The contribution of small firms to the Dutch productivity frontier:
leaders and followers

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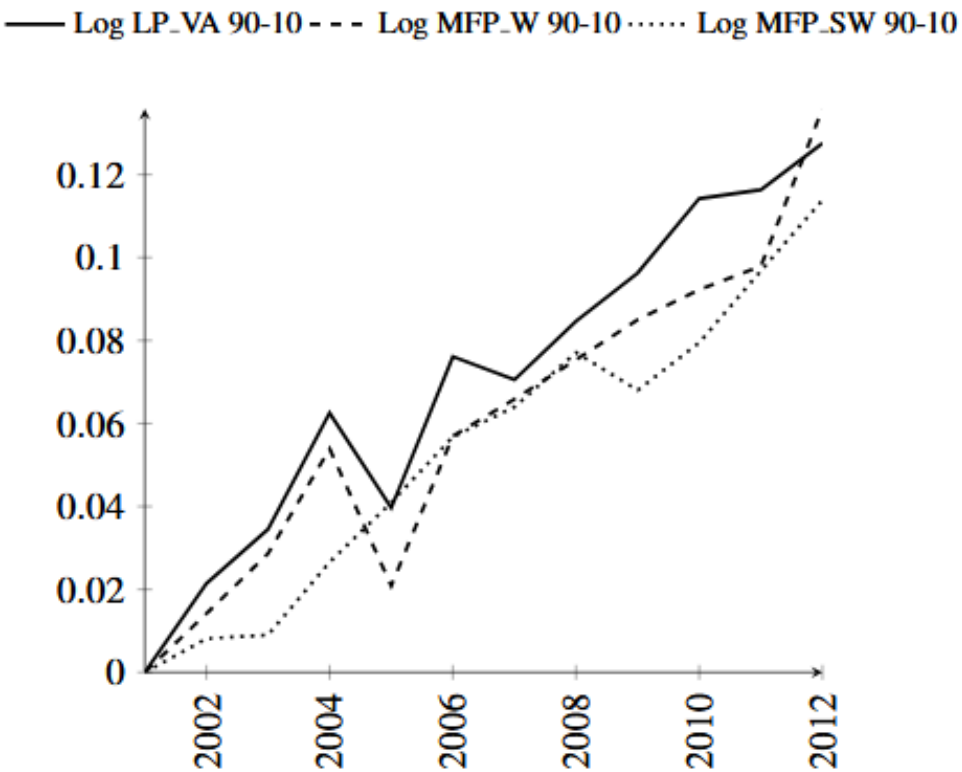
Background

OECD "Great divergences"



Source: OECD (2017)

Causes: (1) spillovers between frontier and laggards; (2) capital misallocation

Representative sample?

- Problem: the coverage of the database is biased towards large firms, in particular for the NL

- OECD (2017) uses "Production Statistics" for NL.
  Share of firms = 7%; employment = 57% (compared to BR-data; 2010)

- Andrews et al. (2016): similar problem with ORBIS data

- *Aim of our study:* explore the divergence hypothesis for the NL, using a large micro dataset, covering in principle *all* corporations

Main findings

Findings I

1. We find no evidence for diverging productivity between firms on the national frontier and laggard firms.

2. Small frontier firms and, to a lesser extent, small laggard firms contribute substantially to aggregate *labour* productivity.

   Aggregate *TFP* mainly depends on TFP of the large frontier firms.

Findings II

3. Small firms display different dynamics than large firms.

   Small firms are more mobile than large firms:

   - exit rates are higher
   - higher probabilities to change TFP-deciles
   - more likely to enter but less likely to remain on the frontier.
   - The convergence speed of small firms to the frontier is estimated to be significantly higher.

Data

Statistics Netherlands Data

- Matched employer – employee data

- Three basic datasets:
  - Business register (entry/exit, composition of corporations)
  - Balance sheet data of non-financial corporations
  - Employee level data (working hours)

- 2006-2015
- 53 Sectors (SBI 2-digit); dropping financial & public sectors
- We are left with 144,000 firms per year (labour hours) / 158,000 (labour costs)

Definitions

- *Output* is measured by value added
- *Labour* is measured in working hours
- *Small* firms: ≤ 20 employees fte
- *Frontier* is defined as firms in the top decile (10%) within a sector
- TFP is estimated using the Wooldridge (2009) methodology
- $Labour\ productivity = \frac{value\ added}{working\ hours}$

Robustness

Experimented with multiple options when estimating productivity:

- value added versus gross output
- labour cost versus labour hours
- investment versus materials as proxy
- Wooldridge (2009) versus Ackerberg et al (2015)

Findings

- Different TFP measures are highly correlated (0.84).
- Different TFP measure lead to different firms on the frontier. (On average, 63% of the frontier firms are same when two measures are compared)
- However, the results are robust.

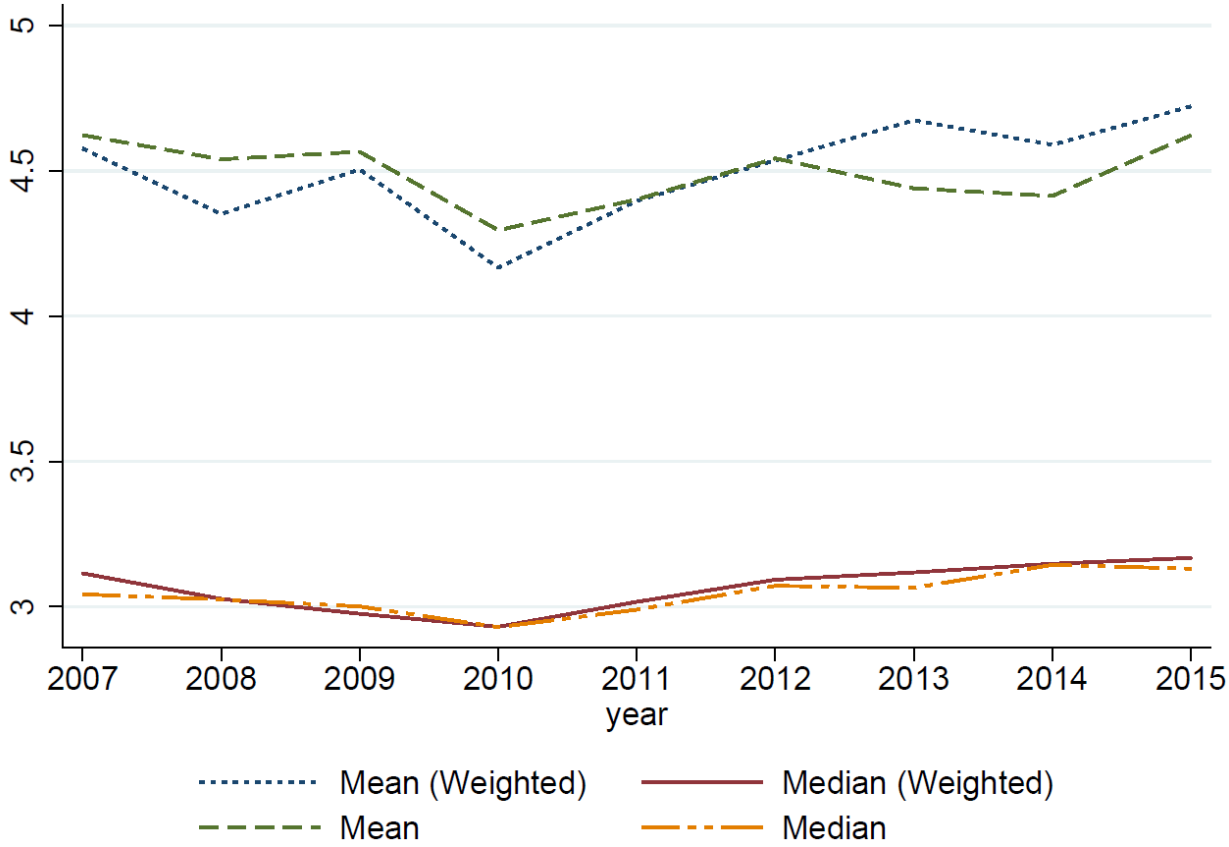
Firm characteristics: median values

	Frontier Firms (Top 10%)	Laggards
TFP	2.6	0.8
Labor (fte)	6.5	3.0
Capital (€1000)	121	85
Revenue (€1000)	2,666	548
Profit rate (%)	10.6	3.2
Age (years)	8.1	8.7

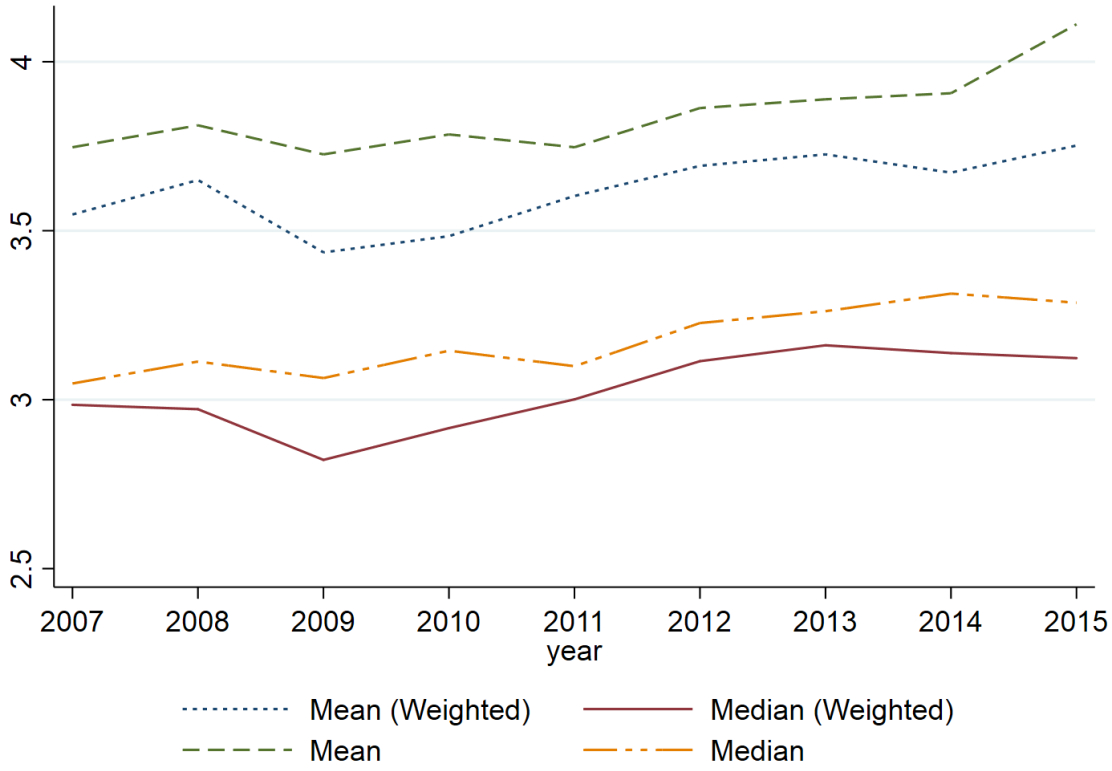
Results

1. No evidence for divergence

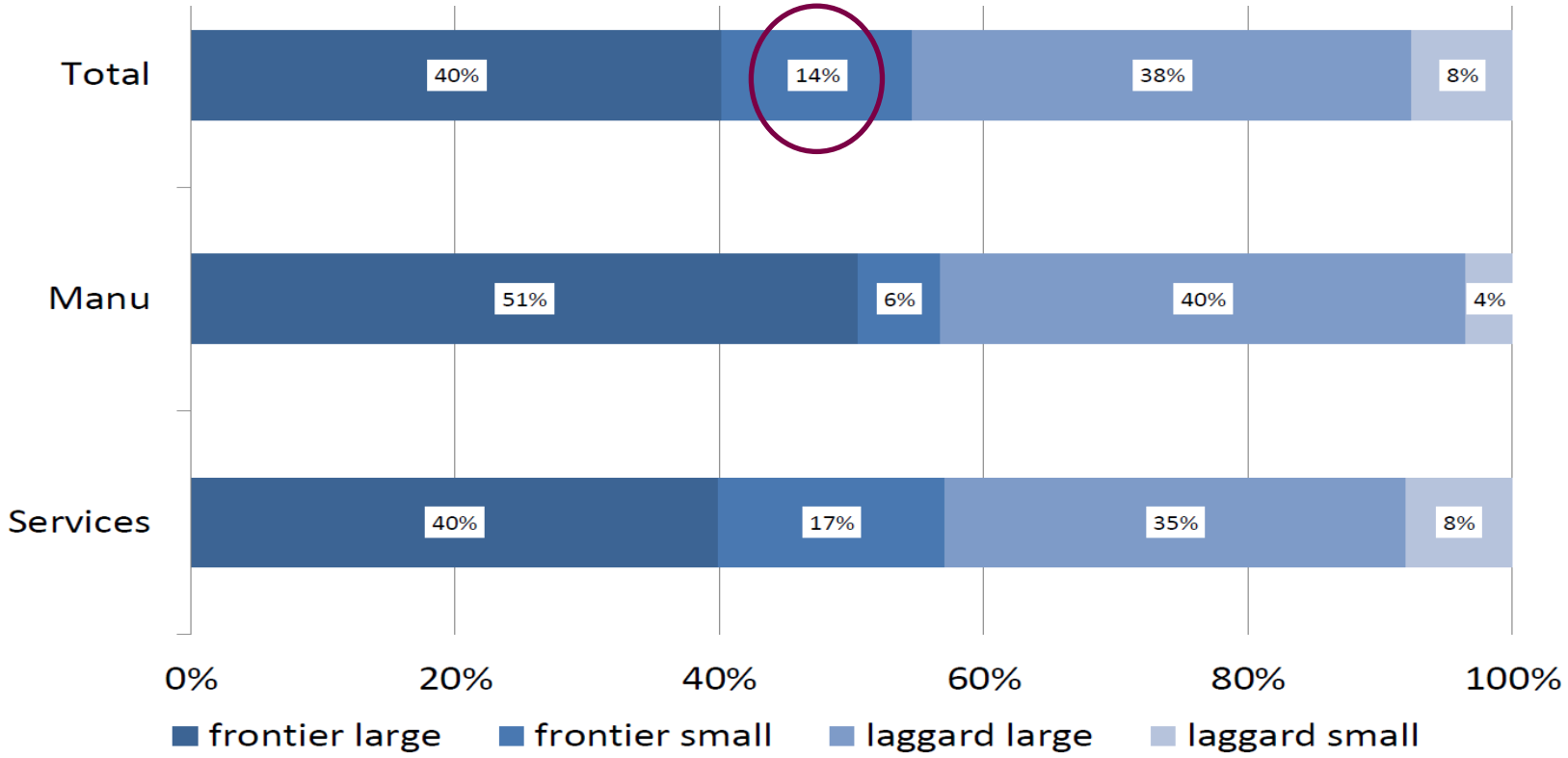
Ratio of Labour productivity between frontier and laggard firms



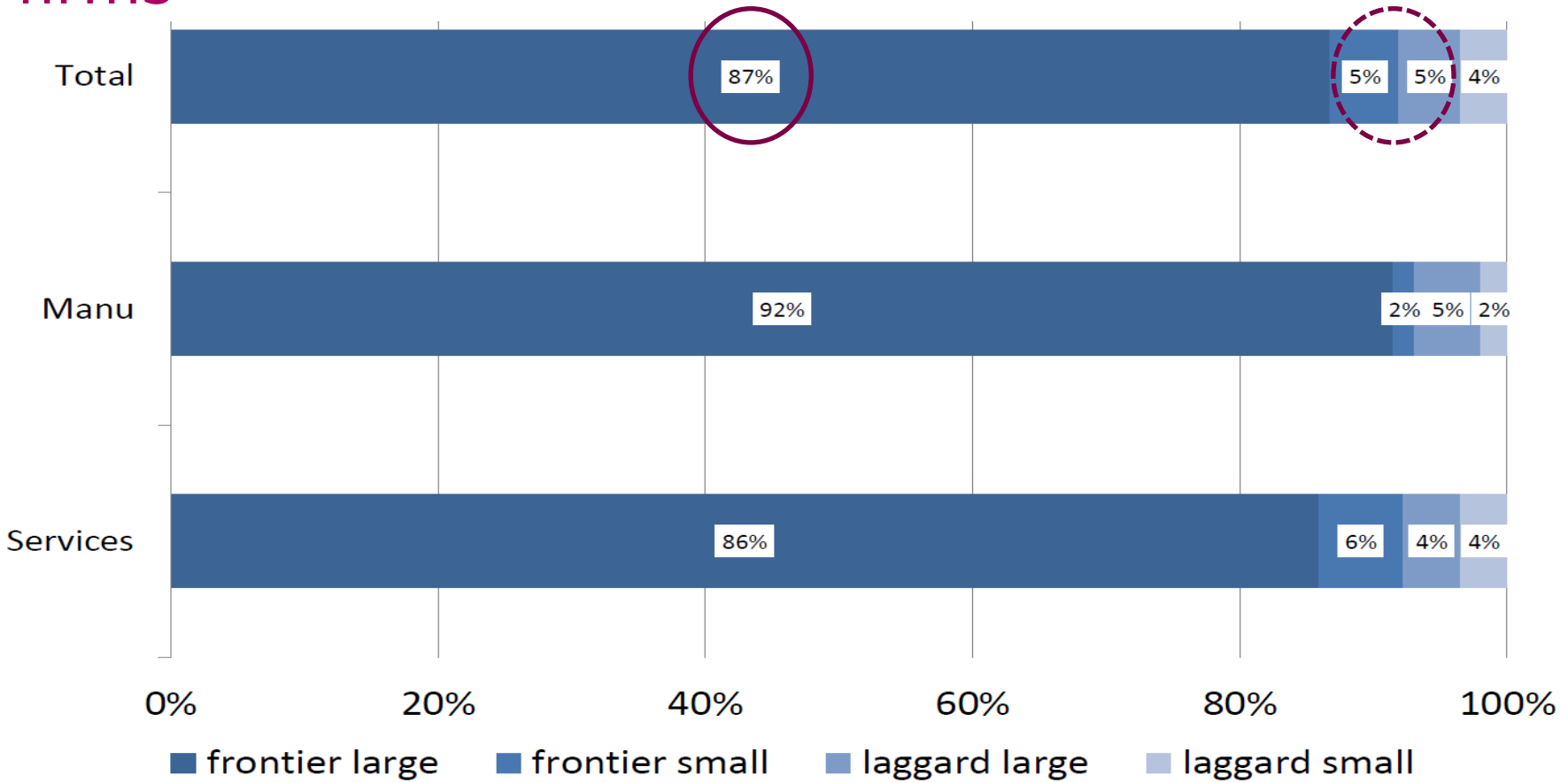
Ratio of TFP between frontier and laggard firms



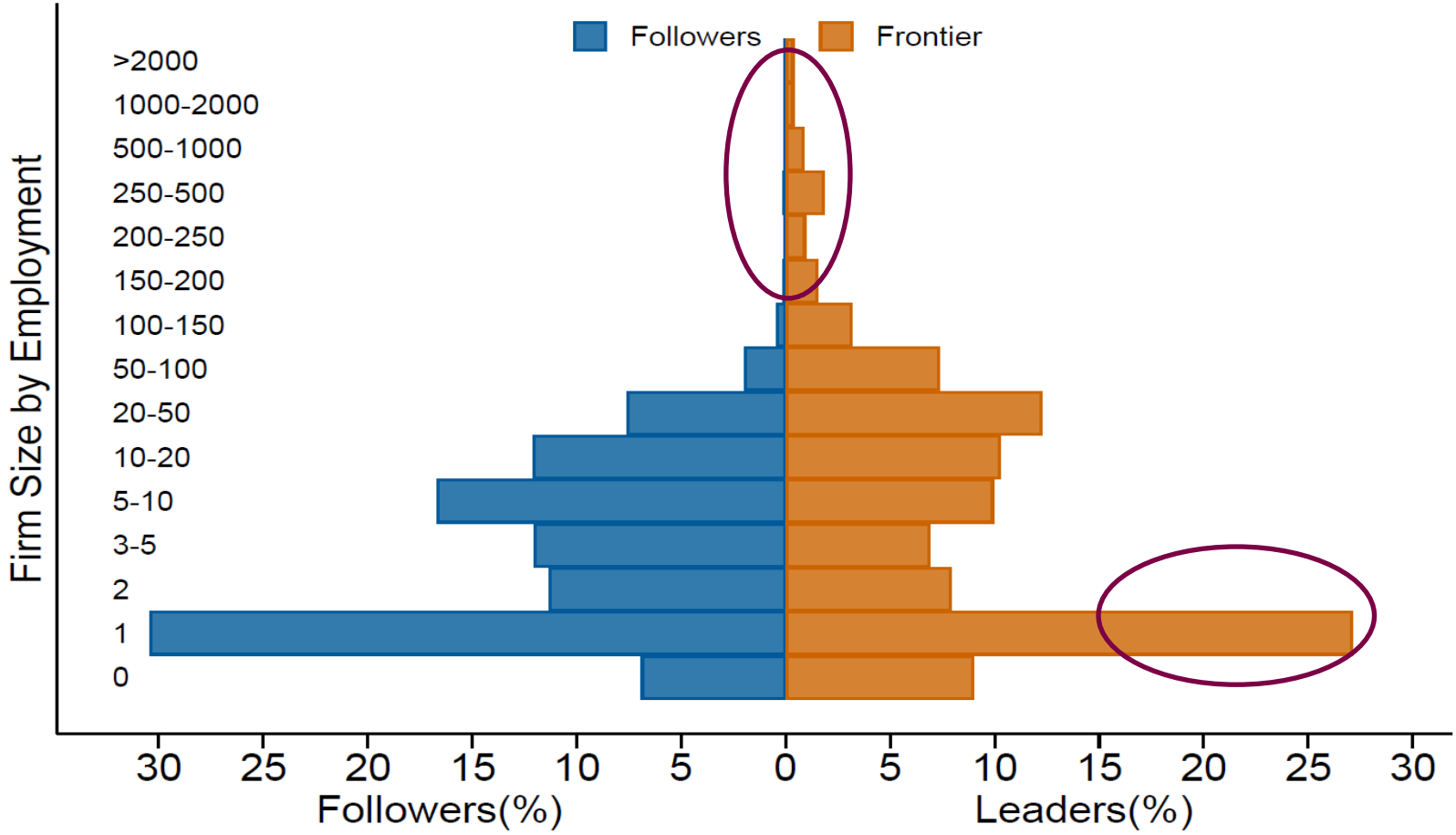
2. Small firms contribute substantially to aggregate Labour productivity (2010)



But aggregate TFP is dominated by large frontier firms



Compositions by firm size (2010; TFP-frontier)



3. Small firms are more mobile than large firms

- A firm has a high probability (75%) to remain in the same TFP-decile or move one decile up or down next year.
- Large firms are more likely to remain in the same decile, or move one up or down: 78% versus 72%
- Large firms are less likely to exit:
  - top decile: 9% versus 19%
- Large firms are less likely to enter but they are more likely to remain on the frontier

Regressions support the convergence hypothesis

- The TFP growth rate depends positively on the gap to the national frontier (= ratio of TFP of top 10% and TFP of individual firm):

- The convergence speed of small firms is estimated to be larger than the speed of large firms

$$\Delta lnTFP_{it} = \gamma_i + \lambda ln\left(\frac{TFP^F}{TFP_i}\right)_{t-1} + \mu_{it}$$

Regressions support the convergence hypothesis

	(1)	(2)
A. Small firms		
$ln(gap)$	0.223^{***}	0.747^{***}
$\Delta lnTFP^F$	0.623^{***}	0.775^{***}
Firm FE	No	Yes
R^2	0.074	0.305
B. Large firms		
$ln(gap)$	0.164^{***}	0.674^{***}
$\Delta lnTFP^F$	0.607^{***}	0.685^{***}
Firm FE	No	Yes
R^2	0.055	0.251

Note: Year and sector dummies are included in all regressions; no. of observations = 775,287 / 93,397 for small/large firms;***: significant at 1%

Conclusions

1. We find no evidence for diverging productivity between firms on the national frontier and laggard firms

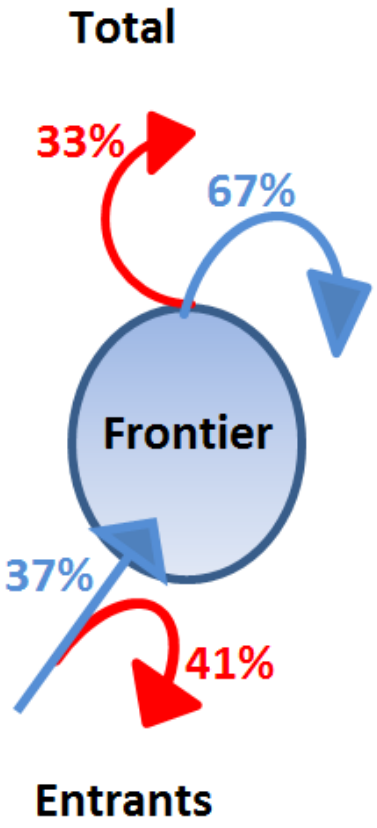
2. Small frontier firms contribute substantially to aggregate productivity.

3. Small firms display different dynamics than large firms

Extra

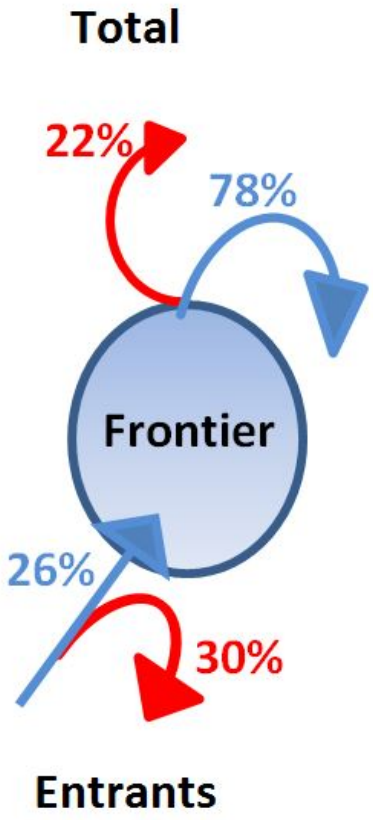
Large firms are less likely to enter but they are more likely to remain on the frontier

Small

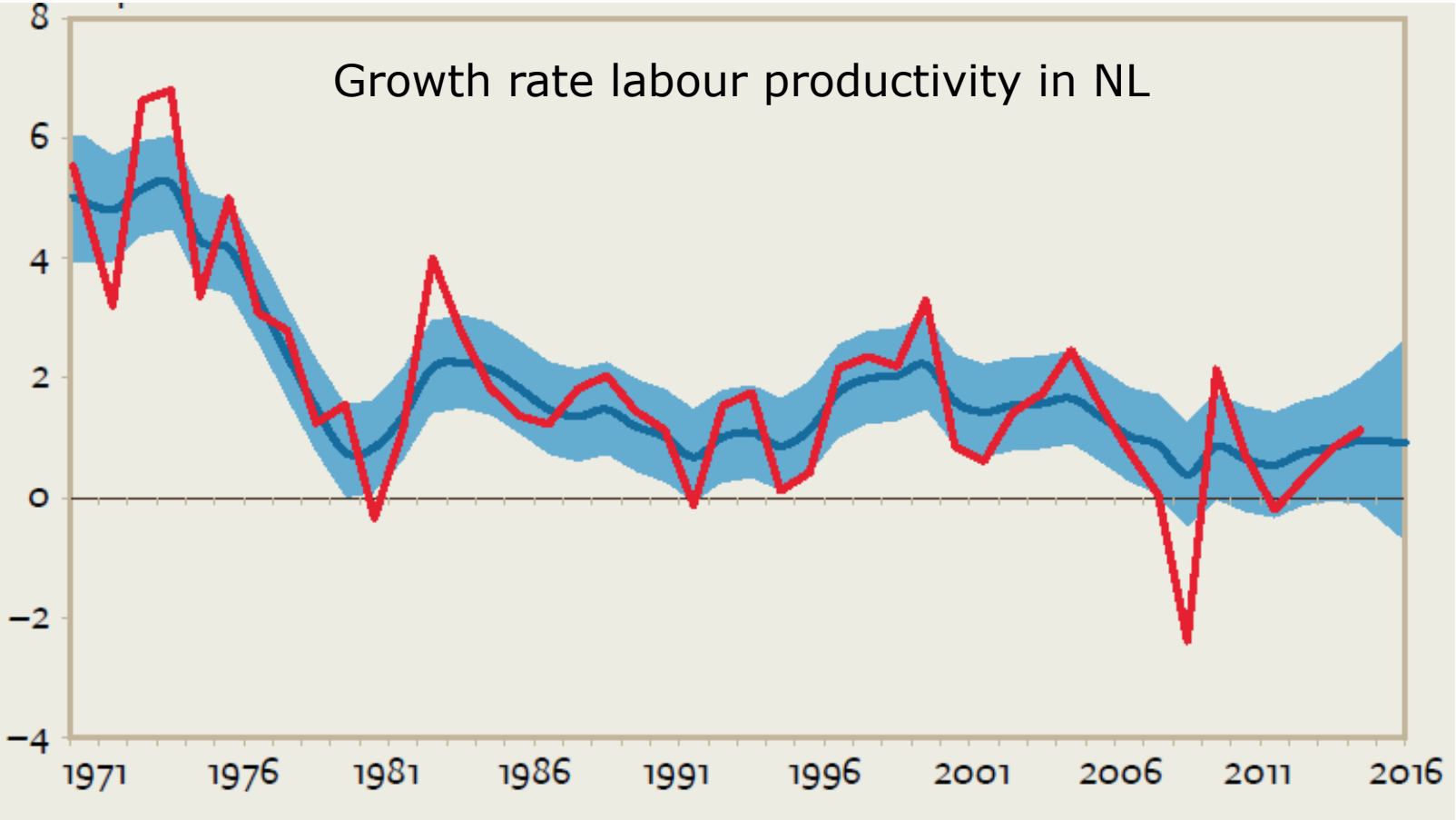


33%	Fraction of leaving incumbents	22%
67%	Fraction of remaining incumbents	78%
37%	Fraction of entrants	26%
41%	Fraction of leaving entrants next year	30%

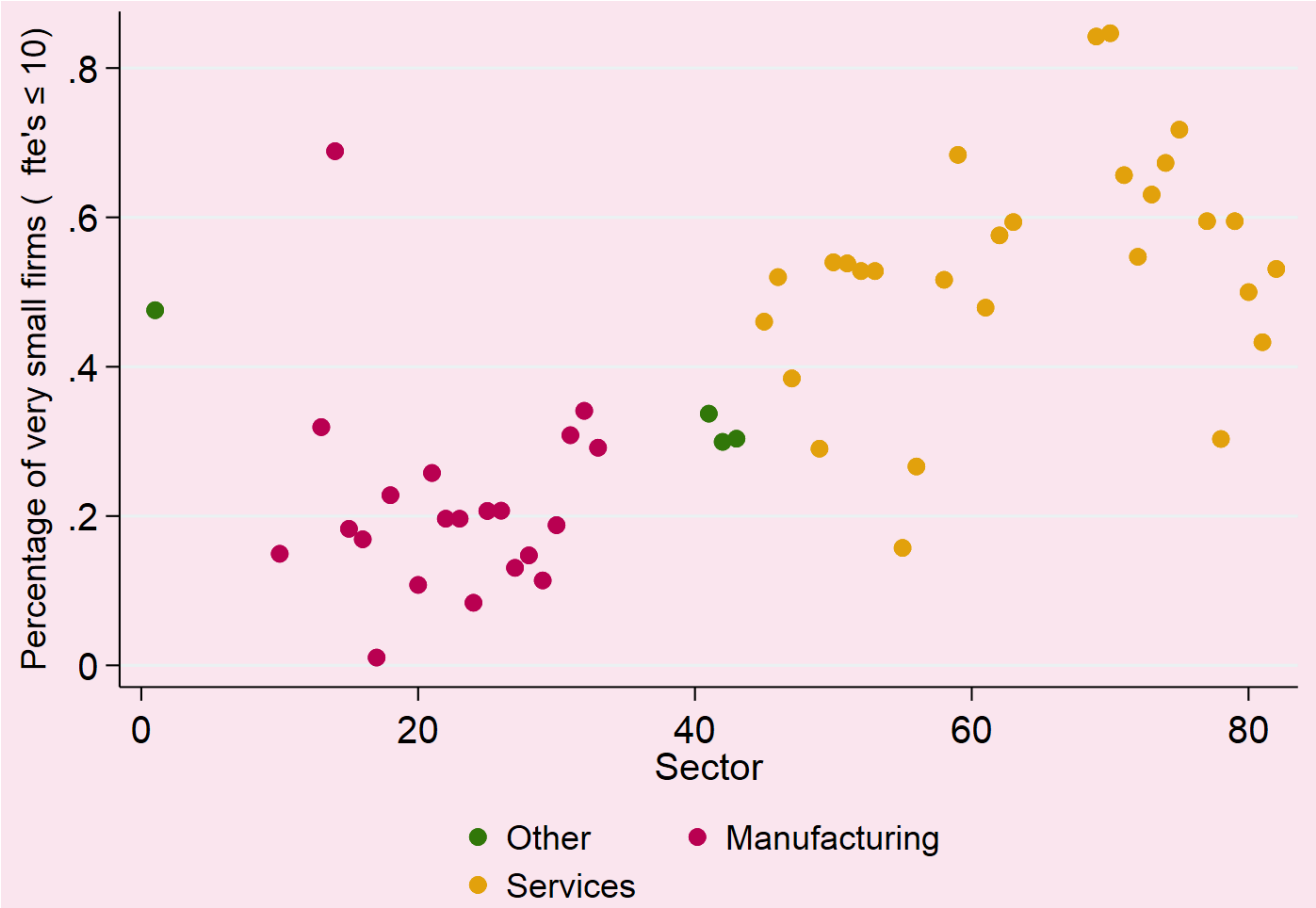
Large firms



Slowdown of structural productivity growth



Small firms on the Frontier by industry



Average yearly transitions between p'tivity deciles

		TFP t+1										
		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Exit rate
Top	D1	65.4	17.7	5.6	3.1	2.1	1.5	1.3	1.0	1.0	1.3	16.8
	D2	15.5	45.6	19.3	7.3	4.1	2.5	1.8	1.4	1.2	1.4	11.2
	D3	4.4	18.9	36.9	19.1	8.4	4.5	2.8	2.0	1.5	1.5	10.5
TFP t	D4	2.2	6.6	19.0	32.4	18.9	8.8	4.9	3.0	2.3	2.0	10.4
	D5	1.4	3.2	7.9	18.9	30.3	18.7	9.1	5.0	3.2	2.4	10.4
	D6	1.1	1.9	4.0	8.3	18.5	29.7	19.1	9.1	5.0	3.2	10.9
	D7	0.9	1.3	2.4	4.4	8.7	18.9	30.5	19.3	8.8	4.6	12.0
	D8	0.9	1.1	1.6	2.6	4.5	8.7	19.1	34.0	19.7	7.7	13.7
	D9	0.9	1.0	1.4	1.9	2.8	4.5	8.4	19.6	40.1	19.5	17.9
Bottom	D10	1.4	1.2	1.5	1.8	2.3	3.0	4.7	7.9	20.4	55.9	31.7

4. Regressions support the convergence hypothesis

	(1)	(2)	(3)	(4)
A. Small firms				
$ln(gap)$	0.223***	0.747***		
$\Delta lnTFP^F$	0.623***	0.775***		
DD2			0.104***	0.167***
DD3			0.147***	0.289***
DD4			0.172***	0.395***
DD5			0.199***	0.495***
DD6			0.224***	0.604***
DD7			0.250***	0.724***
DD8			0.285***	0.874***
DD9			0.352***	1.109***
DD10			0.574***	1.627***
Firm FE	No	Yes	No	Yes
R^2	0.074	0.305	0.068	0.268

	(1)	(2)	(3)	(4)
B. Large firms				
$ln(gap)$	0.164***	0.674***		
$\Delta lnTFP^F$	0.607***	0.685***		
DD2			0.062***	0.132***
DD3			0.087***	0.233***
DD4			0.115***	0.328***
DD5			0.130***	0.417***
DD6			0.152***	0.509***
DD7			0.187***	0.624***
DD8			0.223***	0.784***
DD9			0.268***	1.027***
DD10			0.412***	1.417***
Firm FE	No	Yes	No	Yes
R^2	0.055	0.251	0.053	0.222

Estimates of sectoral convergence speeds