

Ampliare le connessioni per affrontare protezionismi, sfide ambientali e disuguaglianze

La filiera automotive in Toscana tra resilienza, transizione e vulnerabilità

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The project: who, what, how, when, why...

- **Research promoted by MOVET**
- Mapping of automotive companies in the Tuscany Region
- Conducted by researchers from the Department of Economics and Management of the University of Pisa (MOVET member) and staff from the TEA Observatory
- Interdisciplinary approach
- **Project period: April 2025 – April 2026**

EXPECTED IMPACT

- Sector policies
- Corporate strategies and policies of automotive companies in the Tuscany Region
- Investment attraction
- Research (economic and managerial field)

Objectives

Map automotive companies in Tuscany, with particular focus on:

- Number and type
- Supply-chain gaps
- The employment and economic impact of the supply chain
- The economic, financial and asset characteristics of supply-chain companies
- The strategic and managerial profile of supply-chain companies
- The ecosystem supporting the supply chain
- Economic impacts of exogenous shocks and European policies on the Tuscan manufacturing sector
- Development prospects

Supply chain resilience: framing the analysis

WHY

Safeguard employment, income and local skills

WHO

Tuscan automotive companies



**Supply Chain
Chain
resilience**

CHALLENGES

EU policies on energy transition and US trade tariffs

HOW

Quantitative analysis of company financial statements (2013–2023), TEA Observatory survey (2025), entrepreneurial ecosystem analysis

The Resilience of Tuscan Automotive Supply Chain

Evidence from an Input-Output Analysis

Edoardo Alberti¹ and Simone D'Alessandro²

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INTRODUCTION

Why this analysis?

To understand the potential effects of the EV transition and trade shocks, and to support support regional policy decisions.

Contribution of the «Manufacture of transport equipment» sector (automotive and other means of transport), 2023

16,000

employees

Source: regional economic accounts

€1.9bn

value added

Source: regional economic accounts

€3.6bn

exports

Source: Foreign trade, CPA, Istat

PART 1

The two major current challenges

CHALLENGE 1

Energy transition

Vehicle electrification and conversion of the production chain.

CHALLENGE 2

US tariffs

A 15% ad valorem tariff on exports to the United States.

CHALLENGE 1

Energy transition in the automotive world

The «Fit for 55» regulation promotes vehicle **electrification**.

- Conversion of the production chain: suppliers that are **penalized, favored, or neutral**.

A complex systemic transformation, with significant challenges:

- **High** vehicle prices and **battery** costs
- **Geographic concentration** of batteries, rare earths, and critical metals
- **Delays** in charging infrastructure
- Energy system **not yet adequate** for full electrification
- Consumer **range anxiety**

US tariffs **15%** ad valorem tariff

The impact on import demand depends on:

- Tariff pass-through to prices
- Price elasticity of demand
- Degree of substitutability and production specialization — the first is logically very low in the short term, the second is very strong for intermediate goods

EFFECT OF TARIFFS

- Direct impact on the exports affected
- Indirect impact across countries through global value chains
- Multiplier effect from intermediate goods repeatedly crossing borders
- Exporters' ability to diversify → dampens or amplifies the impact in the medium term

PART 2 — METHODOLOGY

Interregional Input-Output

METHODOLOGICAL APPROACH

Defining a value chain

A value chain can be defined as the combination of two components (*Miller and Blair, 2009*):

- a **demand shock** affecting a specific need/function
- the set of **production processes** that respond to that shock

FORMALLY:

$$Fd^s_{z,i} + A Fd^s_{z,i} + (A)^2 A Fd^s_{z,i} + (A)^3 A Fd^s_{z,i} + \dots + (A)(A)^{n-1} A Fd^s_{z,i} = X^s_{z,i}$$

Fd — demand vector of dimensions (M×N)×1

z — producing area/sector

X — total sectoral output level

i — demanding area/sector

METHODOLOGICAL APPROACH

From the Leontief inverse to value added and employment

It can be shown mathematically that the following equality holds:

$$(I - A)^{-1} Fd^s_{z,i} = X^s_{z,i}$$

$(I - A)^{-1}$ = the Leontief inverse

Equation (2) can be expressed in terms of sector/region **value added** as:

$$V^s_{z,i} = \hat{v} (I - A)^{-1} Fd^s_{z,i}$$

$\hat{v}$ = the diagonal matrix with value-added coefficients on the main diagonal

And in terms of sector/region **employment** as:

$$E^s_{z,i} = \hat{\varepsilon} (I - A)^{-1} Fd^s_{z,i}$$

$\hat{\varepsilon}$ = the diagonal matrix with employment coefficients on the main diagonal, indicating employed units per unit of output

SIMULATION SCENARIOS (1/2)

Scenarios

Relocation of component sourcing

Intermediate demand shock

Italian automotive producers partly or entirely stop purchasing components from Tuscany: purchases of intermediate goods from Tuscan suppliers decrease.

In the automotive columns (Tuscany and other macro-areas), the input coefficients relating to Tuscan suppliers in sectors CI (computer, electronic and optical products), CJ (electrical equipment) and 29 (automotive components) are reduced.

Full electrification

Technological/structural shock

Italian automotive producers manufacture only electric vehicles: the combination of inputs used in production changes.

In the automotive sector columns for Tuscany and the other Italian macro-areas, the technical coefficients are changed to reflect the different «production recipe» of the electric vehicle.

SIMULATION SCENARIOS (2/2)

Scenarios

US tariff impact

Foreign final demand shock

The United States introduces tariffs on Italian vehicles and components: foreign demand toward Tuscany decreases.

Reduction of the export component to the US in the final demand vector, estimated assuming different elasticities (from -0.4 to -1.4). The share of Tuscan automotive exports to the US (Istat data) was used to isolate US demand within the «Rest of the World» component.

Combined impact

Mixed shock

Electric transition and US tariffs together: both technology and foreign demand change.

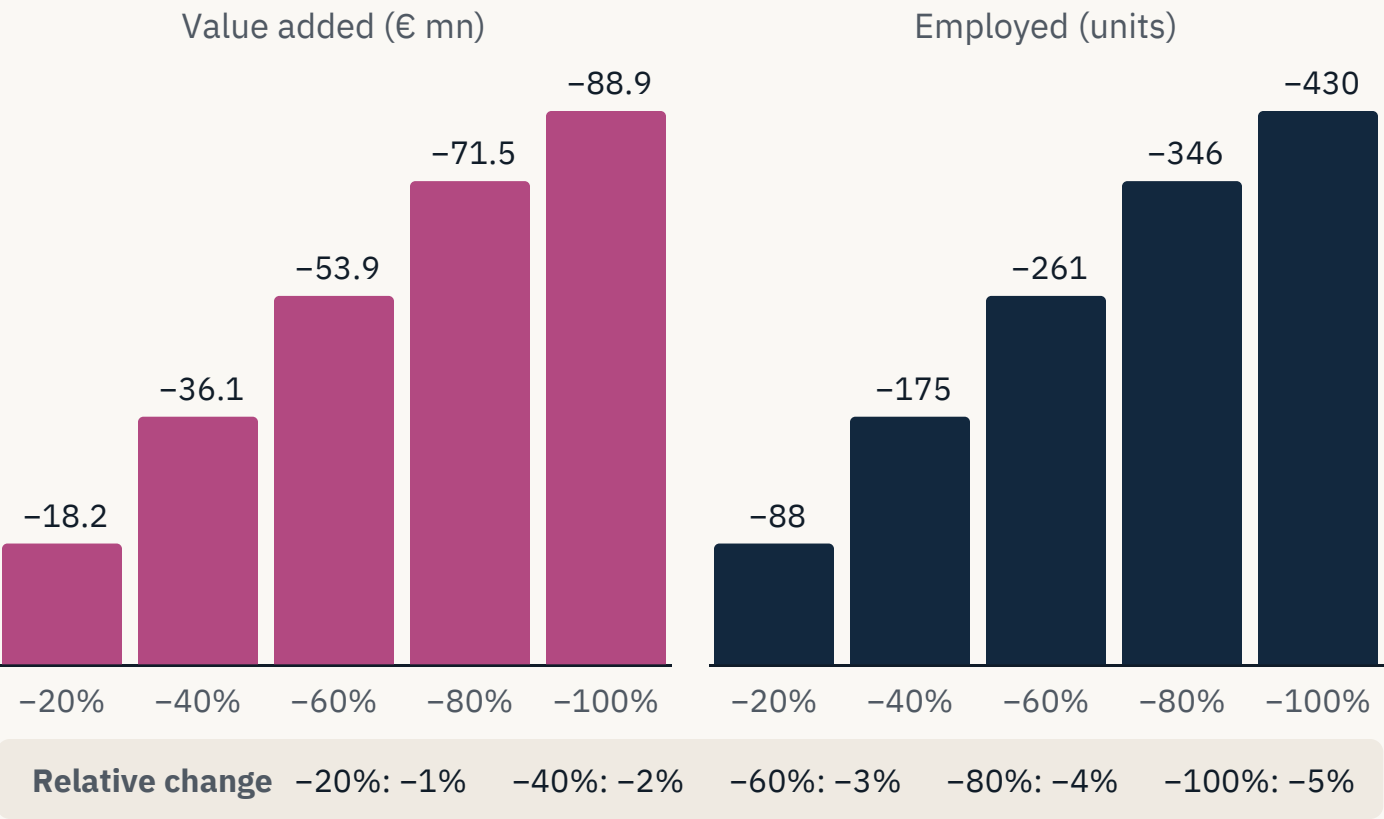
Simultaneous change in the technical coefficients matrix and the final demand vector.

Counterfactual analysis: scenario vs «business as usual» comparison, isolating the impact and holding all other system components constant.

RESULTS — RELOCATION

Impacts of relocating intermediate goods demand

Impact by intensity of component relocation



The impact is concentrated in the sectors directly involved: **29, CI and CJ** account for about **47.7%** of the total loss.

The impact relative to «business as usual» remains contained, because:

- Diversified demand
- High foreign share
- Weak backward linkages

Aggregate impact of electrification

−38.1

€ mn of value added

−206

employees

≈ −1.9%

relative change

RESULTS – ELECTRIFICATION

Internal redistribution within the supply chain

WINNER
CJ — Electrical equipment
+€1.5mn +6 employ.

MAIN LOSERS

25 — Metal products	–€9.7mn · –67 employees
29 — Automotive	–€3mn · –16 employees
G — Vehicle trade and repair	–€3.3mn · –20 employees
H — Transport	–€2.25mn · –7 employees
22 — Rubber and plastics	–€2.2mn · –11 employees

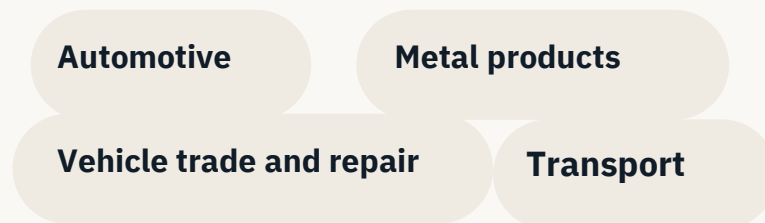
Traditional mechanical components are penalized. The increase in some inputs relates to external supplies (other regions or abroad) → this does not translate into higher local production and does not offset the negative effect of the change in the production recipe.

RESULTS — US TARIFFS

Impacts of US tariffs

Elasticity	Value added	Employment	Rel. change
-0.4%	-€2.3mn	-12 employees	-0.1%
-1.4%	-€8mn	-42 employees	-0.4%

The effect is strongly concentrated on nodes directly linked to exports:



RESULTS — US TARIFFS

Why the impact is limited

The impact is limited and ranges from -0.1 to 0.4% , because:

Automotive product export share to the US **2.6%**

High geographic diversification: EU prevalence and widespread extra-EU markets

POSSIBLE UNDERESTIMATION, BECAUSE

Analysis limited to product 29 only

The IRIO does not capture indirect effects through global value chains

RESULTS — COMBINED SCENARIO

Combined impact of electrification and US tariffs

Scenario	Value added	Employment	Relative change
Electrification only	-€38.1mn	-206 units	-2.1%
Electrification + tariffs	-€41mn	-220 units	

Assuming a price elasticity of demand for imports of Tuscan goods of -0.5.

Thank you for your attention

Edoardo Alberti · Simone D'Alessandro — University of Pisa · Irpet

Defining the scope of the supply chain (1)

Methodological reference → Observatory on the Transformations of the Automotive Ecosystem (OTEA)

THE “EXTENDED AUTOMOTIVE SUPPLY CHAIN” (OTEA, 2024)

The scope of the analysis is not limited to traditional car components but includes:

Micromobility

Engineering services

Aftermarket

**Connectivity and on-board
telematics**

Electric mobility

Charging infrastructure

Final selection result

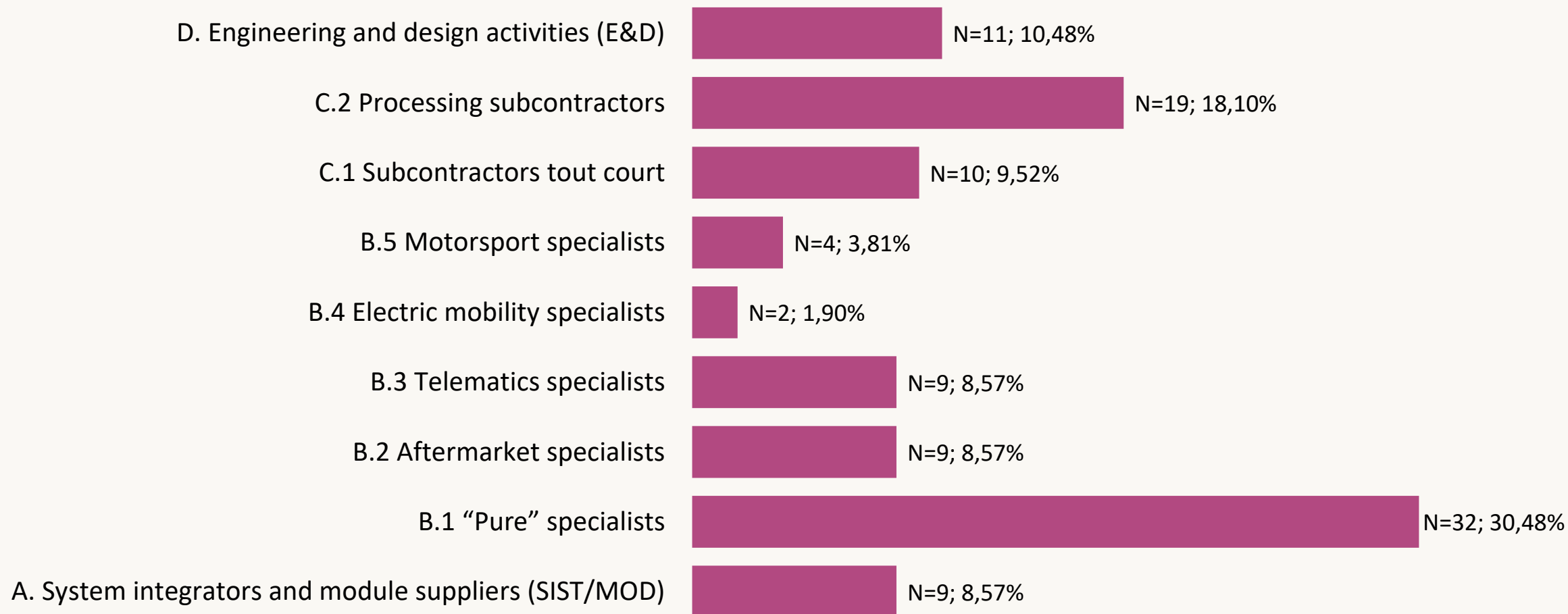
OTEA Database	n = 59
MOVET – 2015 Research Project	n = 21
MOVET Members	n = 2
Companies reported by MOVET members	n = 6
NACE 29 code extraction	n = 3
NACE 26 code extraction	n = 9
Tuscan companies affiliated with ANFIA	n = 0
Companies reported by RPM	n = 3
Companies reported by UCAR	n = 2

FINAL POPULATION

N = 105

COMPANIES

Functional classification of companies in the Tuscan automotive supply chain



METHODOLOGY

Examining the resilience of the Tuscan automotive supply chain: analysis of financial statements (2013–2023)

Riccardo Giannetti, Cristina Campanale, Fabio Magnacca, Simone Camillieri

Department of Economics and Management

Business resilience: the literature

- Business resilience is the ability of an organization to proactively anticipate or respond to crises, maintain continuity of operations, and recover rapidly (*Ortiz-de-Mandojana and Bansal, 2016; Radic et al., 2022*).
- From a financial perspective, resilience — defined as a firm's ability to maintain persistent superior performance (*Markman and Venzin, 2014*) — can be explored by analysing, for example, the variability of key performance metrics, such as the return on equity (*Markman and Venzin, 2014*).
- It is a dynamic ability rooted in various drivers, such as innovation, operational efficiency, strategic foresight, and organizational adaptability.

Business resilience drivers

Operational efficiency and agility

Level of assets' technological innovation

Innovation

Marketing capability

Resource availability and redundancy

Digitization

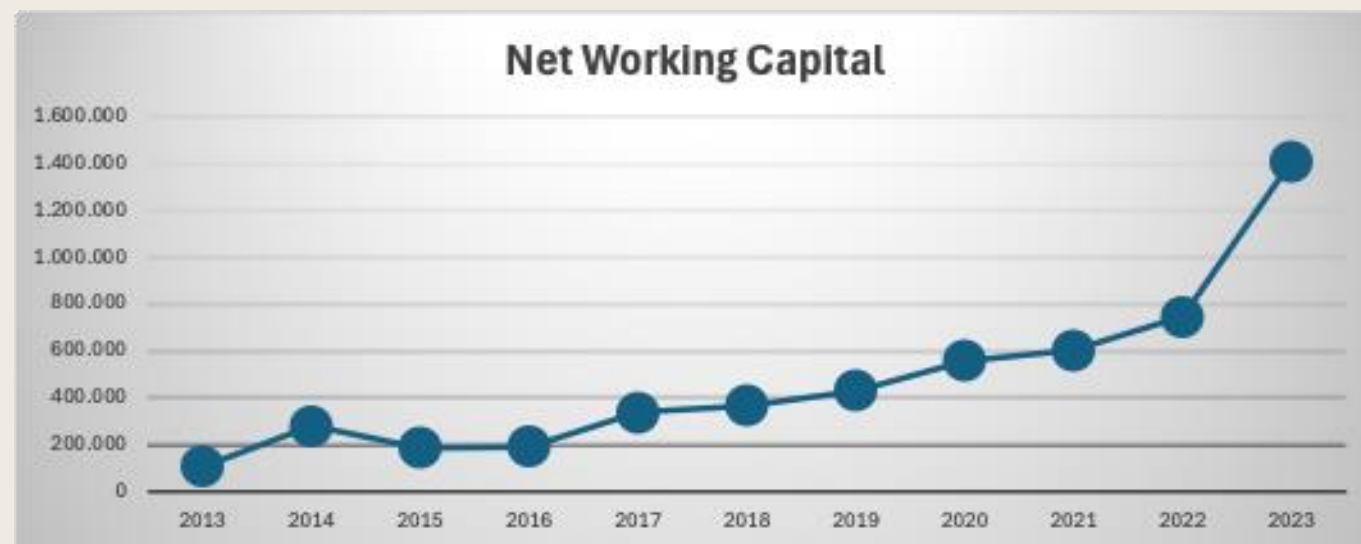
Internal climate and social resources

Networks and collaboration

Environmental and social sustainability

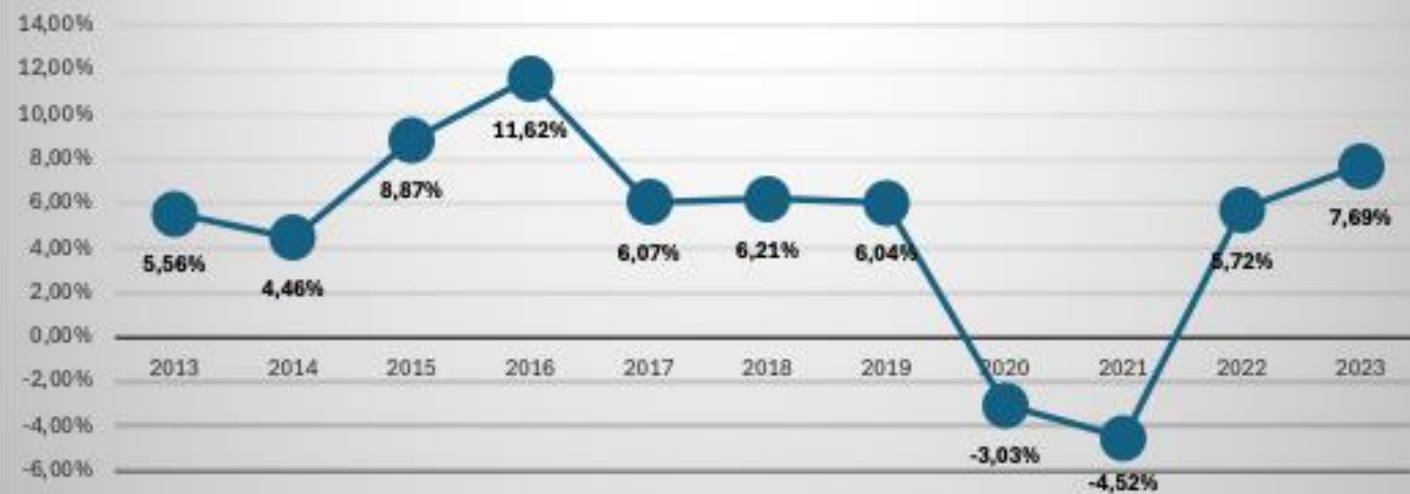
(Campanale, Giannetti, Magnacca, 2025)

Revenues and net working capital

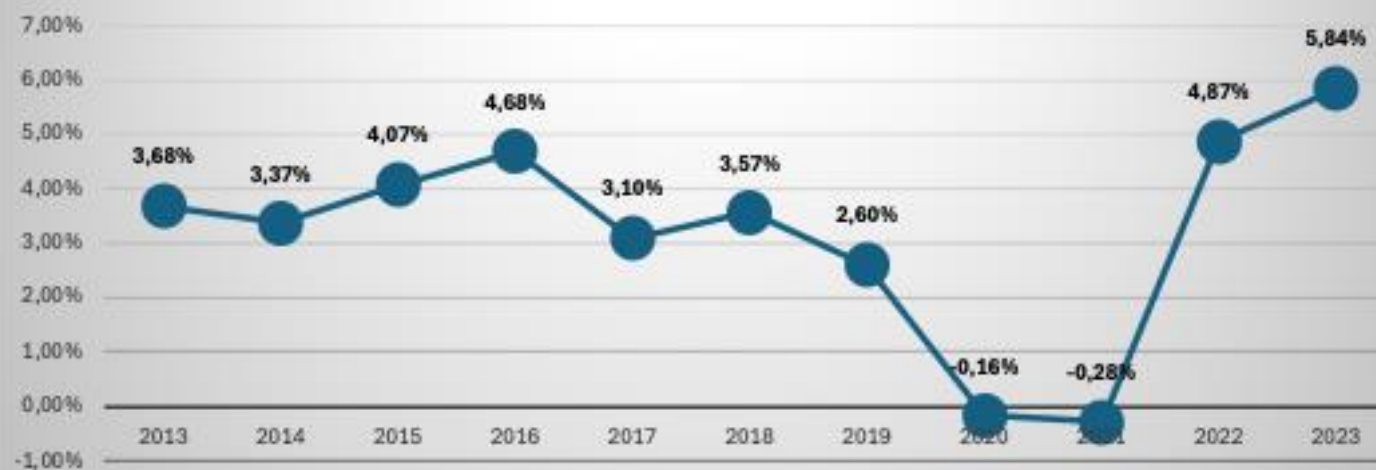


*data in thousands of euros

ROE

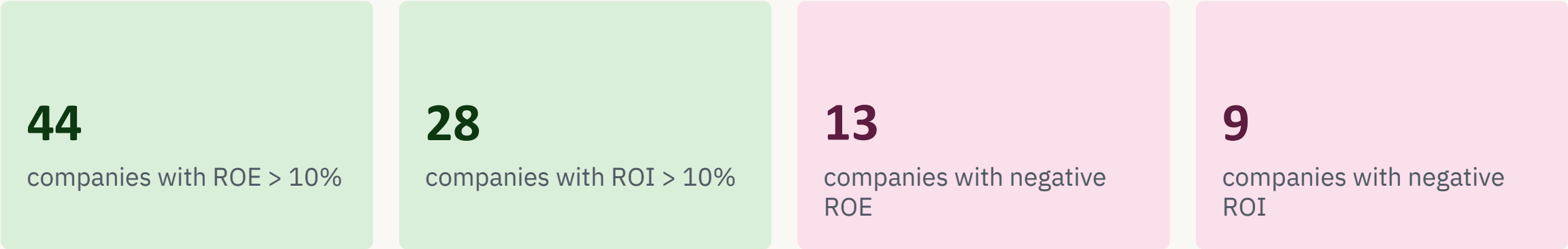


ROI

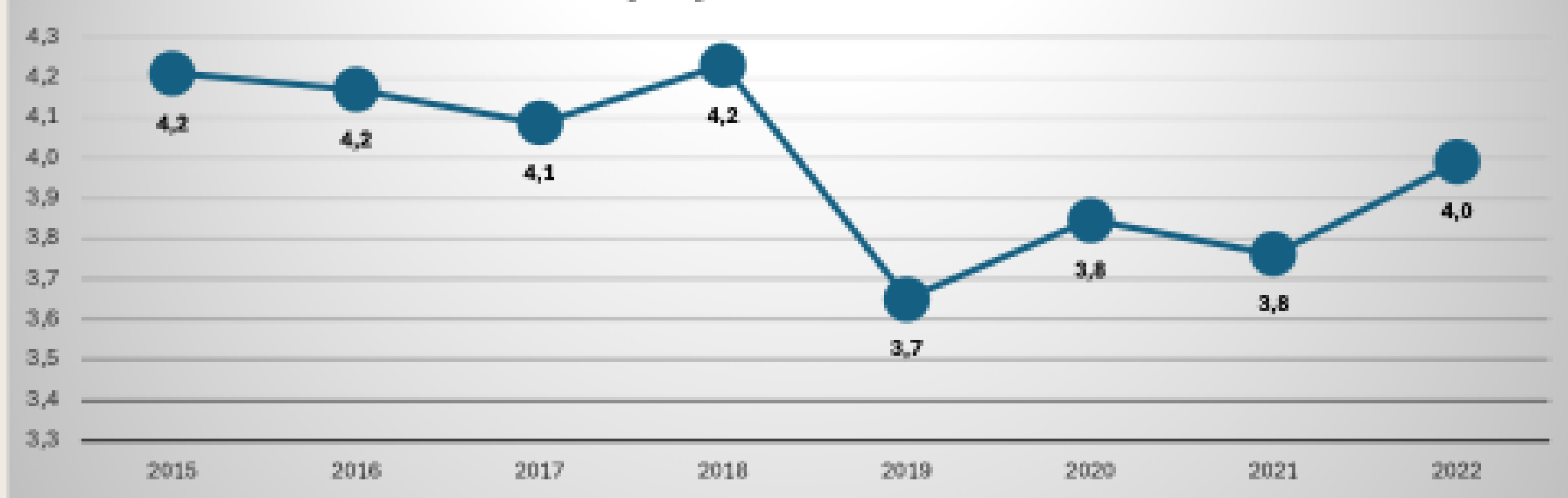


ROE–ROI distribution in 2023

	Q1	Q2	Q3	Q4
ROE	−1.74% to 1.50%	1.54% to 7.06%	7.97% to 17.28%	17.30% to 85.53%
ROI	−11.07% to 1.46%	4.24% to 5.51%	3.26% to 14.37%	7.77% to 6.64%
Companies	26	26	26	26



Equity-to-Debt Ratio



ANALISI DI REDDITIVITA'										
Cluster fornitore		Integratori di sistemi	Specialisti puri	Specialisti mercato aftermarket	Specialisti Telematica	Specialisti mobilità elettrica	Specialisti motorsport	Sub-fornitori tout court	Sub-fornitori lavorazioni	Engineering & Design
Indicatore	Anno									
ROE	2023	-2,3%	10,2%	15,4%	19,0%	3,8%	33,8%	14,1%	10,5%	5,5%
	2022	-4,0%	9,2%	2,0%	7,5%	2,8%	21,6%	16,1%	10,3%	16,2%
	2021	-41,9%	11,1%	8,3%	-0,6%	2,5%	10,1%	12,7%	10,5%	6,6%
	2020	-15,2%	6,1%	5,4%	-16,4%	7,9%	-2,1%	4,7%	5,9%	11,6%
	2019	3,6%	13,0%	5,9%	-3,3%	33,6%	-9,8%	8,5%	8,4%	11,6%
Media		-12,0%	9,9%	7,4%	1,2%	10,1%	10,7%	11,2%	9,1%	10,3%
Trend		↓	↓	↑	↑	↓	↑	↑	↑	≈
ROI	2023	3,4%	6,7%	6,7%	6,5%	4,5%	14,8%	8,3%	6,5%	5,0%
	2022	1,4%	5,4%	2,7%	6,5%	1,8%	6,5%	8,1%	5,9%	5,0%
	2021	-12,6%	6,5%	2,7%	2,8%	2,4%	3,1%	6,8%	5,7%	2,6%
	2020	-3,7%	3,8%	2,3%	-6,9%	6,1%	0,4%	2,8%	2,6%	8,8%
	2019	2,1%	7,5%	2,7%	-15,6%	19,7%	-0,9%	4,8%	4,8%	5,5%
Media		-1,9%	6,0%	3,4%	-1,4%	6,9%	4,8%	6,1%	5,1%	5,4%
Trend		≈	↓	↑	↑	↓	↑	↑	↑	≈
ROS	2023	2,3%	6,5%	6,5%	12,6%	11,5%	11,6%	8,7%	7,2%	6,1%
	2022	1,5%	5,4%	3,1%	12,1%	6,2%	6,5%	7,9%	6,3%	4,5%
	2021	-12,8%	6,3%	2,8%	5,4%	8,3%	3,3%	6,9%	6,8%	5,8%
	2020	-4,0%	4,2%	2,5%	-15,6%	9,1%	0,4%	3,3%	3,6%	11,5%
	2019	1,7%	7,1%	2,8%	-41,4%	14,8%	-0,7%	4,3%	5,2%	6,3%
Media		-2,3%	5,9%	3,5%	-5,4%	10,0%	4,2%	6,2%	5,8%	6,8%
Trend		≈	↓	↑	↑	↓	↑	↑	↑	≈
Capital Turnover	2023	1,5	1,0	1,0	0,5	0,4	1,3	1,0	0,9	0,8
	2022	0,9	1,0	0,9	0,5	0,3	1,0	1,0	0,9	1,1
	2021	1,0	1,0	1,0	0,5	0,3	1,0	1,0	0,8	0,5
	2020	0,9	0,9	0,9	0,4	0,7	1,0	0,8	0,7	0,8
	2019	1,2	1,0	1,0	0,4	1,3	1,4	1,1	0,9	0,9
Media		1,1	1,0	0,9	0,5	0,6	1,1	1,0	0,9	0,8
Trend		≈	≈	≈	≈	↓	↓	≈	≈	≈

Profitability and resilience: the supply chain divides into four profiles

2019–2023 = pre-Covid, 2020–2021 shock, 2022–2023 normalization. Trend calculated by comparing 2019 with the 2022–2023 average.

Aftermarket • Motorsport

ROE is growing, supported by ROI and ROS. Good post-Covid recovery capacity, with overall stable capital efficiency.

Subcontractors t.c. • Processing

Positive and broadly stable indicators throughout the five-year period: Covid did not significantly alter the business model.

Pure specialists • Electric mobility

ROE remains positive but is declining. In electric mobility, a deterioration in the use of invested capital is also observed.

System integrators • Telematics

Integrators: negative average ROI, ROS and ROE, with ROE worsening. Telematics: recovery under way, but overall profitability remains very limited.

Resilience increases with niche specialization, position along the supply chain and level of exposure in terms of capital use.

ROI and ROE: the levers explaining gaps across clusters

ROI = ROS × Capital turnover

The breakdown of ROI distinguishes models that strengthen operating profitability from those that, while remaining positive, show progressive erosion.

ROS: the dominant driver

Differences in ROI mainly stem from different levels of operating margins, rather than major divergences in capital turnover.

Capital turnover almost aligned

For most clusters, invested capital turnover remains around one; the clearest exceptions are telematics and electric mobility.

Warning on the most fragile clusters

System integrators combine negative operating margins and turnover around 1: a signal of structural inefficiency and persistent value destruction.

ROE = Net margin × Asset turnover × Financial structure

The analysis of ROE drivers shows that gaps in return on equity are explained primarily by different abilities to retain net margins.

Net margin: strong heterogeneity

It is the main determinant of ROE: negative for integrators; positive but declining for pure specialists, electric mobility and engineering & design; improving in aftermarket, motorsport and subcontracting.

Asset turnover fairly stable

For most clusters, average values remain between 0.8 and 1.1, confirming that capital-use efficiency explains only part of the observed differences.

Financial structure: amplifying effect

Financial structure is heterogeneous: higher leverage in aftermarket and motorsport, increasing for engineering & design, decreasing for integrators, electric mobility and part of subcontracting.

Profile of the Tuscan automotive supply chain: evidence from the questionnaire survey

Key findings from the 2025 survey of the Observatory on the Transformations of the Italian Automotive Ecosystem.

2,196

companies nationwide in the OTEA database

448

companies participated in the survey

24

Tuscan respondents — 24.2% response rate, 5.4% of national respondents

Despite its relatively limited weight at the national level, Tuscany accounts for approximately 47% of the companies mapped in Central Italy and around 46% of the survey respondents from the Central Italy area.

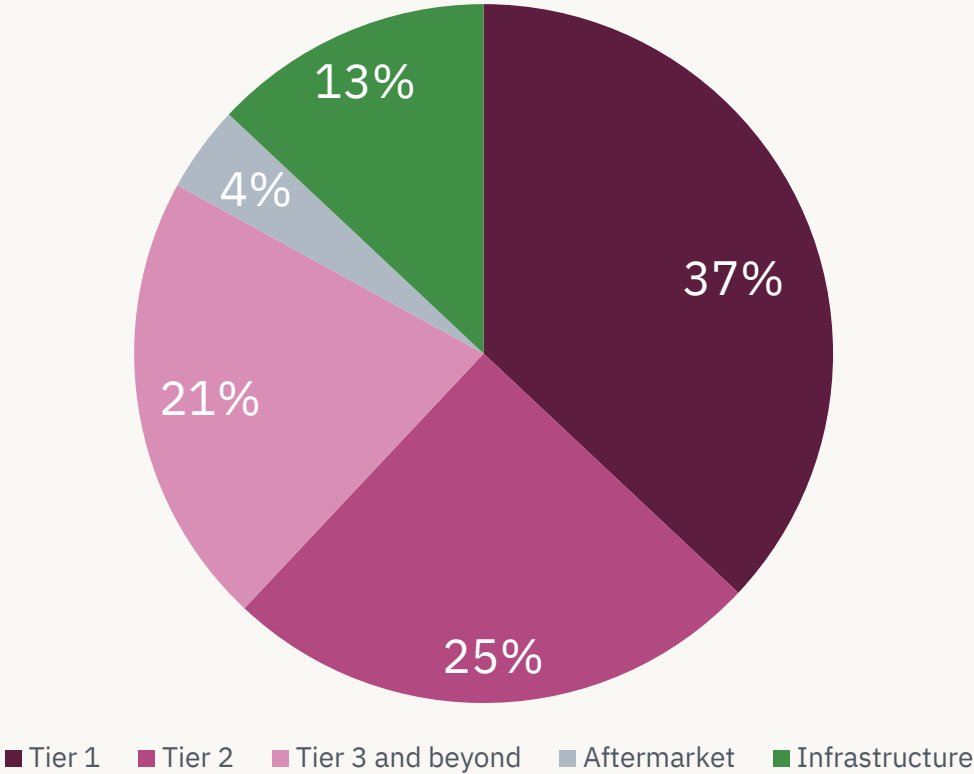
A synthetic profile of the extended Tuscan automotive supply chain (1)

Product distribution as a percentage of total actual revenues

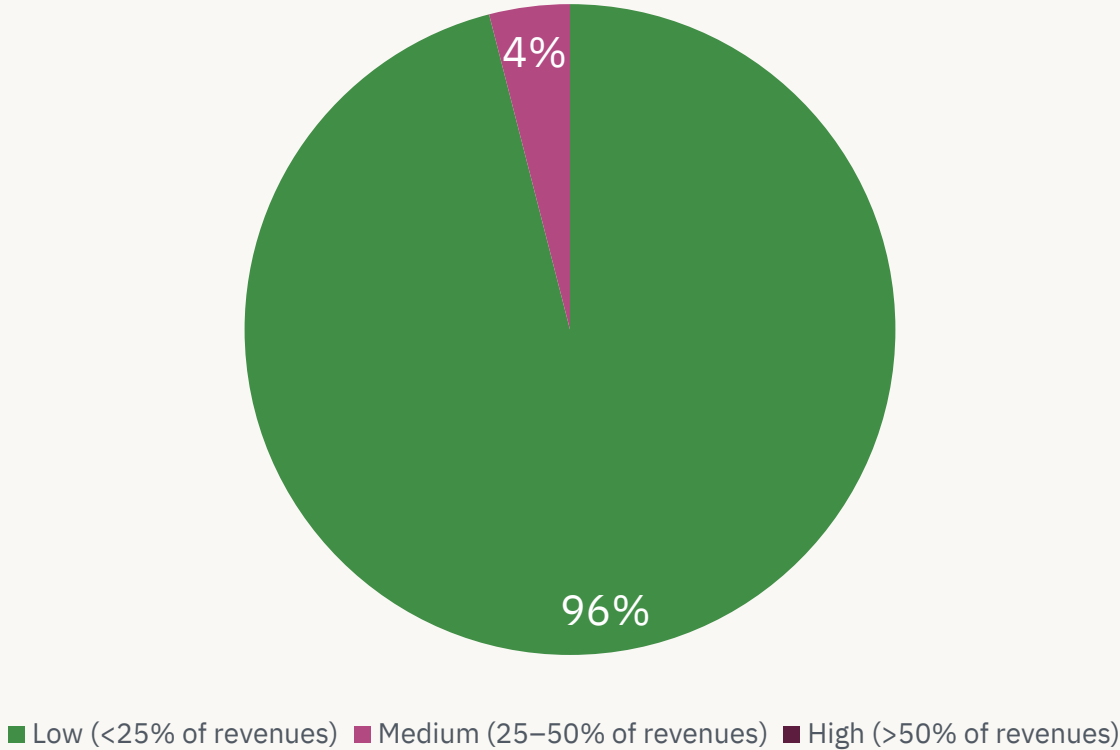
Product category	%
ICE components	40
EV components	33.7
Invariant components	24.3
Engineering & design	0.9
Software	1.1
Total	100

A synthetic profile of the extended Tuscan automotive supply chain (2)

Positioning in the extended automotive supply chain



Degree of dependence on Stellantis (%)



Expected evolution of revenues and employment over the next three years

Evolution over the next three years	Revenues (%)	Employment (%)
Will decrease by more than 20%	16.7	12.5
Will decrease by less than 20%	20.8	12.5
No significant change	45.8	62.5
Will increase by less than 20%	12.5	12.5
Will increase by more than 20%	4.2	0

Strategic trajectories: internationalization and production diversification

Production plants abroad	%
No production plants abroad	92
Presence of production plants abroad	8
No opening of production plants abroad (last and next three years)	88
Opening of production plants abroad (last and next three years)	12

Production diversification path	%
No, it has neither implemented nor started it	42
No, but it intends to start it over the next three years	16
Yes, it has started it	42

Planning tools

Planning tools	Score (1–5)
Competitive context analysis (benchmarking, SWOT/PEST, etc.)	2.21
Target market analysis (market research, CLV, etc.)	2.29
Economic sustainability analysis (forecasts, cash flow, target costing, etc.)	3.00
Strategy implementation (budgeting, balanced scorecard, performance management, etc.)	2.58
Environmental impact assessment/management (LCA, carbon accounting, eco-design, etc.)	1.88

Product innovation (1)

54% of companies have developed or will develop new components and services over the past or next three-year period

Investment distribution for new product development	%
ICE components	17.7
EV components	15.4
Invariant components	39.2
Engineering & Design	18.5
Software	9.2

Product innovation (2)

Impact of EV vehicles on the current product portfolio	%
No impact — all components/services can be used for zero-tailpipe-emission vehicles	8.3
Less than 25% of components/services currently in the portfolio will become obsolete	8.3
Less than 50% of components/services currently in the portfolio will become obsolete	12.5
More than 50% of components/services currently in the portfolio will become obsolete	16.7
All components/services currently in the portfolio will become obsolete	54.2



Process innovation

62.5% of companies started developing new processes in the past three years or expect to do so in the next three years

Reasons for investing in production processes	Score (1–5)
Increase in efficiency/productivity	4.5
Product quality	3.9
Process quality (e.g. waste reduction)	3.8
Increase in production capacity	3.7
Increase in production process automation	3.5
Acquisition of new customers	3.5
Achievement of new certifications	3.4
Process adaptation following new product development	3.2
Customer request	3.1
Reduction of labor	2.7
Access to public funding	2.4

AI supporting product and process innovation?

Around 70% of Tuscan companies state that artificial intelligence has not yet affected competitiveness; only 30% report a positive effect.

Use of artificial intelligence	Score (1–5)
Data analysis and support for managerial decisions	1.9
Human resources management	1.6
Sales and marketing activities	2.0
Supply chain management and procurement	1.6
Optimization of production processes	2.3
Design and development of new products/services	2.3

Human resources: profile needs

Profiles	Present in company (%)	Hiring intention (%)
Mechatronics engineers	33.3	33.3
Software analysts and designers	25	33.3
Software systems designers	25	29.2
Programming technicians	20.8	41.7
Industrial software designers	20.8	33.3
Electronic engineers	16.7	29.2
Software application specialists	16.7	25
Electrical engineers	4.2	8.3
Telecommunications engineers	4.2	12.5
Energy engineers	0	16.7

CONCLUSIONS

Preliminary conclusions

Key points

Resilience depends on:

- Position in the supply chain
- Specialization
- Capital intensity
- Targeted investments
- Support for scale-up and diversification

Thank you for your attention!

Riccardo Giannetti · Edoardo Alberti — University of Pisa, Irpet