along the balanced growth path

$$\text{Flow-balance SR}(\boldsymbol{\eta}, x) = \frac{\boldsymbol{\eta} + x}{1 + \boldsymbol{\eta}}$$

$$\boldsymbol{\eta} \downarrow \implies \textbf{SR} \downarrow$$

A stylized firm dynamics framework

Consider an economy with

- μ_t identically sized firms
- exogenous exit, x_t
- M_t firms enter
- labor supply, N_t, grows at rate η_t

Along the balanced growth path

$$\text{Flow-balance SR}(\eta, \mathbf{x}) = \frac{\eta + \mathbf{x}}{1 + \eta}$$

$$\mathbf{x} \downarrow \implies \mathbf{SR} \downarrow$$

Flow-balance startup rates: 1980-1984 and 2003-2007

Measure labor supply growth using working-age population and compute the flow-balance startup rates.

Flow-balance startup rates: 1980-1984 and 2003-2007

Measure labor supply growth using working-age population and compute the flow-balance startup rates.

in %	Startup Rate
1980-84	12.51
2003-07	10.37
Decline	2.14

The startup rate declined by 2.14 ppts.

Flow-balance startup rates: 1980-1984 and 2003-2007

Measure labor supply growth using working-age population and compute the flow-balance startup rates.

in %	Startup Rate	η_t
1980-84	12.51	1.67
2003-07	10.37	1.11
Decline	2.14	0.56

Working-age population growth rate declined by 0.56 ppts.

Flow-balance startup rates: 1980-1984 and 2003-2007

Measure labor supply growth using working-age population and compute the flow-balance startup rates.

in %	Startup Rate	η_t	$SR(\eta_t, \bar{x}_{80s})$
1980-84	12.51	1.67	10.91
2003-07	10.37	1.11	10.42
Decline	2.14	0.56	0.49

Decline in η explains **1/4** of the decline in the startup rate.

Flow-balance startup rates: 1980-1984 and 2003-2007

Measure labor supply growth using working-age population and compute the flow-balance startup rates.

in %	Startup Rate	η_t	$SR(\eta, \bar{x}_{80s})$	x_t
1980-84	12.51	1.67	10.91	9.43
2003-07	10.37	1.11	10.42	8.47
Decline	2.14	0.56	0.49	0.96

Exit rate, x, also declined in the same period.

Flow-balance startup rates: 1980-1984 and 2003-2007

Measure labor supply growth using working-age population and compute the flow-balance startup rates.

in %	Startup Rate	η_t	$SR(\eta, \bar{x}_{80s})$	x_t	$SR(\eta_t, x_t)$
1980-84	12.51	1.67	10.91	9.43	10.91
2003-07	10.37	1.11	10.42	8.47	9.48
Decline	2.14	0.56	0.49	0.96	1.43

Declines in η and x roughly account for **2/3** of the decline.

Limitations of the stylized framework

Various simplifications:

- exit is exogenous and not linked to changes in η
- firm size is fixed and there is no incumbent employment growth
- there is no heterogeneity in firm behavior by age/size

Limitations of the stylized framework

Various simplifications:

- exit is exogenous and not linked to changes in η
- firm size is fixed and there is no incumbent employment growth
- there is no heterogeneity in firm behavior by age/size

Need an equilibrium model with entry, exit, and labor supply growth to evaluate the demographic channel quantitatively.

An equilibrium framework

Model ingredients

Hopenhayn and Rogerson (1993) with labor supply growth

- Household grows at rate η
- Continuum of incumbent firms have DRS technology with idiosyncratic productivity
- Firms face fixed operating costs and are subject to quadratic labor adjustment costs
- Free entry condition equates expected value of startup with entry cost

Long-run effect of a decline in labor supply growth rate

1. Real wages **do not** change in response to lower labor force growth.
    - A change in real wage would affect the expected value of entering.
    - Free entry condition dictates that entry shifts to completely offset any change in real wage.

Long-run effect of a decline in labor supply growth rate

1. Real wages **do not** change in response to lower labor force growth.
    - A change in real wage would affect the expected value of entering.
    - Free entry condition dictates that entry shifts to completely offset any change in real wage.
2. Incumbents **do not** respond to the change in η.

Long-run effect of a decline in labor supply growth rate

1. Real wages **do not** change in response to lower labor force growth.
   - A change in real wage would affect the expected value of entering.
   - Free entry condition dictates that entry shifts to completely offset any change in real wage.
2. Incumbents **do not** respond to the change in η.
3. Labor market clears entirely through a lower entry rate.

Long-run effect of a decline in labor supply growth rate

1. Real wages **do not** change in response to lower labor force growth.
   - A change in real wage would affect the expected value of entering.
   - Free entry condition dictates that entry shifts to completely offset any change in real wage.
2. Incumbents **do not** respond to the change in η.
3. Labor market clears entirely through a lower entry rate.

$\Rightarrow$ in the long run all adjustment to **labor supply shocks** is through the **entry margin**.

Long-run effect of a decline in labor supply growth rate

1. Real wages **do not** change in response to lower labor force growth.
    - A change in real wage would affect the expected value of entering.
    - Free entry condition dictates that entry shifts to completely offset any change in real wage.
2. Incumbents **do not** respond to the change in η.
3. Labor market clears entirely through a lower entry rate.

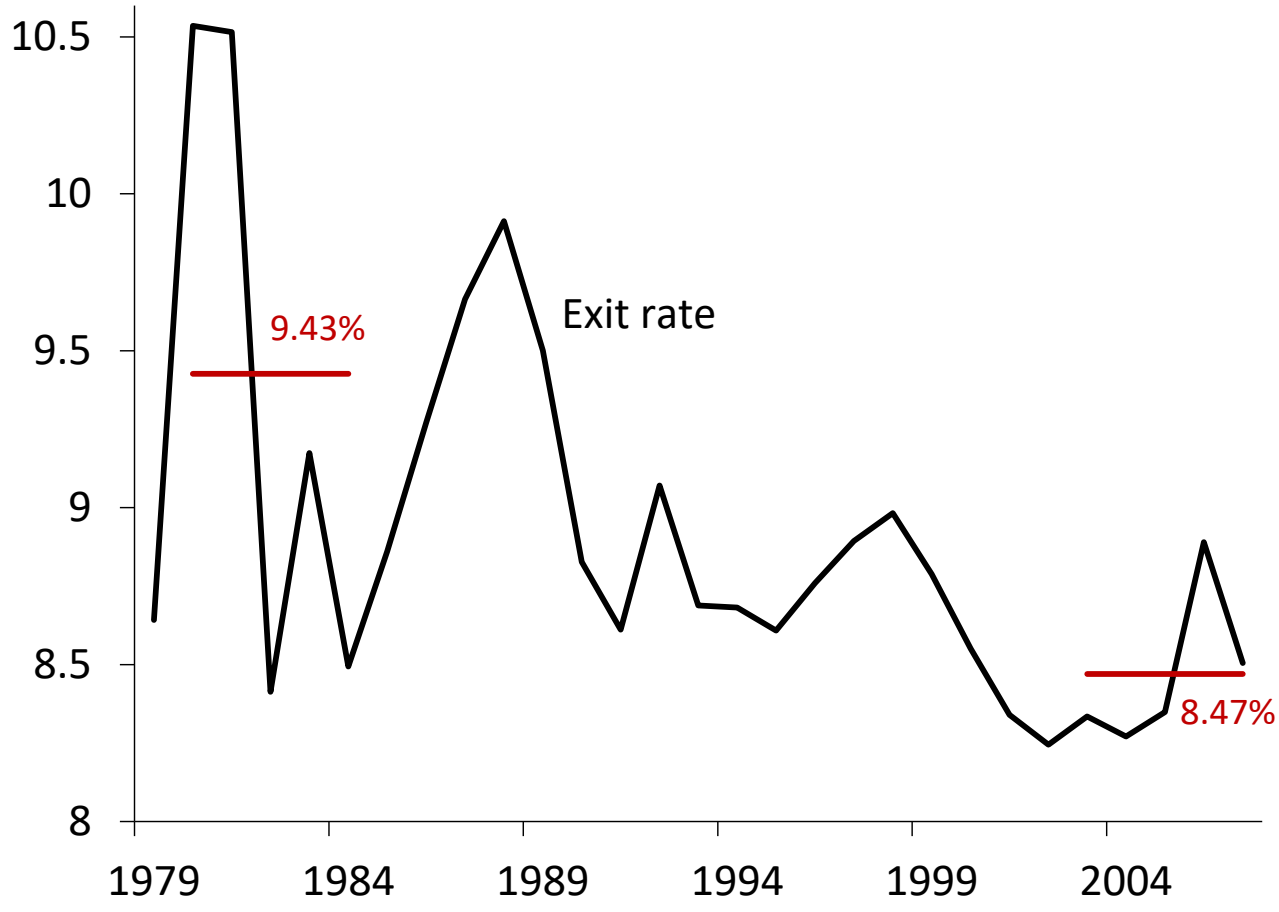
$\Rightarrow$ age composition changes the **aggregate exit rate** despite unchanged incumbent margins

Long-run effect of a decline in labor supply growth rate

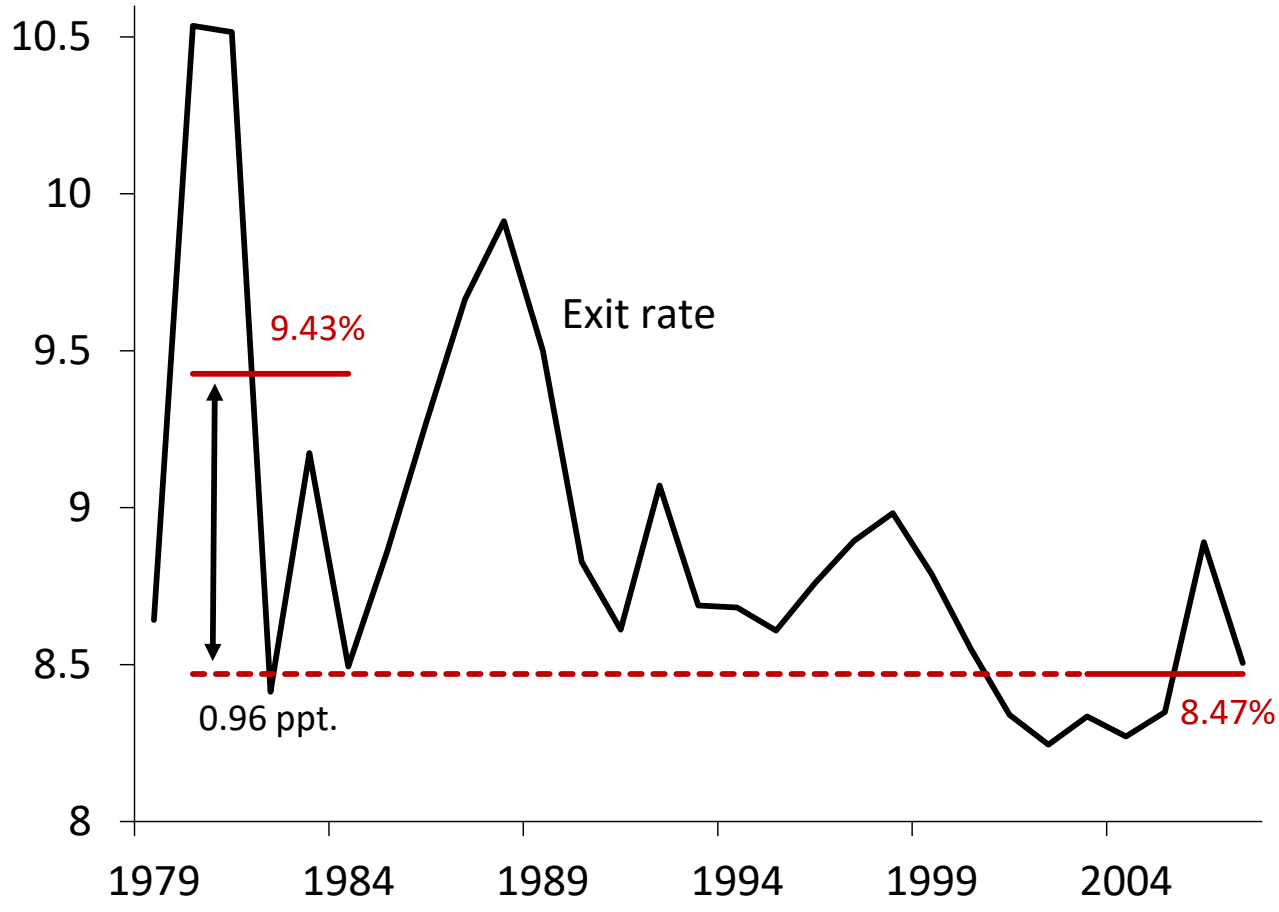
1. Real wages **do not** change in response to lower labor force growth.
   - A change in real wage would affect the expected value of entering.
   - Free entry condition dictates that entry shifts to completely offset any change in real wage.
2. Incumbents **do not** respond to the change in η.
3. Labor market clears entirely through a lower entry rate.

Compare the balanced growth path of the economy corresponding to **high** η (1980-84) and **low** η (2003-07)

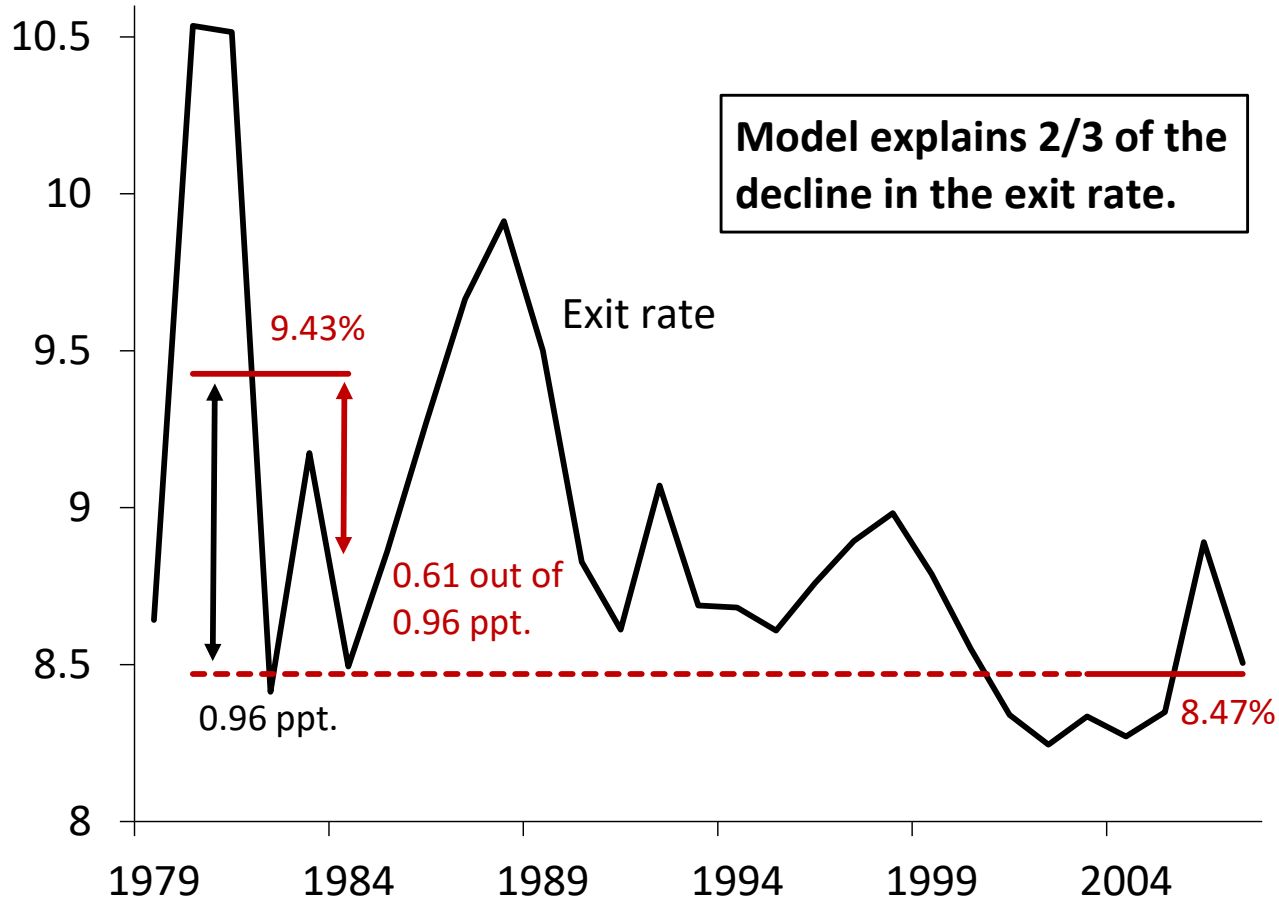
The decline in the exit rate: data vs model



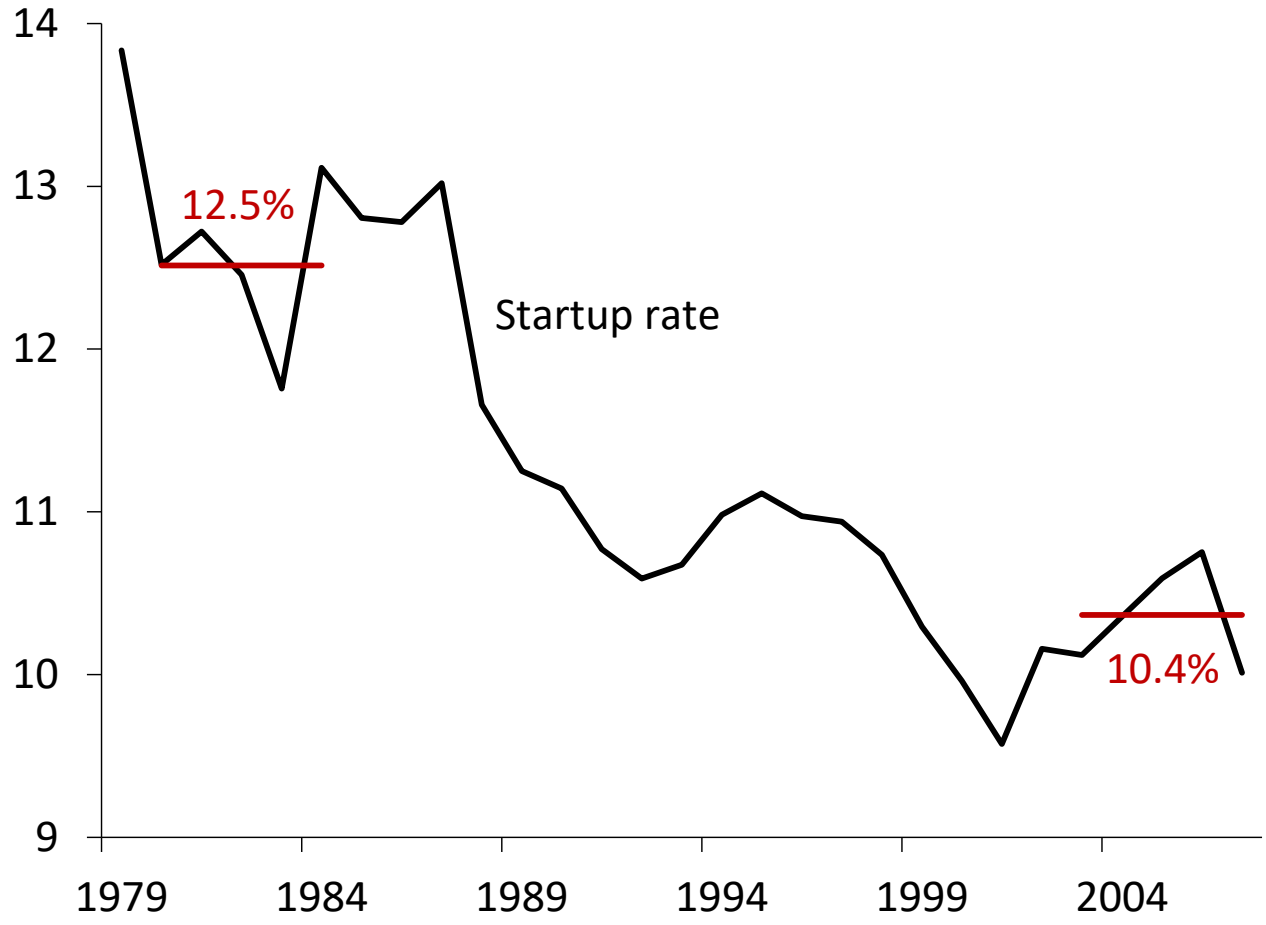
The decline in the exit rate: data vs model



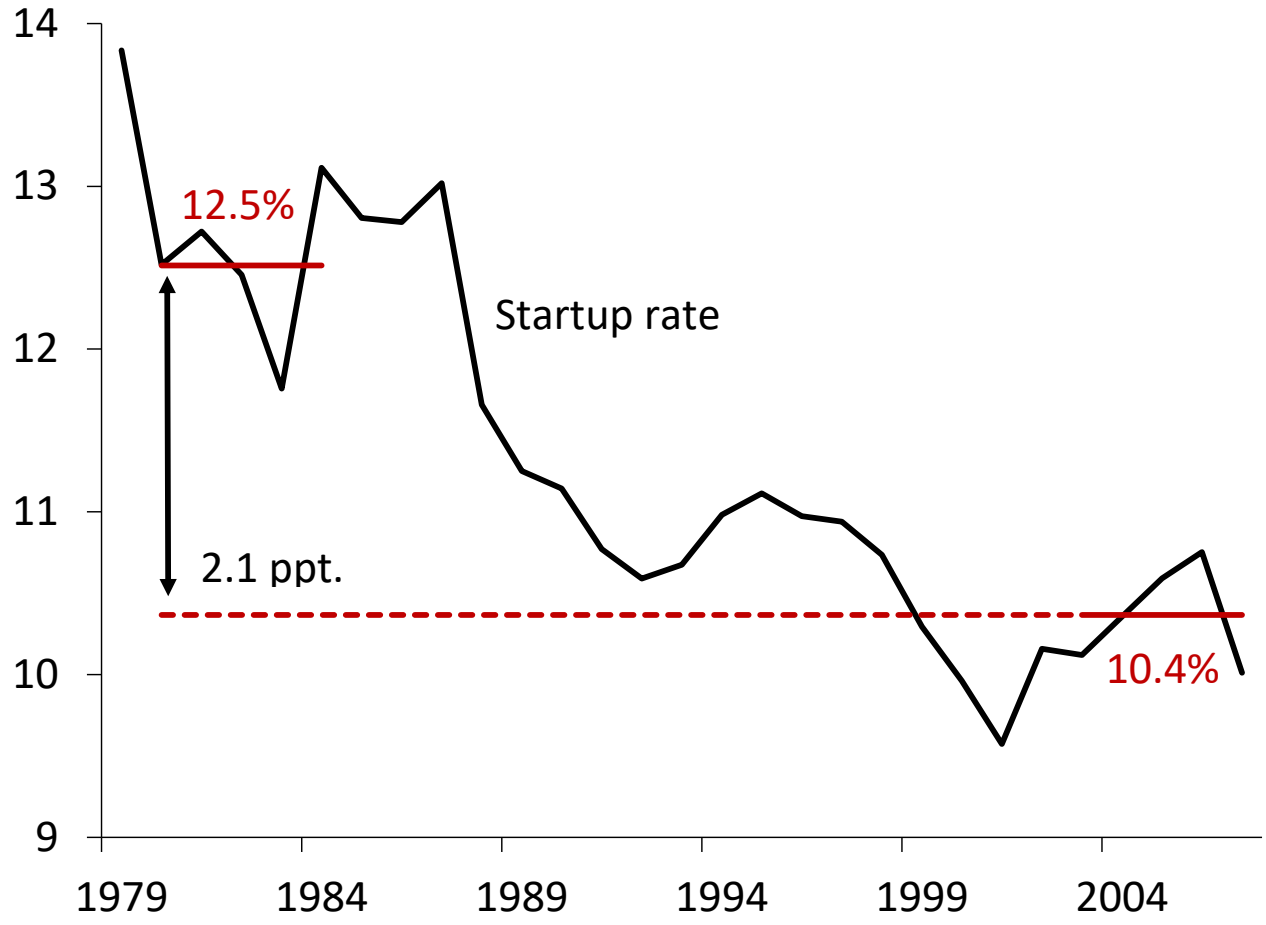
The decline in the exit rate: data vs model



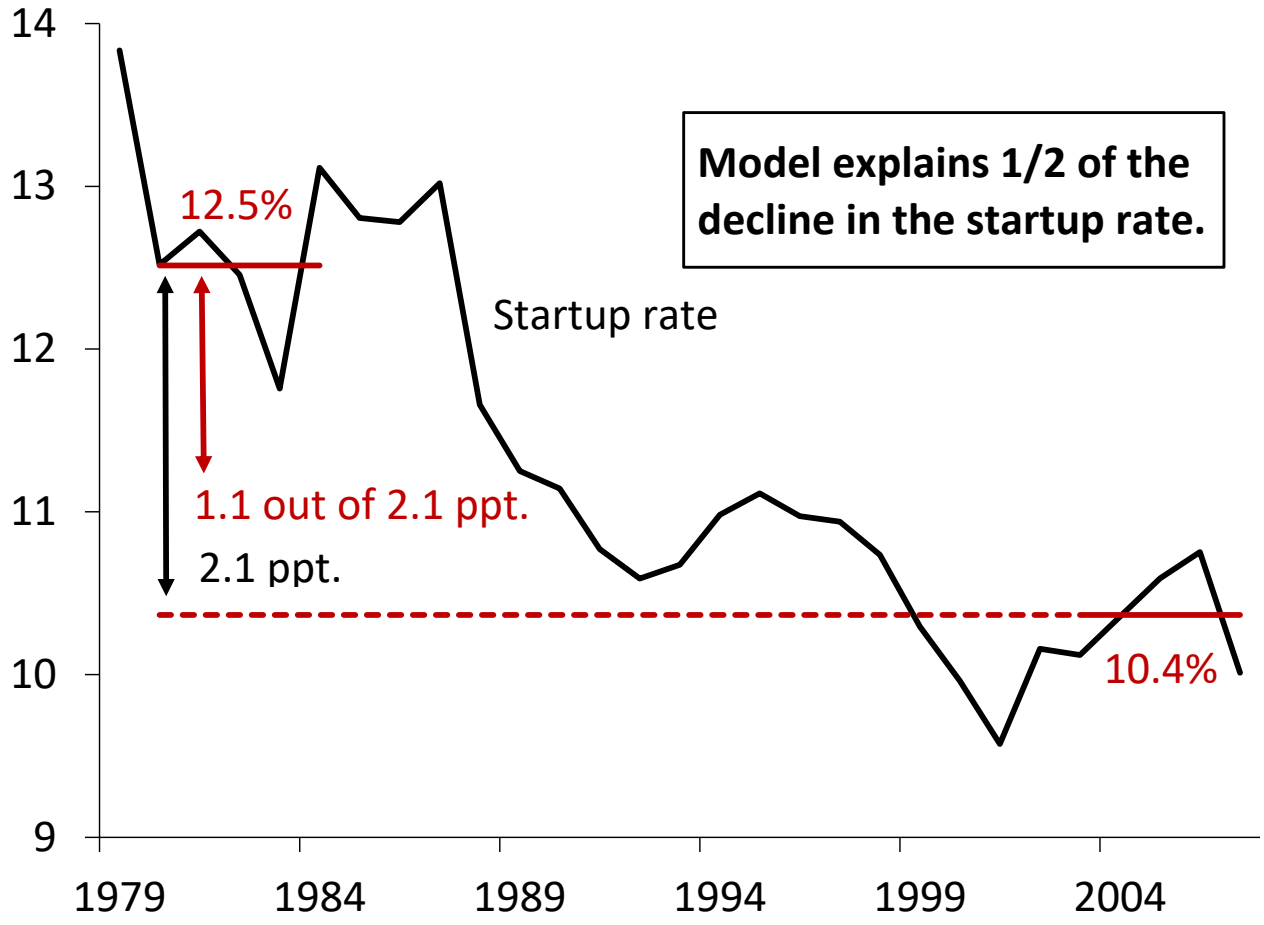
The decline in the startup rate: data vs model



The decline in the startup rate: data vs model



The decline in the startup rate: data vs model



Other channels in the model

Compute the change required for each channel to explain full decline in the startup rate

	Data	Labor supply GR
Required change		-1.2ppts
Δ startup size	+1.3%	0
Δ exit rate (age 3, size $<$50)	-0.17ppts	0

Other channels in the model

Compute the change required for each channel to explain full decline in the startup rate

	Data	Labor supply GR
Required change	-0.56ppts	-1.2ppts
Δ startup size	$+1.3\%$	0
Δ exit rate (age 3, size <50)	-0.17ppts	0

Other channels in the model

Compute the change required for each channel to explain full decline in the startup rate

	Data	Labor supply GR	Entry cost
Required change		-1.2ppts	+59.47%
Δ startup size	+1.3%	0	+11.77%
Δ exit rate (age 3, size $<$50)	-0.17ppts	0	-1.16ppts

Other channels in the model

Compute the change required for each channel to explain full decline in the startup rate

	Data	Labor supply GR	Entry cost	Operating cost
Required change		-1.2ppts	+59.47%	-45.28%
Δ startup size	+1.3%	0	+11.77%	-47.16%
Δ exit rate (age 3, size $<$50)	-0.17ppts	0	-1.16ppts	-1.39ppts

Other channels in the model

Compute the change required for each channel to explain full decline in the startup rate

	Data	Labor supply GR	Entry cost	Operating cost
Required change		-1.2ppts	+59.47%	-45.28%
Δ startup size	+1.3%	0	+11.77%	-47.16%
Δ exit rate (age 3, size $<$50)	-0.17ppts	0	-1.16ppts	-1.39ppts

Required changes are substantial and have counterfactual implications for other margins of firm dynamics

Testing the demographic channel in the cross-section

Cross-state variation in labor supply shifts

$$SR_{st} = \beta \boldsymbol{g}_{st} + \text{State FE}_s + \text{Year FE}_t + \epsilon_{st}$$

Cross-state variation in labor supply shifts

$$SR_{st} = \beta \boldsymbol{g}_{st} + \text{State FE}_s + \text{Year FE}_t + \epsilon_{st}$$

Generate exogenous movements in labor supply growth, $\boldsymbol{g}_{st}$.

- Fertility instrument (IV_1): predict state-level labor supply growth with 20 year lags of birth rates
- Migration instrument (IV_2): predict state-level labor supply growth with lagged inter-state migration patterns

Labor supply growth and start-up rate in cross-section

	OLS	IV_1	IV_2	IV_1 & IV_2
Labor supply growth	0.60***	0.78***	1.18***	1.04***
(20-64, %)	(0.054)	(0.25)	(0.18)	(0.218)
Observations	1,316	1,316	1,316	1,316
R^2	0.90	0.89	0.85	0.87
F-stat	-	24.88	14.99	13.39

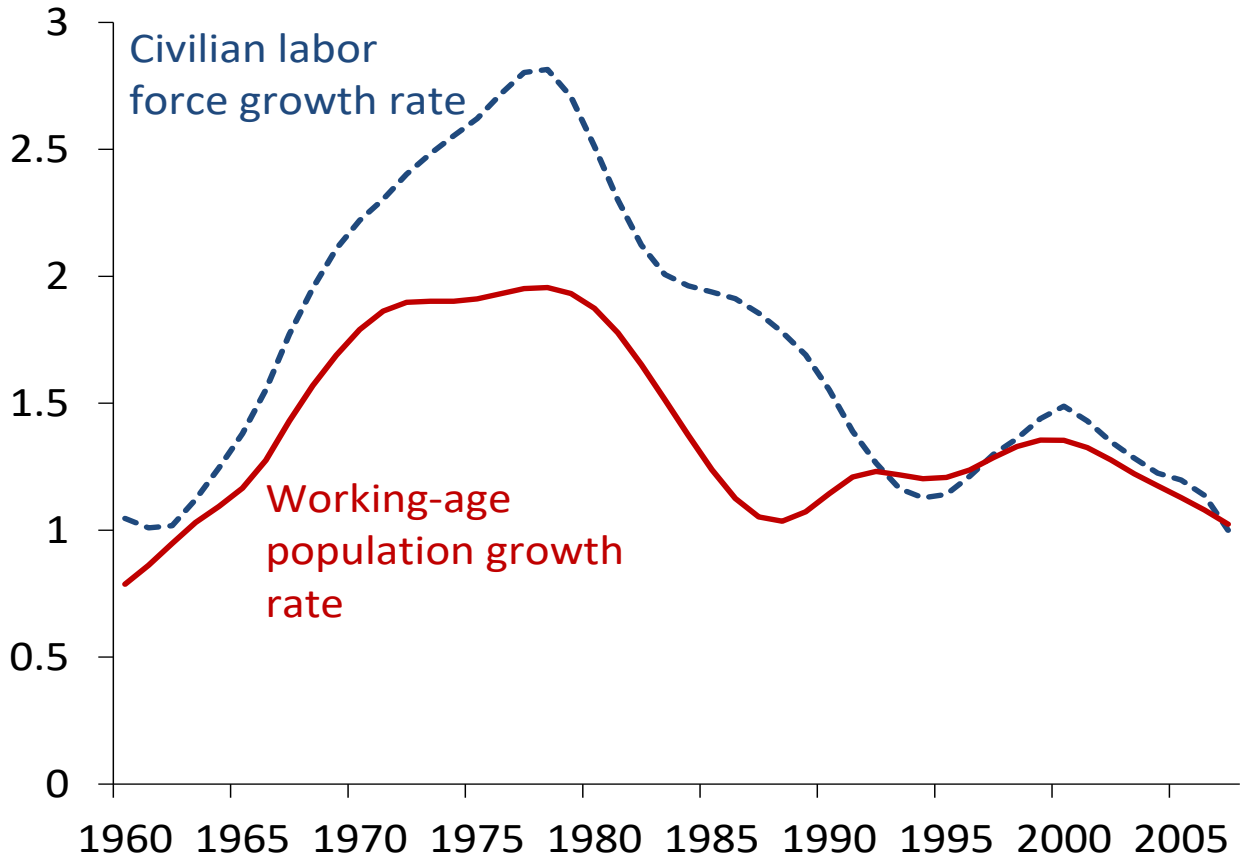
Labor supply growth and start-up rate in cross-section

	OLS	IV_1	IV_2	IV_1 & IV_2
Labor supply growth	0.60***	0.78***	1.18***	1.04***
(20-64, %)	(0.054)	(0.25)	(0.18)	(0.218)
Observations	1,316	1,316	1,316	1,316
R^2	0.90	0.89	0.85	0.87
F-stat	-	24.88	14.99	13.39

- The data support a causal effect of the demographic channel.
- The effect is robust to detailed industry controls, using different measure of labor supply, and adding state-specific trends.
- Accounts for between 20 to 30 percent of the decline if the elasticity estimates are applied to the aggregate data.

Testing the demographic channel in the time-series

Rising labor supply growth rate in 1960-1980



Implications for the 1960-1980 period

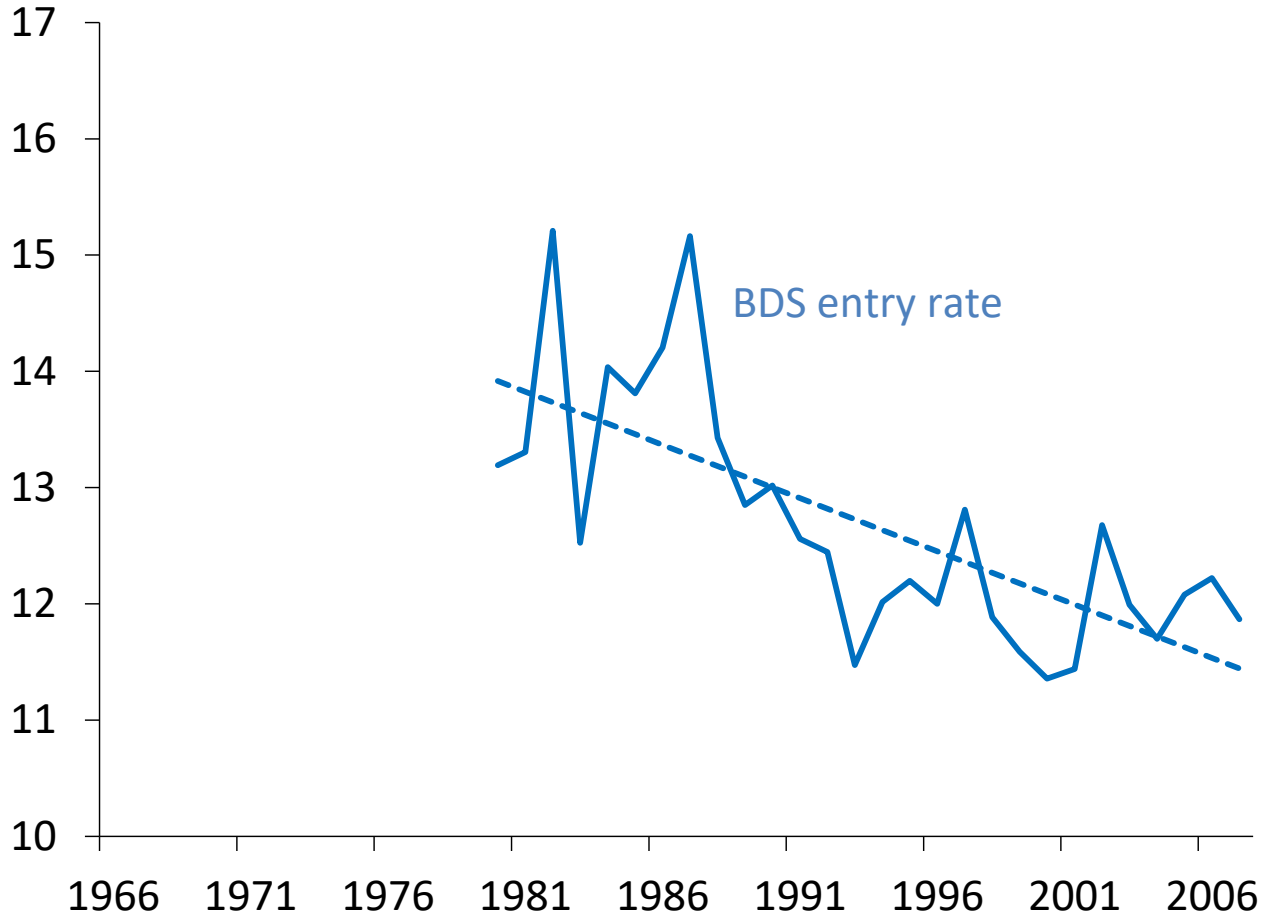
Startup rates should have been rising with labor supply growth.

We test this time-series implication using data from the County Business Patterns (CBP).

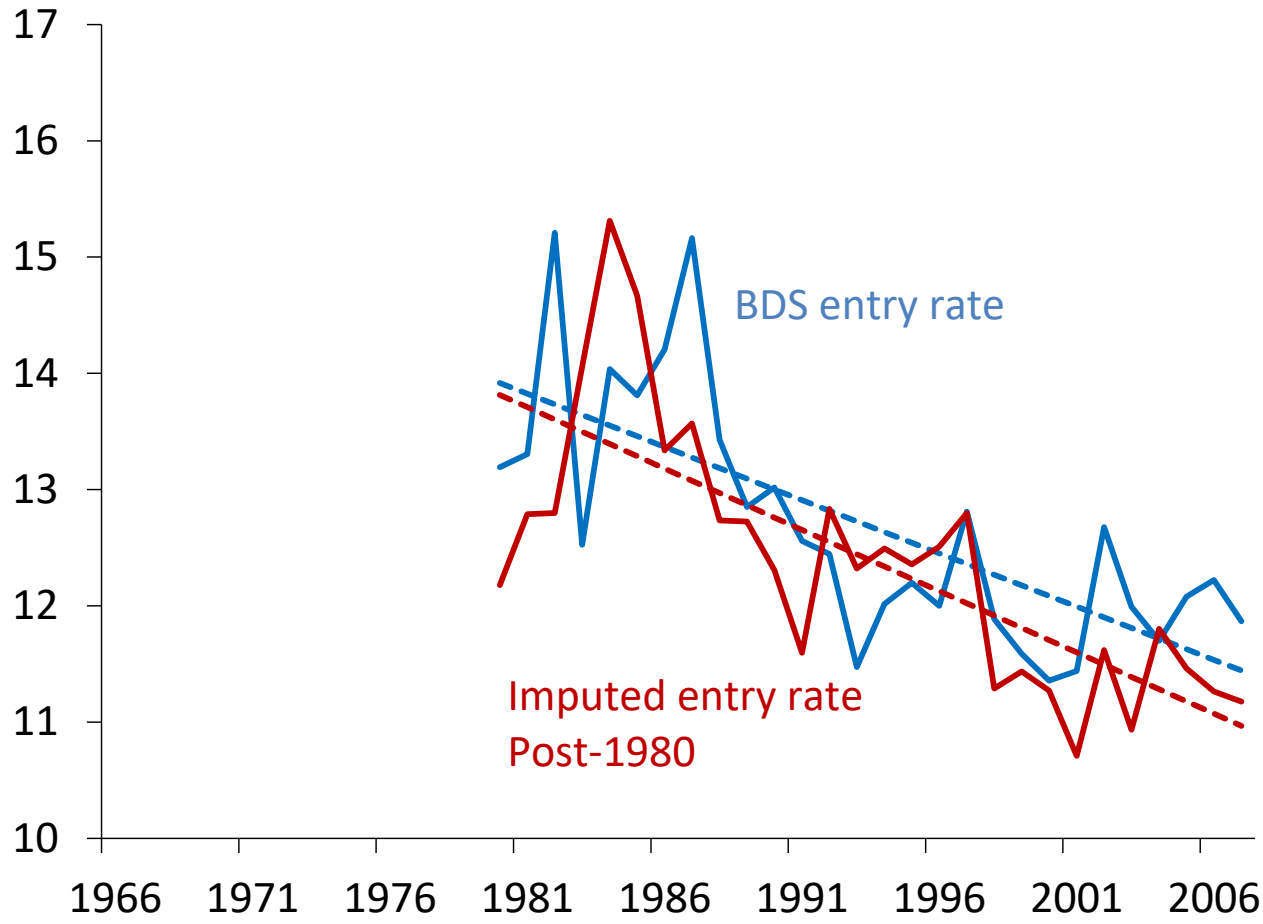
- CBP has been published annually since 1964.
- New method to impute establishment entry rate from CBP cross sections

Key idea: impute gross entry rate from observed net establishment entry rate and statistical model for exit rate

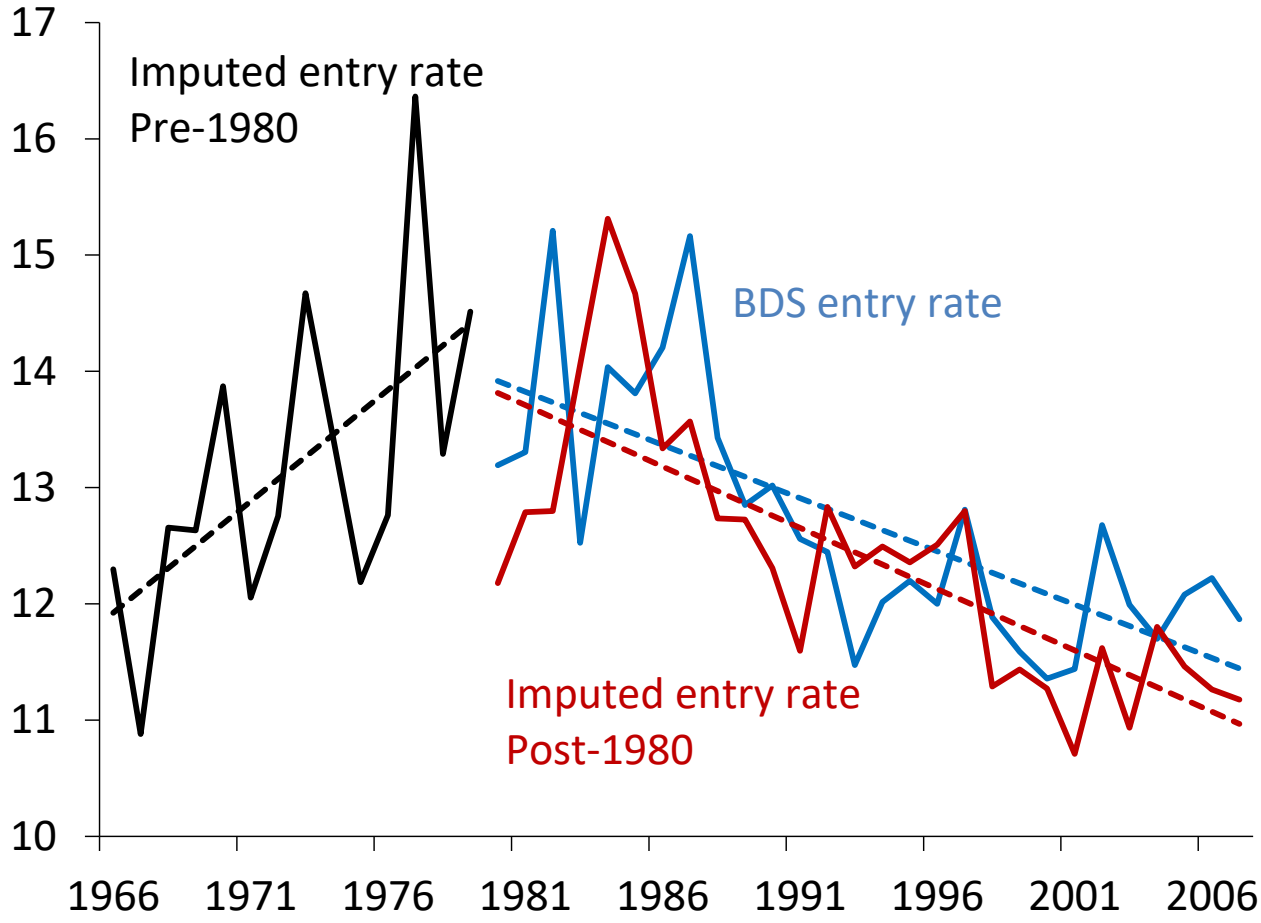
Historical establishment entry rates



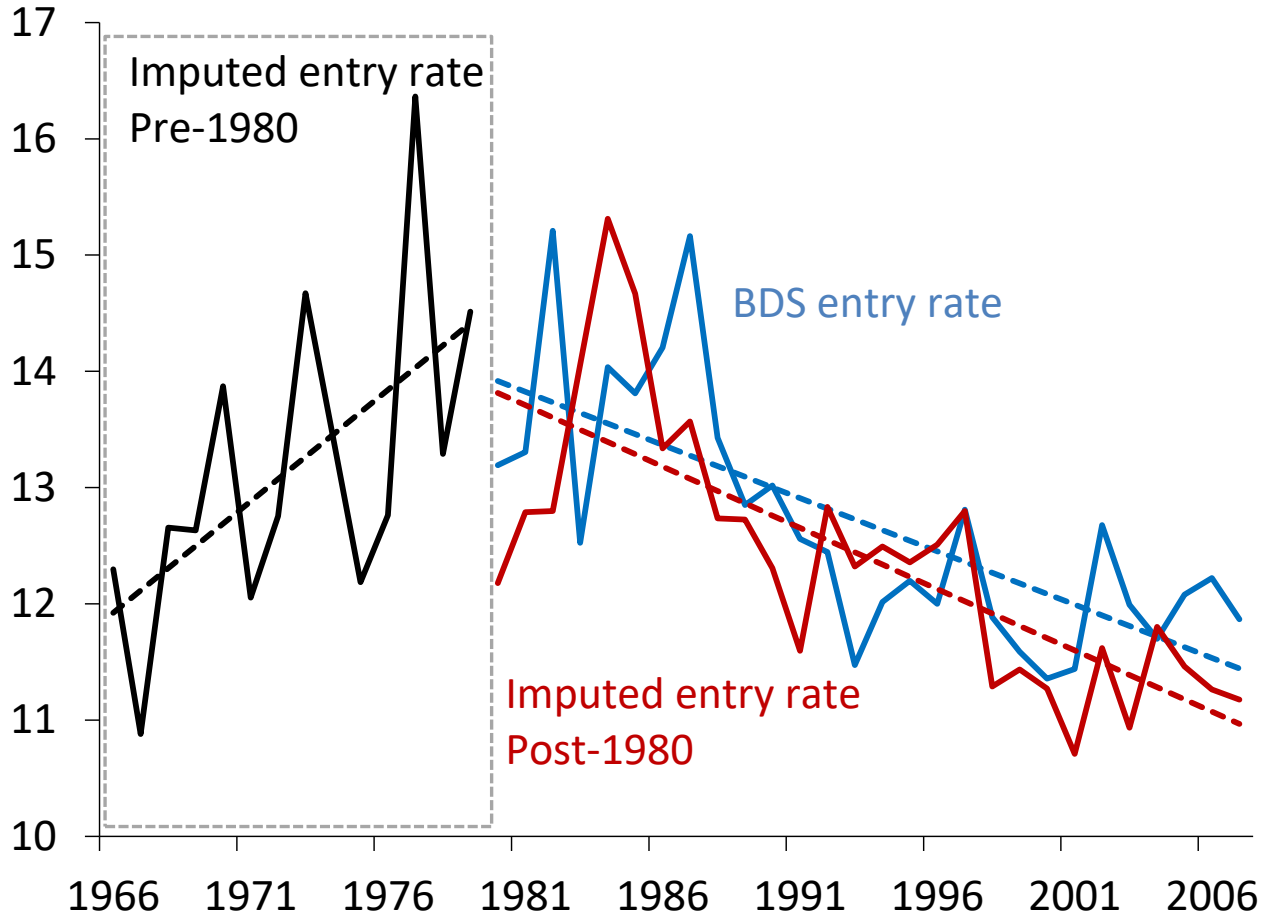
Historical establishment entry rates



Historical establishment entry rates



Pattern consistent with the demographic channel



Conclusion

Examined the quantitative relevance of the demographic channel using three different but complementary approaches.

Conclusion

Examined the quantitative relevance of the demographic channel using three different but complementary approaches.

1. Calibrated model implies that around half of the decline in entry can be explained solely by the demographic channel.

Conclusion

Examined the quantitative relevance of the demographic channel using three different but complementary approaches.

1. Calibrated model implies that around half of the decline in entry can be explained solely by the demographic channel.

2. We tested this hypothesis using cross-sectional variation in labor supply growth and found that the data support a significant causal effect.

Conclusion

Examined the quantitative relevance of the demographic channel using three different but complementary approaches.

1. Calibrated model implies that around half of the decline in entry can be explained solely by the demographic channel.
2. We tested this hypothesis using cross-sectional variation in labor supply growth and found that the data support a significant causal effect.
3. Earlier data support the relationship we have established in the post-1980 data.