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research and innovation capital

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### **Business size, numbers, production value and productivity trends in manufacture and mining-quarrying across the EU, 2008-2017**

Dimitrios  
Papathanasiou,  
Athanasia Zovoili  
(Open U. Cyprus),  
Prodromos Prodromidis  
(KEPE)

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# The objective of the article

is to empirically estimate and contrast the  
long-run trends of four business  
development and performance measures

number of  
companies,  $N$ ,



the average business size in  
terms of persons employed,  
 $L/N$ ,



labor productivity,  
 $Q/L$

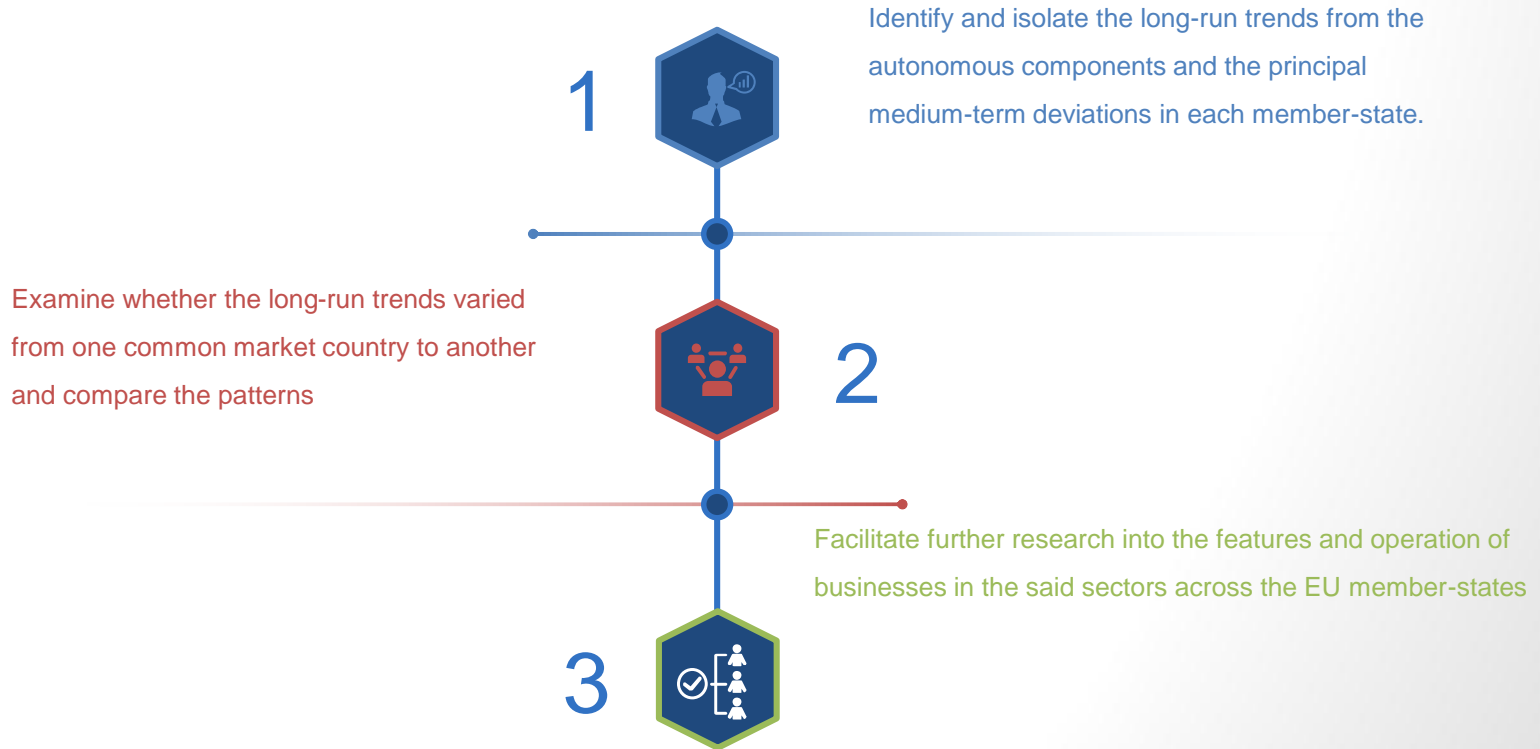


production value,  
 $P$



observed annually across the EU in the manufacturing and mining-quarrying sectors during 2008 -  
2017

# Both separately and collectively these measures sketch crucial aspects of the sectoral structure and business performance



## The activities

included in each sector are defined in a uniform manner across the EU (Eurostat, 2008).



employed hereinafter were collected annually in the context of EU Council Regulation 58/97 (Eurostat, 2015), downloaded by the authors from the Eurostat site in the summer of 2019

## The data

Since the data are regularly updated and, consequently, change, in the following pages the conclusions are formulated based on the frequency of the findings rather than on individual findings



We looked at the trends (as opposed to incidental or mid-term deviations) of  $P$ ,  $N$ ,  $L/N$ , and  $Q/L$  across the EU member-states, keeping in mind that the producers operated in a common market and the same legal, competition, funding and export framework.

As we are interested in the cross-sectional (country-level) aspect, and as the time-series (especially, in the early years) were not always complete, we turn to a pooled—rather than a panel—type of data analysis

# Methodological Approach

The patterns of each measure are econometrically analyzed via Stata on the basis of a close variant of the well-established functional form described by :

Smith and Duncan (1944)  
Fox (1968), Franzini and Harvey (1983),  
Black (1992), Cameron (2005), Lee et al. (2019) and others

$$y_{tc} = \beta_{0c} + \beta_{1c} t_i + \beta_{2c} t_i^2 + \sum_{i=0}^3 \beta_{3ic} m_{itc},$$

→  $y$  : stands for the regressand, i.e., for each of the four measures considered in each sector. Each equation is regressed separately, i.e., not as a system, and each regression involves annual data from the EU-28

→  $t$ : stands for time ( $t = 1, \dots, 10$ ) and enters the expression both as an index and as the long-run trend variable in each member-state

→  $c$ : stands for the number of member-states

→  $m$  is in binary form, stands for an exceptionally high medium-term deviation or fluctuation from the trend observed in a member-state

→ The  $i$ 's denote the number of these medium-term deviations in a member-state ( $i \in [0,3]$  in the sense that in the end, the maximum number of such fluctuations in any one state is three; however, in most states it is equal to zero).

→  $\beta$ 's stand for the regressors' coefficients

The results are provided in Tables and finally gathered in the table presented next. The regressions' high goodness-of-fitness (the  $R^2$ s range from 97.4 to 99.8) cannot be overlooked.

**Table 11:** An overview of the trends of the four business measures observed in manufacture and mining-quarrying across the EU, 2008-17

	p	Manufacturing			p	Mining-quarrying		
		N	L/N	Q/L		N	L/N	Q/L
AT	/	V	/	/	Λ	Λ	V	Λ
BE	-	\	/	/	Λ	Λ	/	Λ
BG	/	\	\	/	/	Λ	V	/
CY	V	/	/	V	-	\	V	/
CZ	/	/	\	/	\	V	Λ	/
DE	/	Λ	V	/	\	Λ	\	/
DK	/	V	/	/	\	V	Λ	V
EE	+	/	\	/	/	Λ	V	/
ES	V	\	\	/	V	\	V	/
FI	\	\	/	/	-	V	Λ	/
FR	/	Λ	Λ	Λ	\	\	Λ	Λ
GR	\	\	/	Λ	-	/	Λ	/
HR	V	\	/	V	Λ	-	Λ	Λ
HU	/	V	/	/	-	\	V	/
IE	/	V	/	/	V	/	V	/
IT	-	\	Λ	/	\	\	Λ	Λ
LT	+	/	/	Λ	-	/	V	/
LU	V	\	V	/	-	Λ	\	/
LV	+	/	\	/	-	Λ	V	/
MT	-	\	V	/	-	V	/	V
NL	/	/	\	/	Λ	/	Λ	Λ
PL	/	V	/	/	-	/	\	/
PT	/	V	/	/	-	V	/	/
RO	/	V	/	/	\	\	\	Λ
SE	-	/	/	/	/	Λ	/	/
SI	+	/	\	/	-	\	V	/
SK	/	/	V	/	-	/	\	/
UK	/	V	/	/	\	/	Λ	\

**Key for symbols**

Results associated with  $p\text{-value} \leq 10\%$

Upward trend: /  
Downward trend: \  
Peak followed by recession: Λ  
Trough followed by recovery: V

Results associated with  $p\text{-value} > 10\%$

Upward trend: +  
Downward trend: -

**Source:** Tables 3-10.



Firm size ( $L/N$ ) moved in the same direction as both its numerator,  $L$ , and its denominator,  $N$ .



Productivity ( $Q/L$ ) moved in the same direction as its denominator,  $L$ ; and so did profitability ( $P$ )



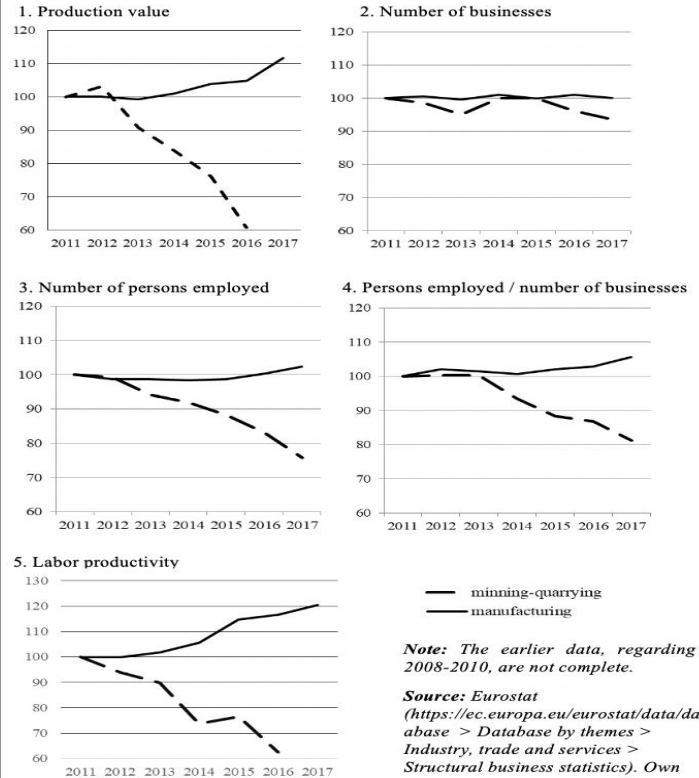
The movement of  $N$  and  $L$  in the same direction is consistent with the argument that

- (a) A rise (drop) in  $N$  and, seemingly, in competition, affects the production of more (less)  $Q$ , thus requiring more (less) staff,  $L$ .
- (b) The presence in the industry of a larger (smaller) workforce of self-employed, and of employees who learn or have learned the business, and others, affects the formation of more (less) businesses in the said industry (e.g., Begg et al., 2008).

However, the other measures could have moved in different directions. Indeed, as we shall see, in most EU member-states the said trends by and large differed from one another, with one exception: the  $Q/L$  trend in manufacture.

For instance, if  $L/N$  and  $Q/L$  were largely influenced by  $L$ . On the other hand, the movement of  $L/N$  and  $Q/L$  in the same direction: (a) may be attributed to the movements of  $Q$  and  $N$ , (b) recalls the findings of Bento and Restuccia (2017) about business size and GDP per capita, (c) is consistent with rising (falling) labor productivity driving business expansion (contraction), and/or with the relative ability (inability) of larger (smaller) businesses to acquire factors that allow their workforce to be more productive.

**Graphs 1-5: Business developments in the manufacturing and mining-quarrying sectors at the EU-28 level, 2011-17 (2011=100%)**



# Conclusions



The article empirically finds that :

23 (82%) of the member-states exhibited an upward labor productivity trend in manufacture; and over 17 (60%) of the member-states (not necessarily the same member-states) exhibited:



mining-quarrying

an upward labor productivity trend



a downward production value trend



manufacture

an upward production value trend



production value and productivity trends that were similar to each other (either upward or V-shaped).

These suggest that while production value and productivity by and large seemed to go hand-in-hand in manufacture, the same was not as widespread in mining-quarrying. In addition, if it is true that an economy's ability to improve its standard of living over time depends on its ability to raise its output per worker (Krugman, 1994), then the upward labor productivity trends exhibited by the majority of the EU member-states in both sectors provides :

- (a) an encouraging sign for the EU's broad economic social policy objectives, as well as
- (b) useful paradigms for the other member-states.

# Conclusions



The long-run patterns of the other business measures considered, namely the trends regarding business sizes and numbers in manufacture and mining-quarrying

were more diverse and evenly split across the EU.

Accordingly, very few countries exhibited :



## manufacture

both upward business number and business size trends



both downward business number and business size trends



## mining-quarrying

both downward business number and business size trends (even though this was the pattern observed on the aggregate (EU) level)



no country exhibited both rising business number and size trends

Overall, the findings suggest the presence of considerable diversity in the trends and the mid-term deviations from one country to another (within sectors) and from one sector to the other (in the same country), as well as similarities. These are interesting for both business decisions and sectoral policy making. It is conceivable that the differences in all four measures are more pronounced at the subsectoral (activity) or subnational (regional) level; however, the production value and productivity figures are not available at the subnational level in Eurostat's dataset.

The switches in the trends and mid-term deviations from the trends, which are empirically pinpointed in time, sectors, and space, deserve a closer look. Their discovery facilitates:

Future research on the causes behind the said switches and deviations may help narrow down (from the multitude of events and announcements that occur over time) the likely causes: a change in the policy mix or in circumstances, some government announcement, and so on



The refinement of business, sectoral or territorial development policy, the repetition/replication of what affected the upward trends or mid-term deviations, and the avoidance in the same or other countries of what affected downward trends or mid-term deviations

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THANK YOU VERY MUCH!!!!!!

Dimitrios Papathanasiou, Athanasia Zovoili (Open U. Cyprus), Prodromos Prodromidis (KEPE)

