Production intensity of Finnish manufacturing companies

Panagiota Kalpakidou | ISA 2022, Philadelphia | 24th June 2022

Authors

Panagiota Kalpakidou

Master student
Tampere University

Timo Seppälä

Professor of Practice
ETLA & Aalto University

Jussi Heikkilä

Professor
Tampere University

Motivation and background

- Production lags behind in value added compared to other functions (Shih, 1996)
- Production relocation: In Finland, Sweden & Denmark approximately one third of industrial enterprises relocated production from their home country during 2010-2015 (Heikkilä et al., 2018)
- Investments in intangible assets in EU and USA have been growing faster than tangible investments over the last 20 years (Thum-Thysen et al., 2017)
- Production intensity concept and methodology
  - Introduced by Holmström, Kenney & Seppälä (2021)
  - Share of company operating profits (EBIT) reinvested in tangible assets
  - A good indicator of the importance of production for companies
  - A good indicator of the dynamics of inventments in tangible assets

Research questions

- **Main Research Questions:**
  - What is the production intensity of a single company / industry?
  - Are the results from Finnish manufacturing industry intensity in accordance with “smiling curve”?

- Supporting Research Questions:
  - What are the operating profits (EBIT) in Finnish manufacturing industry from 2011 until 2020?
  - What are the growth of tangible and intangible assets in Finnish manufacturing industry from 2011 until 2020?
  - Are tangible assets an important element of value creation?
  - Are intangible assets an important element of value creation?

Data

- Company income statement & balance sheet information retrieved from ORBIS database from 2011 until 2020
- 600 Finnish manufacturing companies with more than 50 employees
- 23 sectors (NACE codes) of manufacturing industry:

11 - Food products	15 - Leather and related products	19 - Coke and refined petroleum products	23 - Other non-metallic mineral products	27 - Electrical equipment	31 - Furniture
12 - Beverages	16 - Wood and wood products	20 - Chemicals and chemical products	24 - Basic metals	28 - Machinery and equipment n.e.c.	32 - Other manufacturing
13 - Textiles	17 - Paper and paper products	21 - Pharmaceutical products and pharmaceutical preparations	25 - Fabricated metal products	29 - Motor vehicles, trailers and semi-trailers	33 - Repair and installation of machinery and equipment
14 - Wearing apparel	18 - Printing and reproduction of recorded media	22 - Rubber and plastic products	26 - Computer, electronic and optical products	30 - Other transport equipment	

Production intensity formula
(Research methodology)

Quantity	Formula
$Value\ Added\ (n)$	$cost\ of\ employees(n) + depreciation\ \&\ amortization\ (n) + EBIT(n)$
$Production\ Intensity$ $(2011 - 2020)$	$\frac{tangible\ assets\ (2020) - tangible\ assets\ (2011)}{EBIT\ (2011) + \cdots + EBIT(2019)}$
$R\&D\ Intensity$ $(2011 - 2020)$	$\frac{intangible\ assets\ (2020) - intangible\ assets\ (2011)}{EBIT\ (2011) + \cdots + EBIT(2019)}$

Grouping the results

- Due to extremities presented in the calculated Production and R&D Intensities, it was decided to include 2 groups of results:

1st group	2nd group
All companies included (600)	Companies with extreme values excluded (580)

Production (R&D) intensity > 4 OR Production (R&D) intensity < - 4

Production and R&D Intensive sectors

1st group

- Production Intensity
  - Top sectors:
    - Manufacture of wood and wood products
    - Manufacture of machinery & equipment
    - Repair & installation of machinery & equipment
- R&D Intensity
  - Top sectors:
    - Printing & reproduction of recorded media
    - **Manufacture of basic metals**
    - **Manufacture of electrical equipment**

2nd group

- Production Intensity
  - Top sectors:
    - Manufacture of basic metals
    - Manufacture of chemicals & chemical products
    - Manufacture of motor vehicles, trailers, & semi-trailers
- R&D Intensity
  - Top sectors:
    - **Manufacture of basic metals**
    - **Manufacture of electrical equipment**
    - Manufacture of machinery & equipment

Variation in Production and R&D Intensity

$Variation = \max value - \min value$ (within the same sector)

1st group

- Production Intensity
  - Top sectors:
  - **Manufacture of wood and wood products**
  - Manufacture of machinery & equipment
  - **Manufacture of food products**
- R&D Intensity
  - Top sectors:
    - Printing & reproduction of recorded media
    - **Manufacture of computer, electronics & optical products**
    - **Manufacture of food products**

2nd group

- Production Intensity
  - Top sectors:
    - **Manufacture of food products**
    - Manufacture of paper & paper products
    - **Manufacture of wood and wood products**
- R&D Intensity
  - Top sectors:
    - Manufacture of machinery & equipment
    - **Manufacture of computer, electronics & optical products**
    - **Manufacture of food products**

Company level analysis and results (selected examples)

COMPANY NAME	NUMBER OF EMPLOYEES	Sales	Solid fixed assets	EBIT In thousands	COST OF EMPLOYEES	DEPRECIATION & AMORTIZATION	VALUE ADDED	PRODUCTION INTENSITY
JOHN DEERE FORESTRY OY	786	533197	48196	72784	54541	5838	133000	1,9 %
KONE INDUSTRIAL OY	613	1155000	48844	56979	48968	6643	113000	7%
KONECRANES FINLAND OY	1582	1045856	30199	75712	130295	7556	214000	0%
PONSSE OYJ	1845	785215	137660	69813	109818	30225	210000	21%

Financial information of 2020. Numbers expressed in thousand $.

Industry level analysis and results (selected examples)

Industry	Production Intensity	Variation	R&D Intensity	Variation
Fabricated metal products	8%	4.07	Nearly 0%	3.2
Computer, electronic, and optical products	12%	1.29	0.3%	3.52
Machinery and equipment	16%	3.73	13%	5.41

All numbers are included in the 2nd group of results.

Discussion and conclusions

- Great variance in how different companies and industries invest in their tangible assets (and intangible assets).
- Companies with similar levels of value added do not necessarily present similar levels of Production Intensity.
- Tangible assets remain the most important source of value for the Finnish manufacturing industry.
- The preliminary results do not comply with the value added and “smile curve” theory (in company level). Production does not lag behind in value added compared to other functions.
- The Production Intensity formula needs further examination.

Questions?

Comments, remarks and discussion are more than welcome:

Panagiota Kalpakidou
panagiota.kalpakidou@tuni.fi

Timo Seppälä
timo.seppala@etla.fi

Jussi Heikkilä
jussi.heikkila@tuni.fi

Key References

- Ali- Yrkkö , J., Rouvinen , P., Seppälä, T. & Ylä -Anttila, P., (2011) Who Captures Value in Global Supply Chains? Case Nokia N95 Smartphone; *Journal of Industry, Competition and Trade* . (11), 263-278
- Holmström, H., Kenney, M. & Seppälä, T. (2 021) Global supply chains, value added and production intensity - case Semiconductors, *ETLA Report* No 113.
- Kalpakidou , P. (2022) Production Intensity of Finnish manufacturing companies. Unpublished master's thesis. Tampere University.
- Mudambi , R. (2008) Location, control and innovation in knowledge-intensive industries. *Journal of Economic Geography* , 8, 699–725.
- Shih, S. (1996) Me-too is not my style: challenge difficulties, breakthrough bottlenecks, create values, Taipei: *The Acer Foundation* .
- Stöllinger , R. (2021) Testing the smile curve: functional specialization and value creation in GVCs, *Structural Change and Economic Dynamics* , 56, 93–116.