

Young Leading Innovators & EU's R&D gap



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1. Data

2. Why do we care about Young Leading Innovators (YLI)?

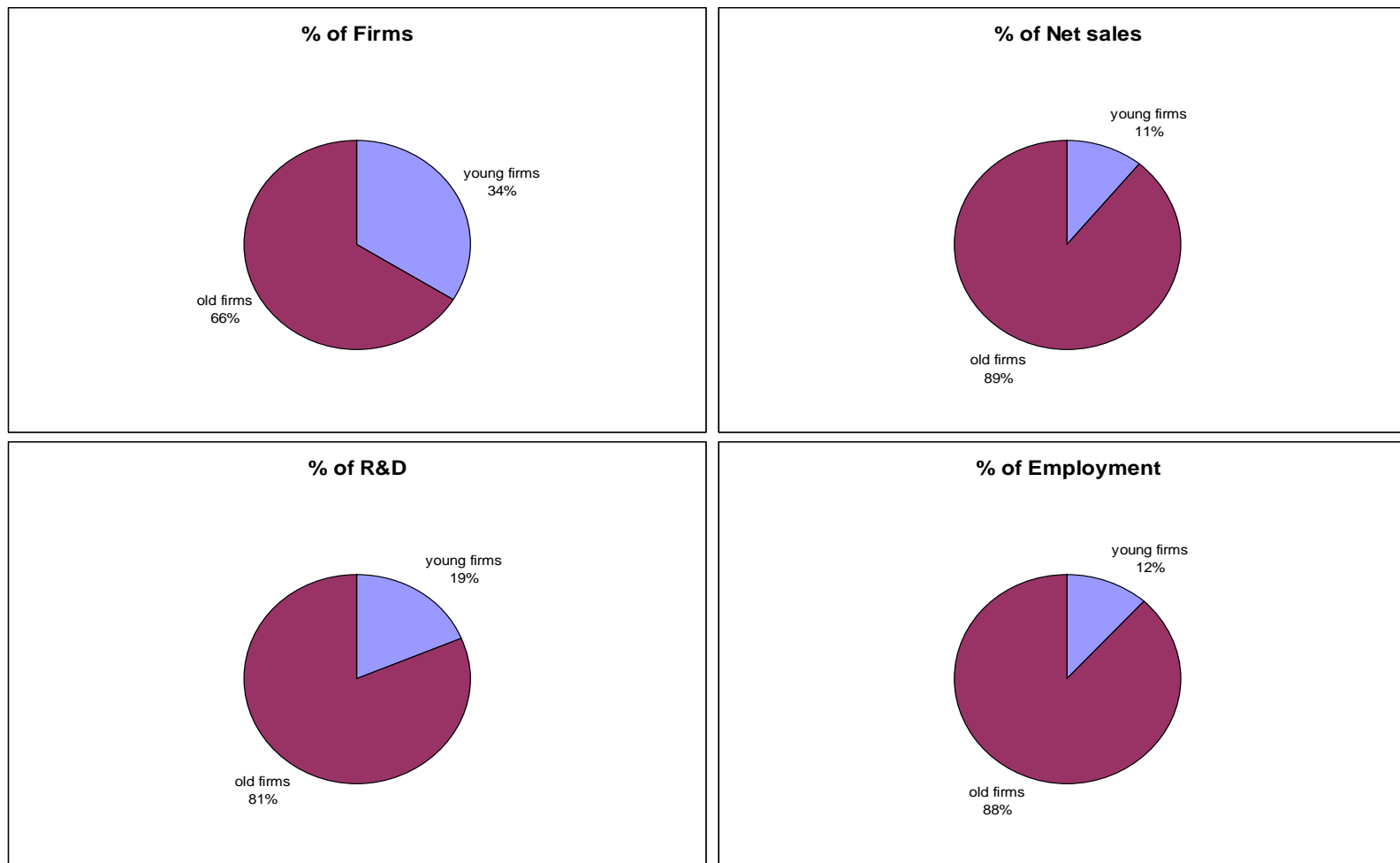
- Importance of YLI firms in R&D, sales and employment
- YLI are important innovators
- YLI shape important sectors
- Difference in R&D intensity between YLI and OLI:
A sectoral look
- Importance of young firms for growth in R&D and Sales

3. YLI and EU's leading R&D gap

4. Conclusion

- Dataset = 1111 largest R&D corporations worldwide listed in the IPTS 2008 industry R&D Scoreboard
- 29% EU; 38% US; 19% JP; 14% RW
- Matching with the age of creation of the firm
- NB:
 - Ex-nihilo creation;
 - Data are representative of about 80% of total R&D in the private sector in the world;
 - Geographic classification of firms on the basis of ownership;
 - Young firms = firms established after 1974 (=34%);
 - Young firms are not small start-ups (average number of employees = 40000 worldwide; young firms = 10000);
 - Young firms labelled as Young Leading Innovators or YLI vs. OLI.

Importance of YLI firms in R&D, sales and employment



YLI are important innovators

Class of age	R&D intensity (in %)
<1900	3.4
1900-1945	3.2
1946-1974	3.0
1975-1989	6.9
>=1990	5.6
Total	3.6

Source: EC-JRC-IPTS/IRI, 2010; authors own calculations.

YLI shape important sectors

	%YLI	%R&D by YLI	%RDI young	%RDI old
Internet	100	100	10.9	
Biotech	91	92	26.7	9.2
Software	86	88	15.3	13.8
Semiconductors	71	53	15.2	13.8
Telecom Equipment	64	34	13.5	12.0
Computer H&S	64	30	3.9	4.9
Health Equipment	26	29	10.6	6.0
Average	34	19	6.3	3.2
Telecom Services	30	11	1.0	1.7
Pharmaceuticals	28	3	15.1	15.5

Difference in R&D intensity between YLI and OLI: A sectoral look

- **Intrinsic effect (within):** in most sectors the difference in RDI between YLI and OLI is small
 - The exception being Biotech and Internet; but in these sectors there are (almost) no OLI
- **Structural effect (between):** YLI are more present in HIGH-RDI sectors
 - Most notably in biotech, semiconductors, software, internet
- So the difference in RDI between YLI and OLI seems to be mostly a structural effect:

Total difference	=	structural effect	+	intrinsic effect
7.2	=	5.7	+	1.5
100%	=	79%	+	21%

- Importance of YLI for growth in R&D and Sales

	Total Growth	Growth YLI	Growth OLI	YLI contribution to total growth
R&D	0.25	0.40	0.22	28%
Net Sales	0.27	0.42	0.25	16%

Notes:

Contribution of young to total growth is calculated à la Denison as $(\text{growth-young} * \text{weight-young}) / \text{growth-total}$

• Importance of YLI for growth in R&D and Sales

	Total Growth	Growth YLI	Growth OLI	YLI contribution to total growth
R&D	0.25	0.40	0.22	28%
Net Sales	0.27	0.42	0.25	16%
By sector				
Pharma	0.36	0.53	0.35	5%
Biotech	0.43	0.47	0.04	98%
Health Care	0.37	0.53	0.32	37%
Software	0.36	0.37	0.30	90%
Semicond	0.28	0.35	0.21	61%
Comp H&S	0.18	0.37	0.10	56%
Telecom Eq	0.37	0.35	0.37	33%
Telecom Services	0.36	0.09	0.40	3%

Source: EC-JRC-IPTS/IRI, 2010; authors own calculations.

Notes:

- Contribution of young to total growth is calculated à la Denison as $(\text{growth-young} * \text{weight-young}) / \text{growth-total}$;
- Shaded are the young sectors; first box is the health-box; second box is the ICT;
- Internet-sector not in the table as it includes only YLI and no observations in 2004.

	World	EU	US	JAP	RW
Share of YLI in Region's firms	34%	20%	52%	1.5%	53%
Share of YLI in Region's R&D	19%	7%	35%	0.4%	27%
Share of YLI in Region's Net sales	10%	4.5%	16%	2%	26%

Source: EC-JRC-IPTS/IRI, 2010; authors own calculations.

- Among US's LI, more than half of them are YLI, i.e. since 1975. The same holds true for RW. In Europe only 1 out of 5 LI are young, Japan has almost no young firms among its LI.
- In the US, YLI account for 35% of total R&D, in the EU this is a mere 7% !

	World	EU	US	JAP	RW
RDI	3.4	2.8	4.6	3.7	2.7
RDI of YLI	6.3	4.2	10.2	1.1	2.7
RDI of OLI	3.1	2.7	3.5	3.7	2.7

Source: EC-JRC-IPTS/IRI, 2010; authors own calculations.

- RDI intensity of EU companies is on average smaller than US companies: EU's RDIGap-score is 61% (US=100%)
- This holds both for OLI and YLI
- But the difference is more pronounced for YLI: while EU's RDIGap-score is 77% for OLI, the RDIGap-score for YLI is 41% (EU as % of US=100%).

Higher RDI of US companies can therefore be explained by:

- EU has less YLI than the US. This matters when YLI have a higher RDI: structural effect
- EU-based YLI are less RDI than their US counterparts: intrinsic effect
- Also EU-based OLI are less RDI than their US counterparts: intrinsic effect

Total difference	=	structural effect (YLI+OLI)	+	intrinsic effect (YLI+OLI)
3.97	=	(2.28 - 0.98)	+	(2.15 + 0.51)
100%	=	33%	+	67%

Source: EC-JRC-IPTS/IRI, 2010; authors own calculations.

NB:

- Intrinsic effect is for 81% caused by YLI
- Or 54% of the EU-US RDI differential is explained by the lower RDI of EU YLI as compared to US YLI.

Back of the envelop policy scenario calculations based on this result:

- Suppose the EU would be able to boost the RDI of the 59 YLI there are in Europe to US levels, i.e. eliminate the intrinsic effect; Note that, as we keep the same structural composition, the negative structural effect will be magnified.
- Result: the difference in RDI between the EU and the US would be reduced from 3.97 to 2.76, i.e. total EU RDI would be 4.2
→ **new EU private R&D to GDP ratio of 1.75**
- Suppose the EU would be able to get more YLI, i.e. eliminate the structural effect, Note that as we keep the intrinsic effect, these extra EU YLI are still less RDI than their US counterparts.
- Again the difference in RDI between the EU and the US would be reduced from 3.97 to 3.49, i.e. total EU RDI would be 3.47
→ **new EU private R&D to GDP ratio of 1.45**

Why are EU YLI overall less RDI than US YLI?

Is this because EU YLI are less present in HIGH-RDI sectors (structural effect) or because they are within sectors, less RDI than their US counterparts (intrinsic effect)?

Intrinsic (within) effect: In which sectors are EU YLI less RDI than US?

EU YLI are strongly **less RDI** than US YLI in *Biotech* and also (but to a lesser extent) in *Comp H&S*.

In most sectors, the differences are not very strong.

In some sectors, EU YLI are **more RDI** than their US counterpart; This holds in *Telecom Eq*, the sector where EU holds a RTA.

Structural effect: In which sectors are their less EU YLI? Are these the HIGH-RDI sectors?

The *Internet* sector is the clearest case of a structural EU YLI problem, as there are no EU YLI while in the US, they are all YLI. And this is a HIGH-RDI sector.

In *Software*, EU YLI are not necessarily smaller in relative numbers, but they are substantially smaller in R&D size as compared to their US counterparts.

In *Semiconductors*, EU YLI are at equal footing in terms of relative numbers, but they are larger in R&D size as compared to their US counterparts; The same holds for *Comp H&S*.

In *Telecom Equipment*, where EU YLI held a superior RDI position relative to their US counterparts, there are unfortunately relatively less YLI and they are smaller in R&D size.

In *Biotech*, there are less EU YLI and they are smaller in R&D size as their US counterparts.

The same holds for *Health Care*; In *Pharma*, there are more YLI in the US than in the EU, but in both cases they are small.

Conclusion: Almost all the difference is in the structural effect:

Total difference	=	structural effect	+	intrinsic effect
2.917	=	2.906	+	0.011

- **YLI are important innovators (RDI twice as RDI of OLI)**
- **YLI shape important sectors (internet, biotech, software, semiconductors,...)**
- **Difference in RDI between YLI and OLI mostly structural**
- **Overall YLI contribute to 28% of R&D growth (2004-2007)**
- **Difference in RDI between EU and US is larger for YLI than for OLI → mainly an intrinsic effect**
- **Lower RDI of EU YLI (vs. US YLI) → mainly a structural effect.**

Thank you for your attention !

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