

(Re)allocation and industry productivity (growth): accounting for firm turnover

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About my talk

- It is based on two papers
 - Maliranta, M. ja Määttä, N. (2013). Allocation and industry productivity. Accounting for firm turnover. The Research Institute of the Finnish Economy ETLA, Working Papers No. 11. Helsinki.
 - Hyytinen, A. ja Maliranta, M. (2013). Firm lifecycles and evolution of industry productivity. Research Policy, 42(5), 1080-1098.
- Focus is on
 - Measurement issues
 - Empirical results

Background (1/2)

- Current literature emphasizes
 - Heterogeneity of firms
 - (Re)allocation of resources among firms in a productivity-enhancing manner (“creative destruction”)
- Empirical findings have stimulated increasing theoretical literature on heterogeneity and (re)allocation
 - Technology choices and capital vintages, management, uncertainty, labor quality etc. (Leibenstein 1966, Jovanovic 1982, Ericson&Pakes 1995 etc.)

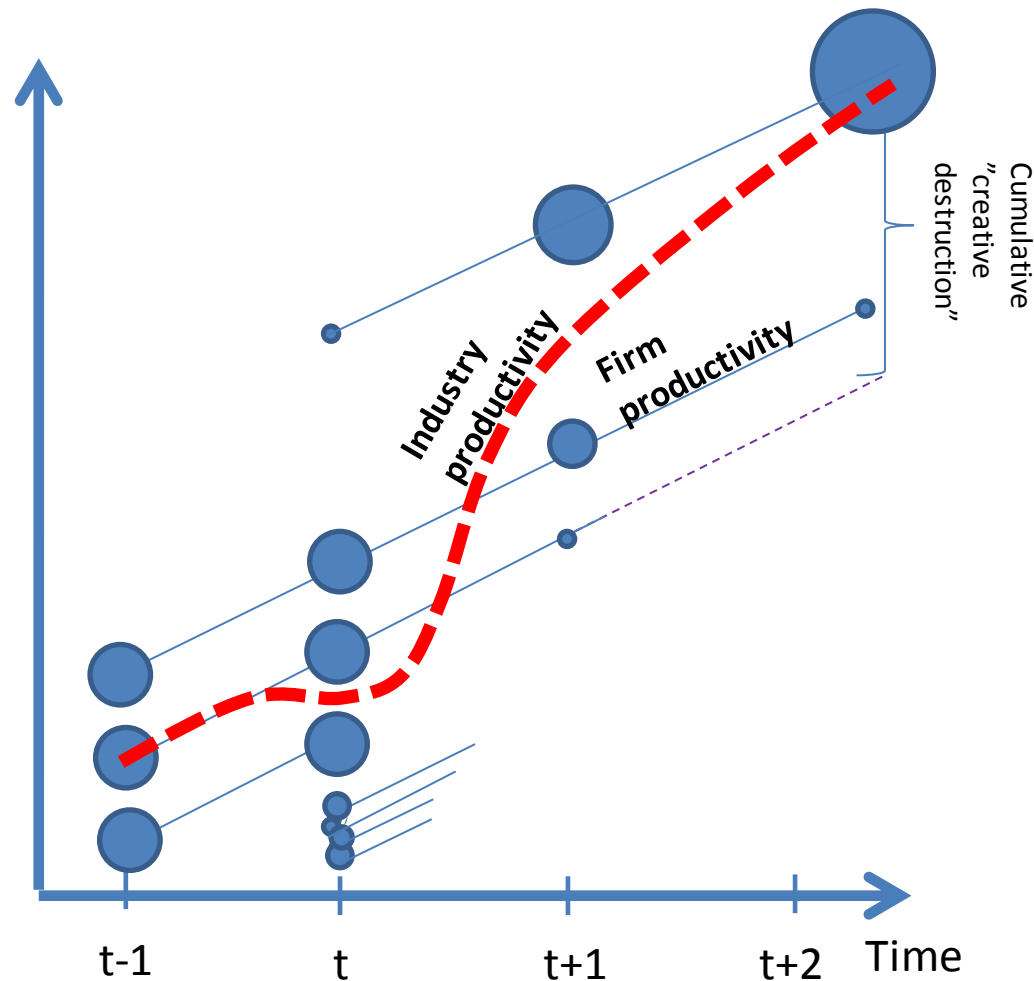
Background (2/2)

- The role of (high-productivity) entrants
 - Introduction of radical innovations
 - Competitive pressure on incumbent firms (e.g. Aghion et al 2009)
- However, only very few new entrants have high productivity and survives
- The role of experimentation in the market?
- How to measure the aspects experimentation and (re)allocation?
- Measurement methods: Griliches-Regev (1995), Olley-Pakes (1996), Haltiwanger (1997), Vainiomäki (1997), Melitz-Polanec (2012) etc.

Illustration of the "creative destruction" mechanism

Some stylized facts

- Average productivity level of entrants is low
 - Productivity dispersion is highest among new/young firms
 - Most entrants disappear very soon
 - High productivity firms grow in size
- => Industry productivity growth rate may exceed average prod. growth rate of firms (see graph)

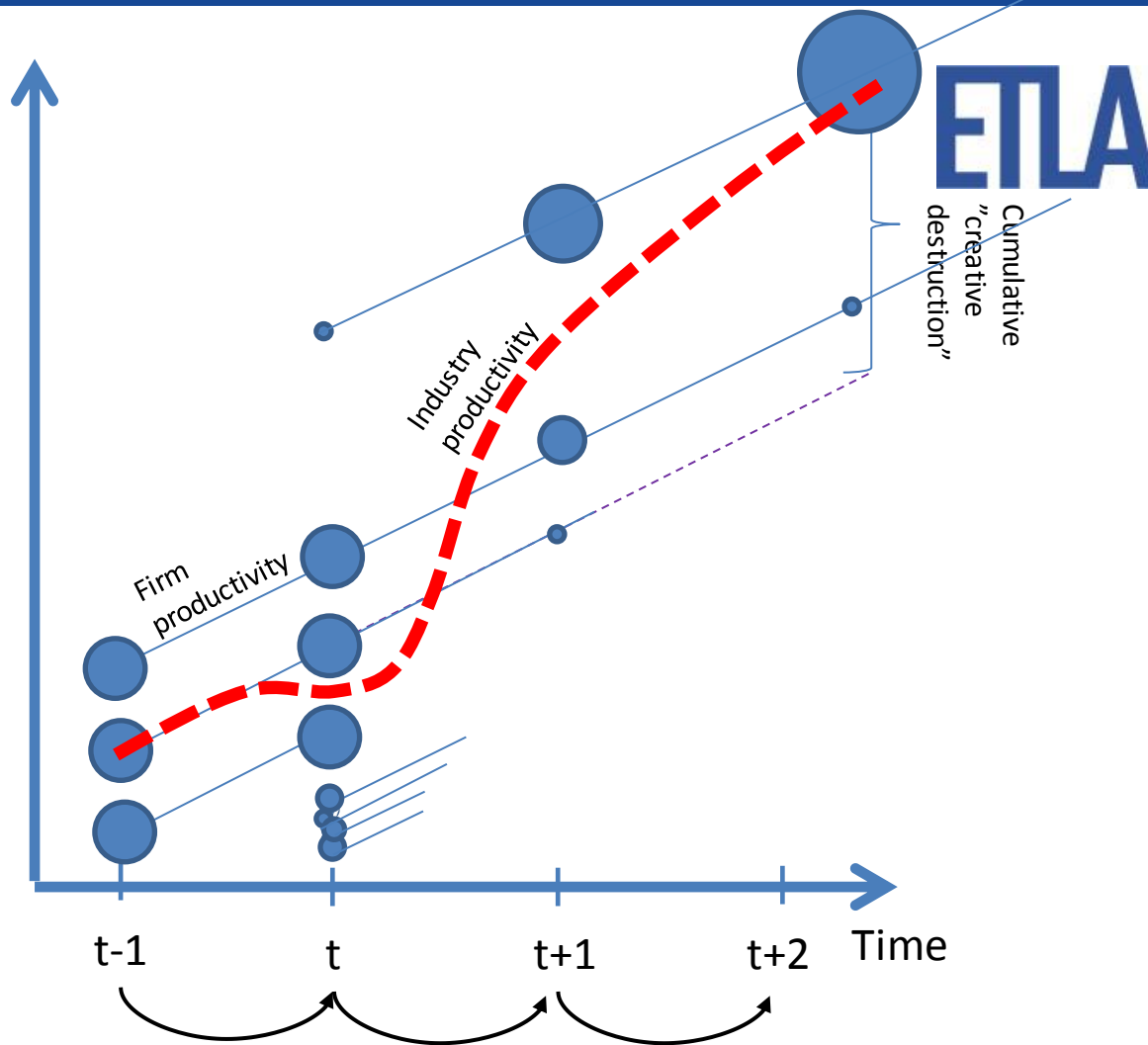


How to measure "(re)allocation effect"?

Static approach/measure

Olley-Pakes decomposition

OP-cov = Difference between weighted and unweighted average productivity of firms



Change in OP-cov

>0

???

???

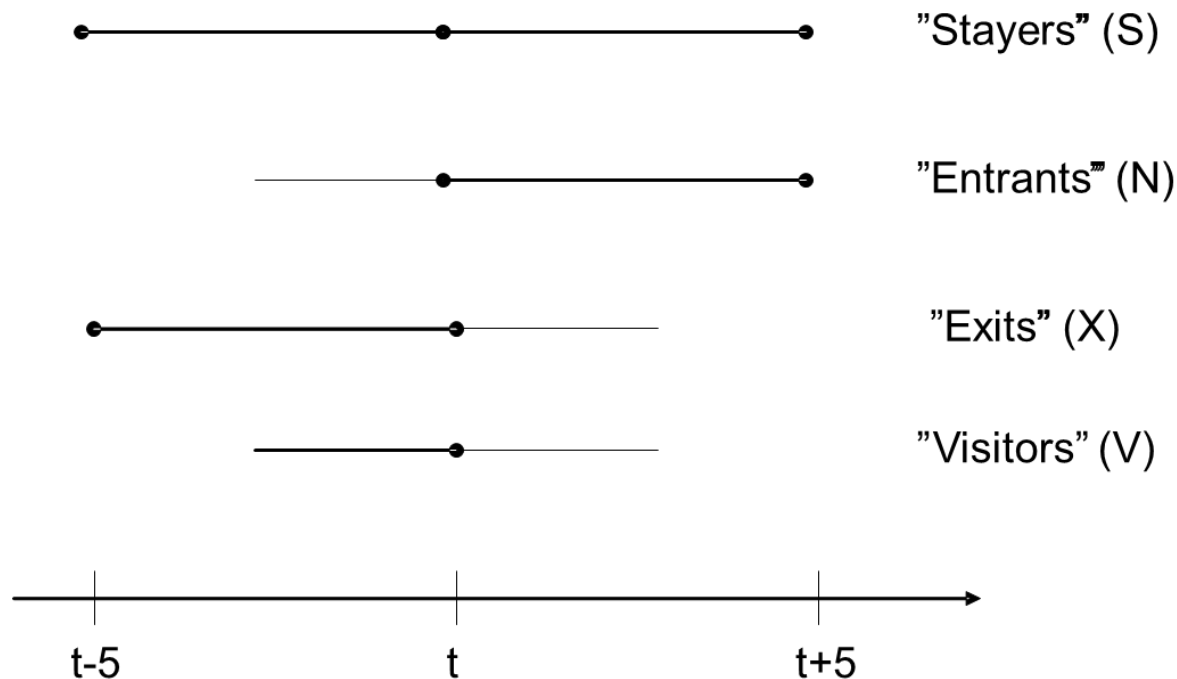
How to account for the role of firm turnover through entries and exits?

-Entrants tend to increase and exits decrease OP-cov

- Need for isolating their effects



Classification of firms



OP-decomposition

- Standard OP covariance decomposition

$$\Phi_t = \bar{\varphi}_t + \sum_i (s_{it} - \bar{s}_{it})(\varphi_{it} - \bar{\varphi}_{it}) = \bar{\varphi}_t + \text{cov}(s_{it}, \varphi_{it})$$

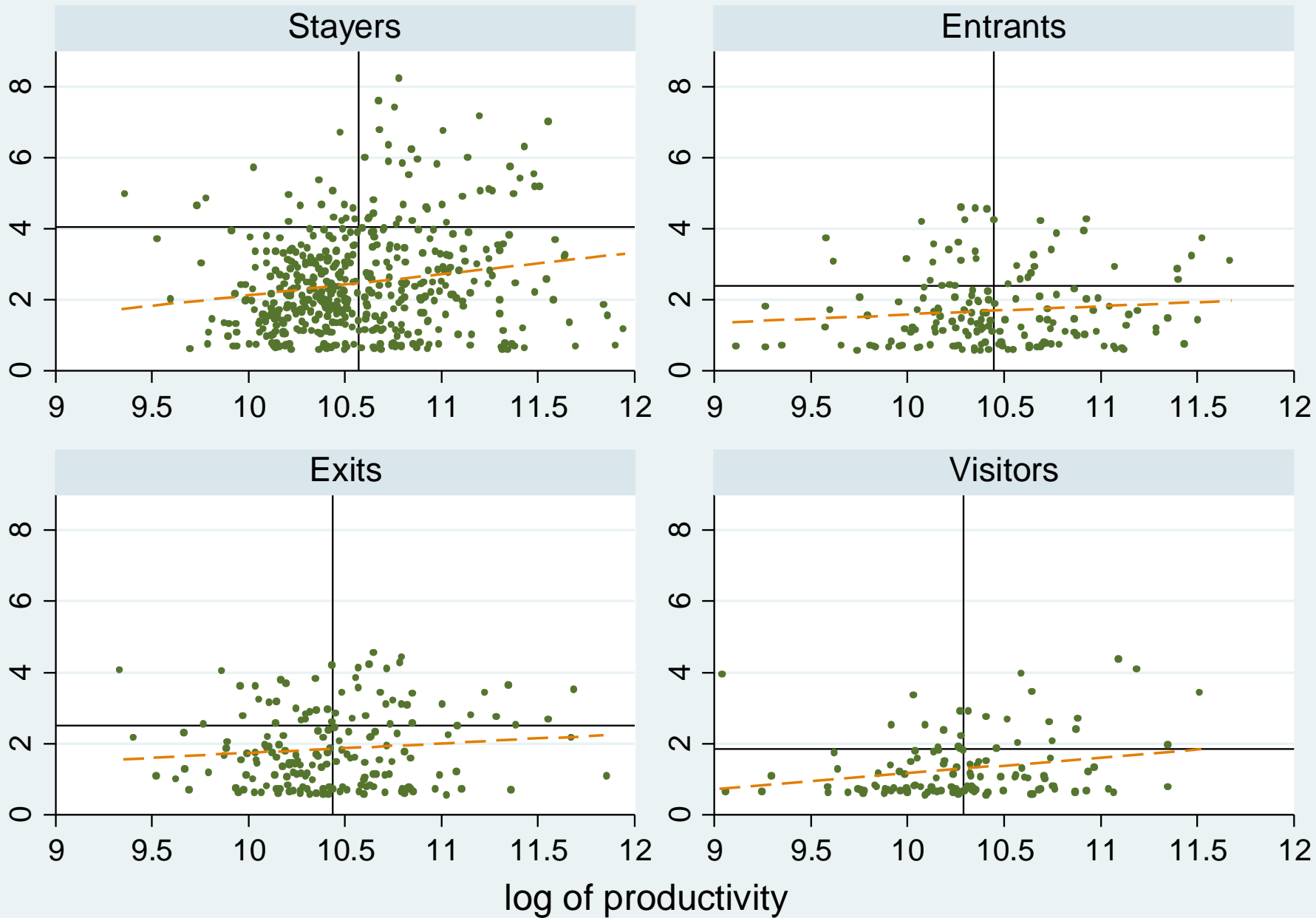
- Augmented OP decomposition:

$$\text{cov}_t = \text{cov}_t^S + \sum_{j=N,X,V} \frac{L_t^j}{L_t} (\text{cov}_t^j - \text{cov}_t^S) + \sum_{j=N,X,V} \frac{N_t^j}{N_t} \left(\frac{\bar{L}_t^j}{\bar{L}_t} - 1 \right) (\bar{\varphi}_t^j - \bar{\varphi}_t^S)$$

Within group effect

Between group effects

An illustration of augmented OP-decomposition



Graphs by firm group

Source: Maliranta&Määttänen (2013)

Table 2. Decomposition of the contribution to the covariance component by the augmented Olley-Pakes productivity decomposition, firm data

	OP(All) (1)= (2)+(3)+(4)	OP(Stayers) (2)	Contribution of non-stayers	
			Within groups (3)	Between groups (4)
Total	26.3	22.6	-2.4	6.1
<i>Contributions</i>				
<i>Entrants</i>			-1.0	1.5
<i>Exits</i>			-1.2	1.6
<i>Visitors</i>			-0.2	3.0

Notes: Decomposition is made by applying (7). Components may not add up due to rounding.

Augmented OP- Covariance decomposition



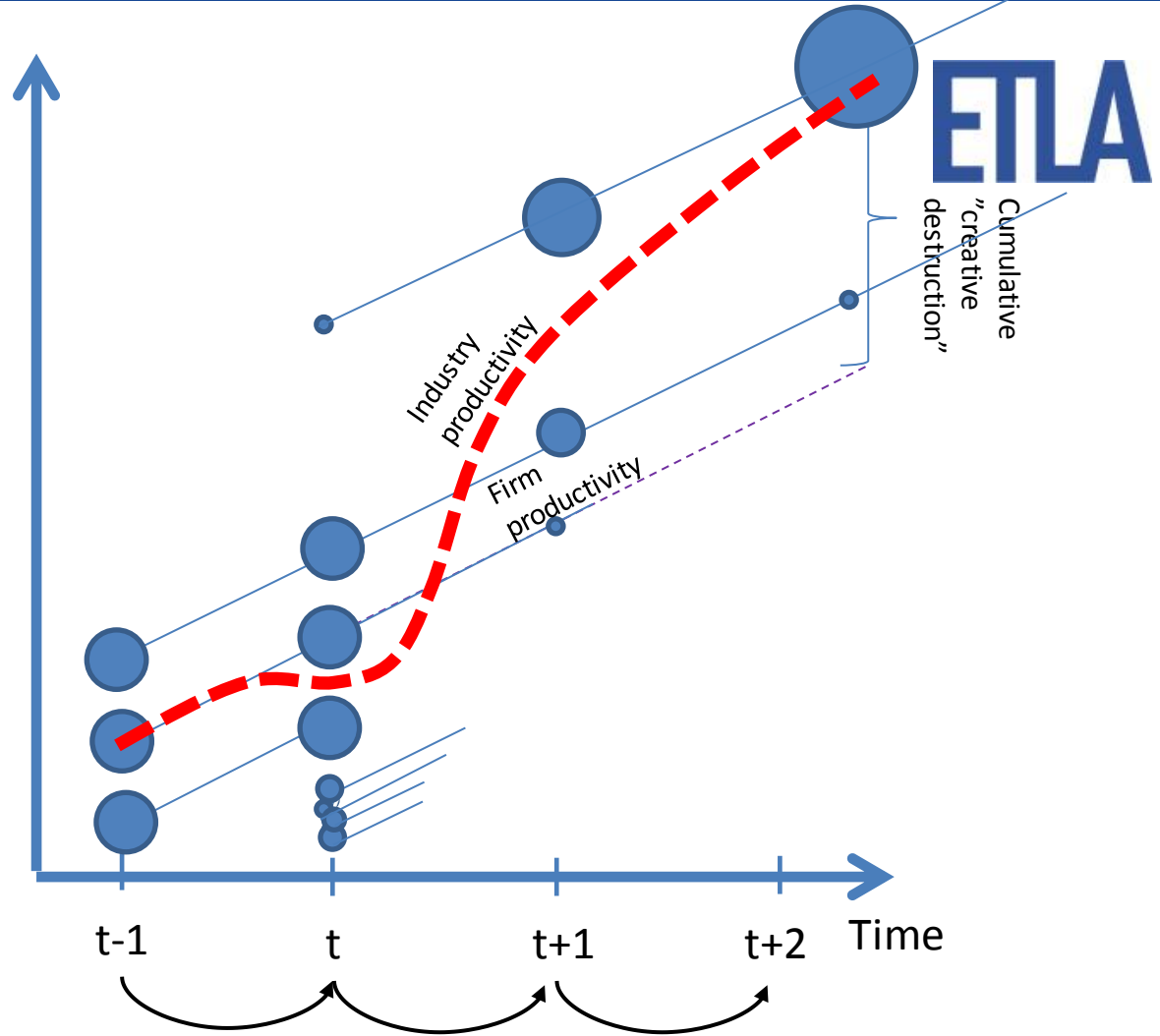
	All	Stayers	Difference		Components of between group effect			
			Total effect	Within group	Between group	Entrants	Exits	Visitors
Manufacturing	33.9	27.8	6.1	-1.1	7.2	2.5	1.0	3.7
Construction	6.8	4.2	2.6	-1.6	4.2	1.6	0.0	2.6
Service	13.2	-0.4	13.7	3.2	10.5	4.3	0.5	5.7
<i>MANUFACTURING</i>								
Food (15-16)	33.9	25.2	8.7	-1.9	10.7	3.6	1.3	5.7
Textiles (17-19)	26.3	15.7	10.7	-0.9	11.6	3.6	1.2	6.8
Wood (20)	18.5	10.7	7.9	0.4	7.5	2.5	0.7	4.3
Paper (21), Printing (22)	63.8	55.9	7.9	-0.6	8.4	2.2	2.0	4.2
Chemicals (24)	44.1	31.5	12.5	0.1	12.4	5.9	2.0	4.4

How to measure "(re)allocation effect"?

Dynamic approach

- Industry productivity growth rate (**IND**)
- Firm productivity growth rate (**WH**) (=average productivity growth rate), measured with an ideal index

E.g. Maliranta (1996),
Böckerman&Maliranta (2012),
Hyytinen&Maliranta (2013)



$IND - WH =$	<0	>0	>0
Entry +	<0	$=0$	$=0$
Exit +	$=0$	>0	>0
BW	$=0$	>0	>0

Break-down of productivity growth components by firm age group (1/3)

Panel A: Manufacturing (excl. electr.)		A1: Absolute components				A3: Normalized components		
	$\Delta\Phi$	Entry	Exit	Between	Within	Exit	Between	Within
	3.05	-0.33	0.31	0.17	2.91	0.31	0.17	2.91
Entrants	-0.33							
1-5 yrs.	0.25		0.13	-0.06	0.18	2.24	-1.01	3.10
6-10 yrs.	0.37		0.08	0.02	0.27	0.92	0.18	3.18
11-15 yrs.	0.44		0.08	0.04	0.33	0.71	0.40	3.08
16- yrs.	2.32		0.02	0.17	2.13	0.03	0.22	2.83

Notes: The numbers refer to the annual averages of period 1996-2007, calculated using the firm-level (SBS) data. Firm age is defined on the basis of the age of the plants it owns in period t . "Absolute components" refer to equations (3a)-(3d) and (5a)-(5c) in the main text. "All in $t-1$ " refers to the employment share of cohort k among all the firms present at time $t-1$, and "Average" to the average employment share of cohort k among all continuing firms. "Normalized components" are obtained by dividing the cohort-specific absolute components by the relative size of the cohorts. Their weighted average matches the sector-level totals (the first rows of sub-

Break-down of productivity growth components by firm age group (2/3)

Panel B: Electronics		B1: Absolute components				B3: Normalized components		
	$\Delta\Phi$	Entry	Exit	Between	Within	Exit	Between	Within
	12.31	-0.72	1.15	0.86	11.01	1.15	0.86	11.01
Entrants	-0.72							
1-5 yrs.	0.93		0.25	0.05	0.63	4.20	0.79	11.10
6-10 yrs.	2.12		0.15	0.13	1.85	1.09	0.91	13.39
11-15 yrs.	3.51		0.15	0.01	3.34	0.65	0.06	14.35
16- yrs.	6.46		0.60	0.68	5.19	1.05	1.19	9.06

Notes: The numbers refer to the annual averages of period 1996-2007, calculated using the firm-level (SBS) data. Firm age is defined on the basis of the age of the plants it owns in period t. "Absolute components" refer to equations (3a)-(3d) and (5a)-(5c) in the main text. "All in t-1" refers to the employment share of cohort k among all the firms present at time t-1, and "Average" to the average employment share of cohort k among all continuing firms. "Normalized components" are obtained by dividing the cohort-specific absolute components by the relative size of the cohorts. Their weighted average matches the sector-level totals (the first rows of sub-

Break-down of productivity growth components by firm age group (3/3)

Panel C: Services		C1: Absolute components				C3: Normalized components		
	$\Delta\Phi$	Entry	Exit	Between	Within	Exit	Between	Within
	1.24	-1.17	0.87	-0.12	1.66	0.87	-0.12	1.66
Entrants	-1.17							
1-5 yrs.	0.87		0.47	-0.22	0.62	2.80	-1.33	3.78
6-10 yrs.	0.71		0.23	0.08	0.40	1.06	0.35	1.85
11-15 yrs.	0.40		0.09	0.01	0.29	0.44	0.03	1.36
16- yrs.	0.43		0.07	0.01	0.35	0.19	0.03	0.86

Notes: The numbers refer to the annual averages of period 1996-2007, calculated using the firm-level (SBS) data. Firm age is defined on the basis of the age of the plants it owns in period t . "Absolute components" refer to equations (3a)-(3d) and (5a)-(5c) in the main text. "All in $t-1$ " refers to the employment share of cohort k among all the firms present at time $t-1$, and "Average" to the average employment share of cohort k among all continuing firms. "Normalized components" are obtained by dividing the cohort-specific absolute components by the relative size of the cohorts. Their weighted average matches the sector-level totals (the first rows of sub-

Break-down of productivity growth components by plant age group

Panel A: Manufacturing (excl. electr.)		A1: Absolute components				A3: Normalized components		
	$\Delta\Phi$	Entry	Exit	Between	Within	Exit	Between	Within
	3.14	-0.56	0.57	0.20	2.93	0.57	0.20	2.93
Entrants	-0.56							
1-5 yrs.	0.39		0.22	-0.06	0.23	2.66	-0.76	2.89
6-10 yrs.	0.30		0.11	0.02	0.17	1.15	0.23	1.84
11-15 yrs.	0.31		0.06	0.07	0.18	0.68	0.72	2.00
16- yrs.	2.70		0.18	0.17	2.35	0.25	0.23	3.18

Notes: The numbers refer to the annual averages of period 1996-2007, calculated using the plant-level (BR) data. "Absolute components" refer to equations (3a)-(3d) and (5a)-(5c) in the main text. "All in t-1" refers to the employment share of cohort k among all the firms present at time t-1, and "Average" to the average employment share of cohort k among all continuing firms. "Normalized components" are obtained by dividing the cohort-specific absolute components by the relative size of the cohorts. Their weighted average matches the sector-level totals (the first rows of sub-panels A3-C3) when the input shares of the cohorts are used

Conclusions

- There seems to be a need for isolating the role of firm turnover when studying industry productivity (growth) and (re)allocation
- We have considered two alternatives
 - Measurement of allocation effect with a static **augmented OP-covariance**.
 - The effect of (long-lived) entrants, exits and visitors is measured (within group and between group effects)
 - Measurement of reallocation effect with a dynamic **productivity growth decomposition**
 - Break-down of entry, exit and the between components by firm (or plant) age group