

## DOES MANUFACTURING STIR UP INNOVATION?

### In this Issue

- Because of its positive contribution to employment and economic growth, the EU has set a manufacturing target of 20% of GDP. This could also boost R&D, productivity and exporting.
- Our analyses do not find empirical evidence that a large manufacturing sector has a direct influence on exporting activity or productivity growth.
- We find a positive association between manufacturing and R&D investment. The EU manufacturing strategy could help reaching the 3% R&D intensity target.
- However, the link between manufacturing and R&D depends on the industrial structure of a country. Support to new high-tech sectors should be coupled with actions to encourage technological upgrade in existing ones.

### 1. Manufacturing for growth: the context

A large number of developed countries have experienced a decline in the relative share of their manufacturing sectors, which has occurred alongside a longer-term shift towards the service sectors (OECD, 2016). This rapid decline in manufacturing has been perceived by many as a source for concern.

It has been recently suggested that there are three main advantages of a large manufacturing sector: as a source of productivity growth; as an engine for R&D and innovation; and as a trigger for trade and internationalization (e.g. EPSC 2015).

With a view to stimulating manufacturing activity as a means of creating more and better jobs, and boosting competitiveness and growth, EU policymakers have put forward the target of 20% of value added coming from a country's manufacturing sector by 2020 (EC, 2014 and 2017).

### 2. Evidence from country data

A recent empirical study by the JRC (Coad and Vezzani, 2017) examined the three relationships suggested above, with a particular focus on the relationship between the share of manufacturing of an economy and its business R&D investments.

Figure 1 plots the relationship between the size of the manufacturing sector in 2001 and the growth of R&D investment by businesses (i.e. 2001-2013 change in Business Enterprise Research & Development, BERD). The figure shows a positive relationship, with countries as China, Korea, and Slovenia coupling particularly high shares of manufacturing with a

sustained R&D growth. Sweden and Iceland experienced a strong decline in BERD. Countries above the red line experienced a disproportionate increase in BERD given their manufacturing intensity. The positive association between the initial importance of the manufacturing sector and subsequent changes in BERD is statistically significant; although there is much variation around the red line of best fit in the figure (which explains 16% of the total variance).

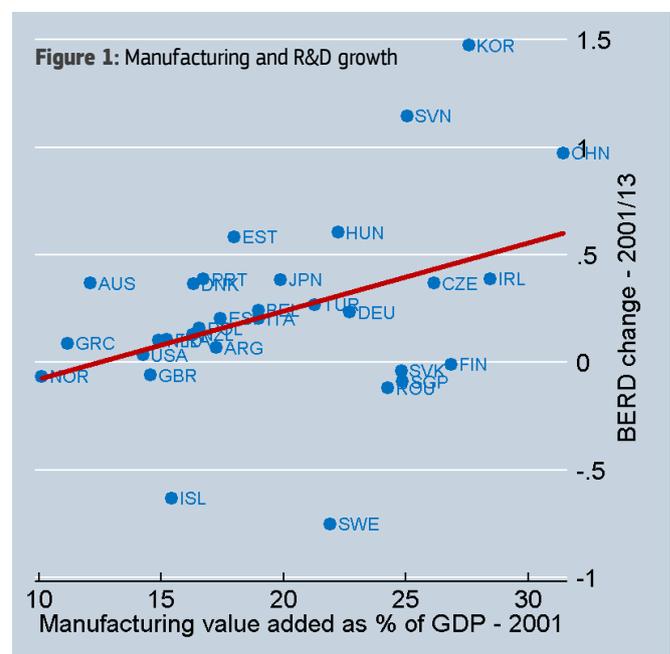
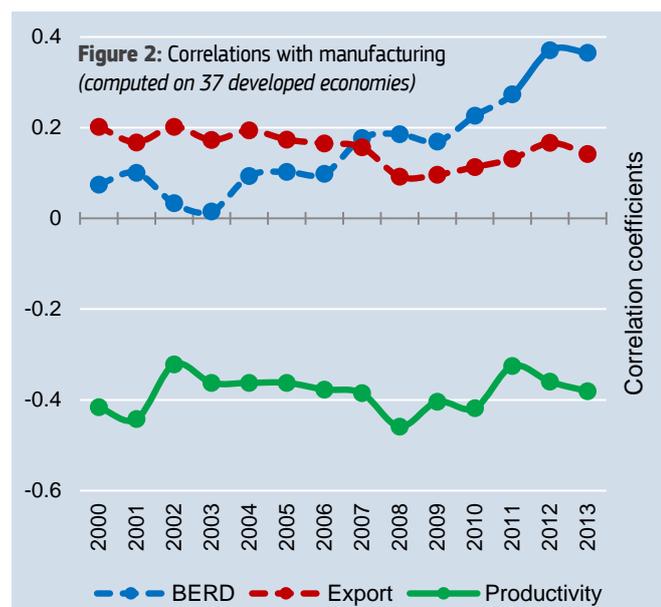


Figure 2 shows the evolution of simple correlation coefficients between the manufacturing shares and the three outcomes: BERD, export intensity and productivity. The figure shows a negative relationship between manufacturing and productivity, this can be due to the fact that the calculation of productivity

includes physical capital investments, but not intangible investments (e.g. R&D, software or training), thus penalizing manufacturing-intensive countries. Exporting intensity is not significantly associated with manufacturing intensity, and this result is confirmed also in our regression analysis. Interestingly, while it was not possible to observe the relationship between manufacturing and BERD over most of the period, this has become positive in the most recent years.



Further analyses (dynamic panel regressions) confirm the positive relationship between manufacturing intensity and BERD. However, we do not find empirical evidence that a large manufacturing sector has a direct influence on exporting activity or productivity growth.

### 3. Regrets about deindustrialization?

There are a number of reasons why the decline of manufacturing may have gone too far. There are fears that excessive outsourcing and offshoring, in the context of global value chains (GVCs), has threatened the economic security of countries because of the loss of local strategic capabilities (Pisano and Shih, 2012; Berger, 2013).

Capabilities accumulated through the operation of manufacturing processes can be a source of ‘absorptive capacity’ to better absorb and integrate new knowledge and ideas and exploit emerging technological opportunities related to new products and processes. Pisano and Shih (2009) introduced the notion of ‘industrial commons’ to refer to the complex web of collective R&D, engineering and

manufacturing capabilities that are needed to sustain innovation. The availability of local suppliers and technical skills is seen as a positive externality that facilitates the development of innovative solutions to manufacturing challenges, thus spurring on further innovation, in manufacturing sectors characterized by strong knowledge cumulativeness.

Deindustrialization is not as simple as a relocation of low-skill jobs abroad, because of the interactions between manufacturing processes, on the one hand, and innovation and design functions, on the other. If multinational firms can only afford to have one large manufacturing facility (Fuchs, 2014), then the establishment of manufacturing facilities in low-wage countries will lead to the offshoring of higher-skill tasks (related to innovation, design and engineering) in addition to lower-skill manufacturing tasks. Repeated interactions between manufacturing processes and engineering units facilitate productivity improvements and process innovations.

### 4. Research & policy implications

European policy makers have put forward a 20% manufacturing share target as a means to improve the EU’s economic performance. However, there is a lack of longitudinal evidence on the performance of countries with different-sized manufacturing sectors, especially when performance is measured in terms of innovative activity, exporting activity and productivity growth. The results presented here suggest that a manufacturing target is compatible with efforts to boost R&D investment. Empirical analyses highlight a positive relationship between manufacturing share and BERD. Yet, no robust relationship between manufacturing and productivity growth or exporting emerges.

A modern manufacturing sector still play a role for innovation-led growth in developed economies, even if its importance may have decreased in recent decades (Szirmai, 2012). However, this role seems to depend on the specific industrial structure of a country (Moncada-Paternò-Castello, 2016). This suggests that while policymakers should focus on new high-tech sectors, large competitiveness gains may derive from the technological upgrade of existing sectors. In this respect, upgrading the industrial base for the digital age, investing in the industry of the future, and supporting industrial innovation on the ground (EC, 2017) represent the most promising avenues to (re)boost EU competitiveness and create new and better jobs.

## Annex - Data sources and methodology

The empirical application is based on a country level panel dataset built combining three different data sources. Indeed, no single data source contains the required data for (at least) the most advanced economies. The main variable of interest, manufacturing value added as a share of GDP is taken from World Bank indicators (<http://data.worldbank.org/indicator>). Business R&D expenditures as a share of GDP are taken from the OECD's Main Science and Technology Indicators (<http://stats.oecd.org/>). Finally, productivity is measured through total factor productivity (TFP) as reported in the Penn World tables (PWT) version 8.0 (Feenstra et al., 2015) and computed using output-side real GDP at constant prices, capital stock, labour input data and the share of labour income of employees and self-employed workers in GDP. More details on the data and analysis can be found in Coad and Vezzani (2017).

## Disclaimer

The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

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