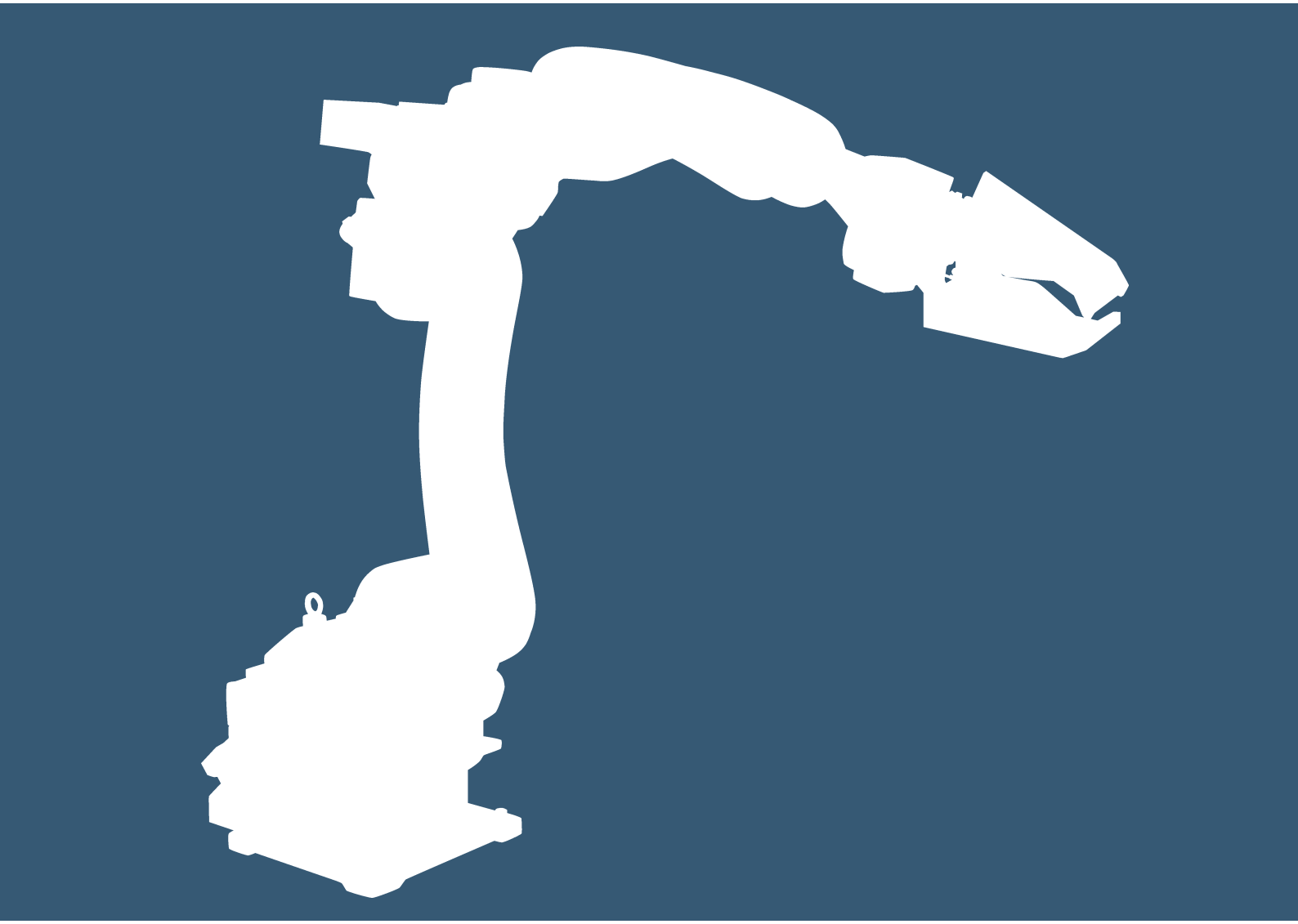
THINK ACT

POINT OF VIEW



INDUSTRY 4.0

Manufacturing in Belgium should embrace digital technologies to step up competitiveness and create differentiated products

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Deindustrialization is a worldwide trend with significant impact on our future wealth and society. While some countries focus on cost leadership to counter it, a differentiation strategy is more attractive for Belgium. Industry 4.0 technologies could enable the manufacturing sector to create this sustainable competitive edge, but we have to act now.

The phenomenon is not new: services take an increasing part in the world economy to the detriment of manufacturing[1]. The speed at which this is happening is astounding: since the 1970s, manufacturing as share of world GDP decreased by over one-third.

At the same time, manufacturing is shifting away from developed countries towards Asia, representing 31% of global manufacturing added value, up from 8% in 1991. Western-Europe is hit hard, with a decrease in share of manufacturing added value from 36% to 25% in 2011. The US managed to keep their share of manufacturing more or less stable (22% compared to 24% in 1991).

In Belgium, the situation is alarming: industrial added value decreased by about one quarter between 2001 and 2011, in an overall growing economy. Manufacturing employment decreased by 16% over the same period. Of course, a small part of this decline is explained by the outsourcing trend, i.e. jobs that were previously part of manufacturing (e.g. maintenance, logistics, IT, cleaning, etc.) become part of "services" when outsourced.

Manufacturing is a key driver of the economy

Although deindustrialization has hit Western-European countries hard over the past decades, manufacturing still generates over EUR 1,500 bn added value and over 23 m much-needed direct jobs. The emergence of new services, able to generate as much wealth and fill in these jobs, would require a significant amount of time. A switch to a services-only economy is therefore not a viable option.
Deindustrialization could potentially polarize the society. Indeed, the manufacturing sector generates a high number of middle income jobs. These include factory and machine laborers, skilled crafts and white collar jobs. Employment in the service sector tends to diverge to either low income or high income jobs, with not much in between. On the bottom end of the pay-spectrum we find restaurant waiters, security agents and cleaning personnel, while on the top end there are computer programmers, doctors, lawyers and bankers. This is illustrated by the high correlation between deindustrialization and the loss of middle income jobs. Middle income employment is the only job category that declined in Flanders between 2001 and 2012, a phenomenon often dubbed "the decline of the middle class". By counting on the service sector only, this trend will reinforce and could polarize our society. A

Industrial activity remains a key driver in an economy, also for the service sector. Many services are not stand-alone, but support the Industry. Logistics, storage and R&D are primarily consumed by the Industry. Other services such as banking and insurance, maintenance and advertising are at least partly driven by Industrial activity. Only a small share of services like food services, arts, media, health care are mainly driven by private and public spending. In this perspective, only 26% of total

1 In this study, manufacturing is the industrial sector excluding mining, energy and construction

Belgian added value is not linked to Industry (services in majority not consumed by Industry and Agriculture).

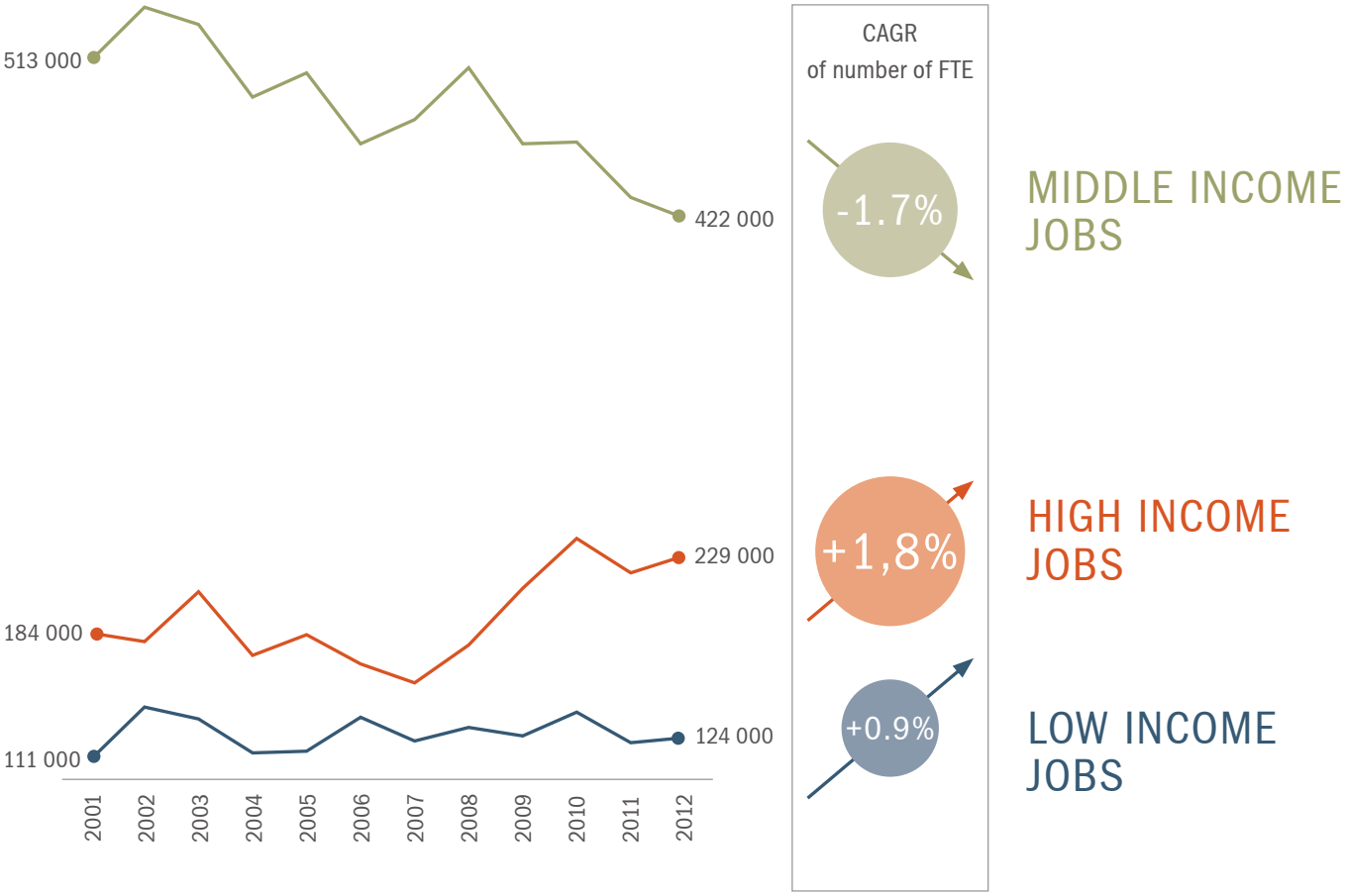
Therefore, Industrial development has a multiplying growth effect on the European economy as it generates technological innovation, trade surplus and it creates both industry and services jobs. In Europe, 65% of total research and development investment is performed in industry, which generates high quality service jobs. All in all, besides the income generated directly by manufacturing, various studies conclude that the creation of each manufacturing job generates about 1.4 local additional jobs in other sectors.

From a strategic point of view, it would be dangerous to relinquish manufacturing entirely to other regions. With the decline in production activity, competencies that are difficult to rebuild will be lost. Belgium, and by extension the whole of Europe, will be dependent on other countries to deliver key products. Deindustrialization poses a significant geopolitical threat if Europe is dependent on other countries to manufacture its products, just as its current dependency on Russian natural gas poses a threat for its energy security.

Without a strong and serious initiative towards reindustrialization, we risk being pulled into a vicious circle that would eradicate manufacturing our countries. Indeed, the loss of competitiveness in manufacturing has triggered its deindustrialization and loss of production volumes. The lower volumes result in a lower return on investment for new investments, thus reducing the incentive for new investments. When investments in manufacturing production assets are lowered, they are less frequently replaced and upgraded. Over time, industrial assets become obsolete and competitiveness of manufacturing decreases further. The result is a vicious deindustrialization circle. Throughout the process, know-how and human capital is lost, increasing difficulty to reverse this cycle.

A

EVOLUTION OF NUMBER OF FTES PER INCOME LEVEL IN FLANDERS[1]



1 Source: Belgian federal government, Roland Berger analysis

The Resilient vs. the Distressed

Although deindustrialization is hitting hard, not all sectors are impacted equally. When comparing the evolution of added value and employment per sector in Belgium, three groups emerge: resilient, worrisome and distressed sectors.

First the good news: the resilient group has been able to maintain or even slightly grow their added value and employment over the past decade. This group includes Machinery, Food & Beverages, Pharma, Chemicals and Rubber & Plastic, but also the very diverse sector of furniture and jewelry. Additionally, sectors that are spurred by government policy and less sensitive to offshoring, such as Electricity & Gas, and Water & Waste, were highly resilient to deindustrialization.

The next group, the worrisome, has fared less well. Added value has decreased by about 4% per annum in Metals, Printing and Electrical equipment, which is directly translated in a significant job loss. These sectors are clearly fighting to remain competitive in Belgium.

Finally, the distressed group contains sectors struggling to keep their manufacturing activities in Belgium. Many of the companies in these sectors break the news with restructuring of activities or factory closures, which has a clear impact on their employment and added value generation. We note Textiles, Motor vehicles, Electronics and Petroleum. B

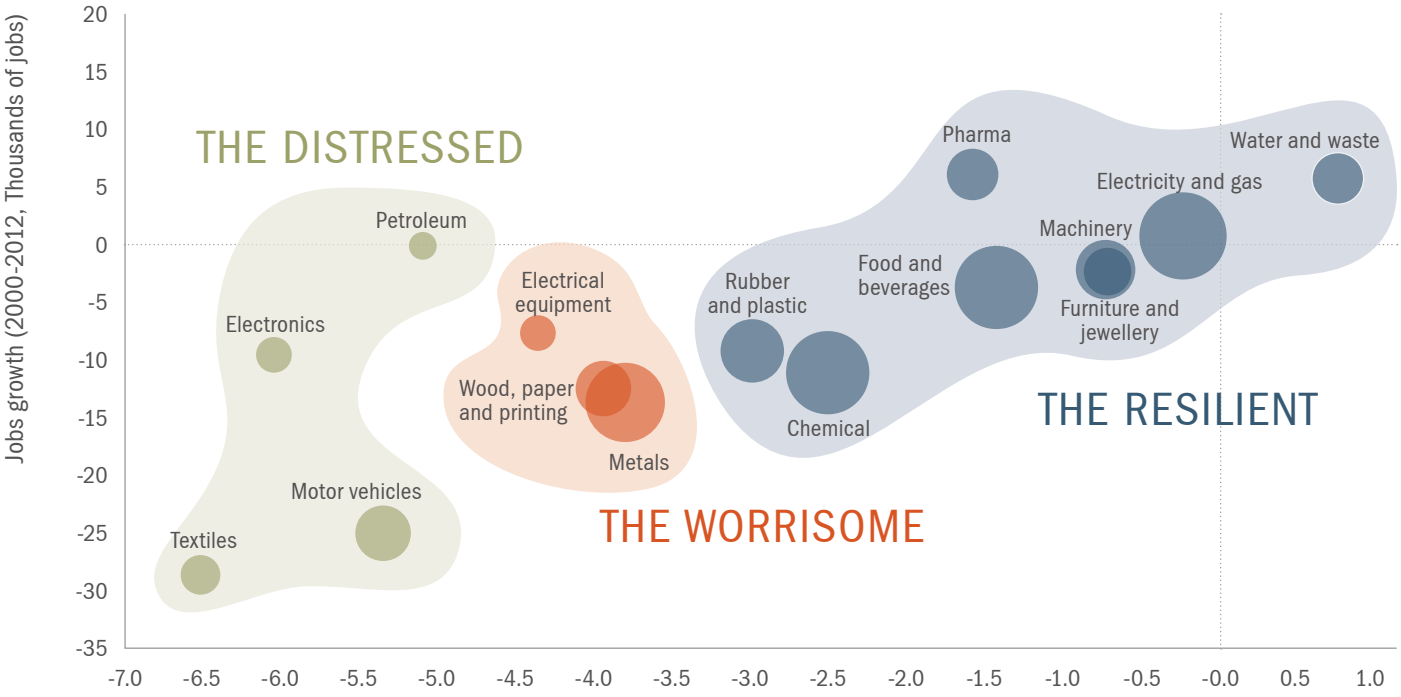
Facing the competition

So, should we be fatalistic in Western-Europe and accept deindustrialization? Is there really nothing we can do to revert the trend?

We believe we can. Some countries have shown a remarkable resilience against deindustrialization. Five Western-European countries have shown to be resilient and succeeded in increasing manufacturing activity. In Germany, growth in the manufacturing sector is strong, resulting in a reindustrialization. In Austria, Sweden, Ireland and the Netherlands, the manufacturing sector is also growing, but it is outpaced by overall eco-

B

VALUE ADDED AND NUMBER OF JOBS GROWTH PER INDUSTRY IN BELGIUM BETWEEN 2000 AND 2012[1]



1 Source: Eurostat, Roland Berger Analysis. Bubble size indicates industry size, measured as share in economy-wide gross value added (2012)
2 CAGR of share of the industry in the overall gross value added

nomic growth, still resulting in a decline of its relative share.

So what explains these performance differences? In general, the competitiveness of a company, a sector, or even a country can be explained by a cost advantage, a favorable business context or a differentiating capability.

Our research has shown that the Netherlands and Ireland benefit primarily from their cost advantage to attract and keep manufacturing activity. Sure enough, these countries have among the lowest productivity adjusted labor cost and the lowest statutory corporate tax rate. Belgium has some trump cards in the form of low gas prices for industrial clients, but cannot compete with the best on taxes or labor costs.

Scoring high on ease of doing business is, while important to nurture the existing industrial base and to attract foreign investments, not sufficient to spur a healthy manufacturing sector. The reality check confirms that all resilient countries score high on ease of doing business. The United Kingdom, and to a lesser extent Belgium, illustrate that this is more an enabler than a differentiator: although the country is consistently ranked high for ease of doing business, its manufacturing sector fares no better than Belgium's.

The other resilient countries Germany, Austria and Sweden focus more on their differentiation capabilities to drive their manufacturing competitiveness. They invest more in innovation per capita than their peers while focusing R&D spend on manufacturing activities. Moreover, they are R&D effective both in their machinery sector and in manufacturing as a whole. In Germany, Austria and Sweden, over 200 patents are filed in the manufacturing sector per million inhabitants. Belgium reaches only 130 a year. In machinery, Germany files three times as many patents per inhabitant as Belgium. These countries have also clearly focused on the digital revolution to further differentiate their offering.

When looking at the impact of the different strategies on the economy, it becomes clear that a differentiation strategy is the most attractive one.

For European countries, the evolution of manufacturing added value and employment has evolved differently in the last business cycle, between 2001 and 2013, depending on their focus. We can distinguish two main strategies: C

COST LEADER STRATEGY

Focus on lowering production factor costs and increasing productivity. These countries gradually increase their competitiveness (fiscal advantages, labor flexibility…), which leads to a stable or even modestly growing manufacturing sector, but at the cost of reducing employment.

DIFFERENTIATION STRATEGY

Witness a much smaller decrease in employment as they invest more in their manufacturing tooling to differentiate their products and gain market share. Poland invested in its manufacturing tooling and benefitted from integration of its plants with Germany (German nearshoring strategy) to support export growth over the past few years. These countries succeed in growing their manufacturing sector, while keeping constant or even growing employment.

Countries without a clear focus on either cost or differentiation (or both) see a continuous decline in both employment and added value. Although it is important to keep factor costs under control to regain competitiveness, it is not reasonable to believe Belgium will succeed in becoming a cost leader. Hence, it should focus efforts on a differentiation strategy.

Industry 4.0

The question remains how these countries have increased their manufacturing competitiveness. Germany and Austria in particular are driven by digital manufacturing technology, a set of technologies for which the term "Industry 4.0" has been coined. After the three previous industrial revolutions, we are on the verge of a new wave of manufacturing technologies. Physical objects are being seamlessly integrated into the information network. The Internet is combining with intelligent machines, production systems and processes to form an interconnected ecosystem. New manufacturing technologies allow for nearly unlimited customization. They will allow European industry to improve its competitive positioning compared to other countries, by increasing productivity and/or by creating superior products.

We have identified eight functional concepts that characterize Industry 4.0. Each of these is a clear evolution from the functional characteristics of the third industrial revolution, the automation boom which started in the 1960's.

SMART RESOURCE MANAGEMENT will be enabled by real-time resource demand measurement and management in conjunction with supply of energy, raw materials, utilities, etc. Currently, even best-in-class companies measure and optimize their resources consumption only periodically. E.g. reducing production rate when demand for electricity on the grid is high

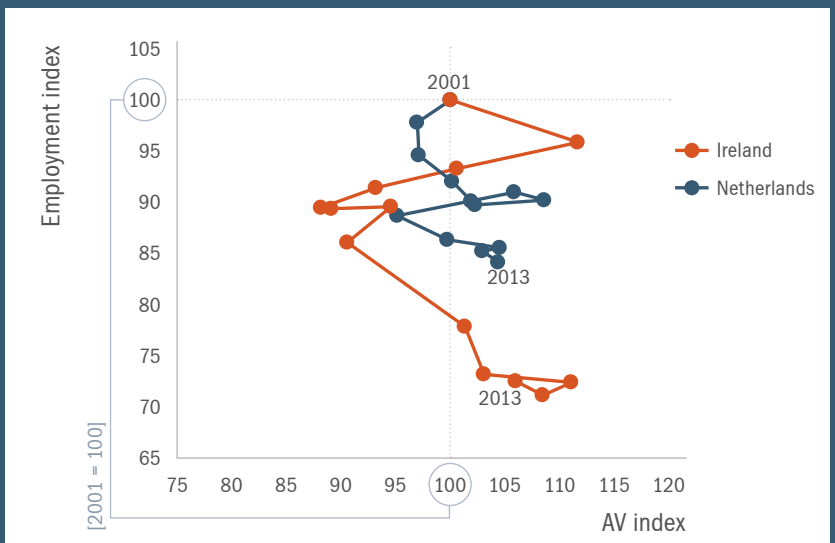
AUGMENTED OPERATORS are enabled by advanced human-machine interfaces that increase flexibility, productivity and quality for non-automatable operations. This is a step forward from the trained interaction of operators with machines today. E.g. the use of smart glasses in order picking

SELF-OPTIMIZING MACHINE NETWORKS are connected and intelligent machines and transportation vehicles that are able to improve performance autonomously. This is clearly different from the automation of individual production steps through a preprogramed sequence of operations, which is reviewed periodically. E.g. learning robots that self-optimize incision depth and length in a bakery

MANUFACTURING STRATEGY

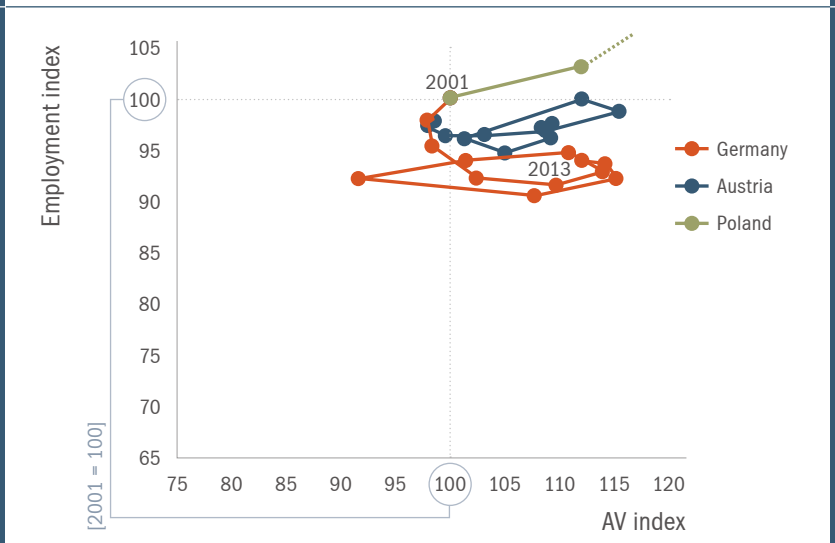
THE EUROPEAN PERSPECTIVE

Cost strategy



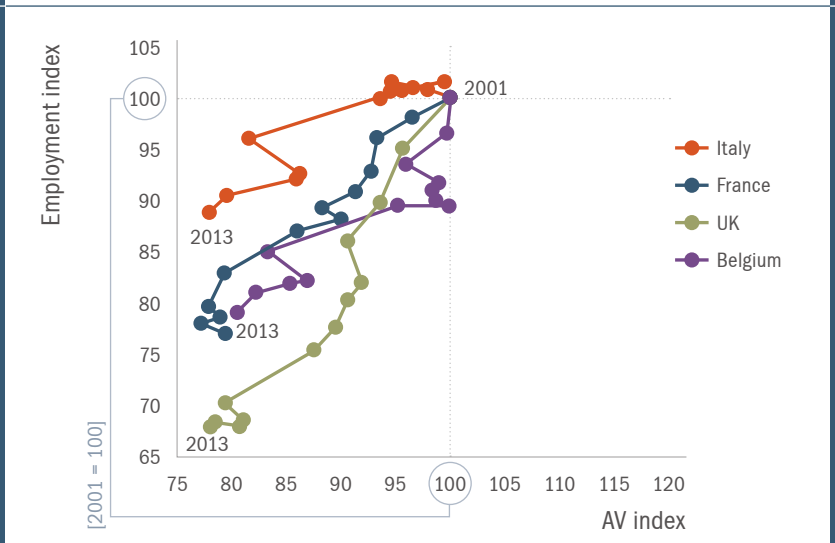
Improvement of competitiveness by a decrease of employment volumes and costs.

Differentiation strategy



Investments in the industrial tool.
Export increase.
Monitor of employment volume while increasing productivity.

Deindustrialization



Loss of competitivity (degradation of trade balance and decrease of volumes).
Decreasing adjustments of production factors (twork and investments) to maintain price competitiveness.

MASS-CUSTOMIZATION means that each individual product can be tailored to the requirements of the individual customer, without losing the efficiency of mass production. This is enabled by new production technologies such as additive manufacturing and multi-purpose machines. With the current production technologies, the choice between producing highly standardized products at low cost or tailor-made products at high cost often hast to be made. E.g. a producer of prescription lenses tailors its lenses to the individual needs of customers as measured by opticians

SMART PRODUCTS will create added value for the customer through incorporation of embedded communication, storage and analysis capabilities, e.g. reduced maintenance, breakdown diagnosis, location-based services, etc. Products will no longer be delivered "As-is", without auto diagnostics during life-time nor interactions with end customer. E.g. integration of sensors in mattresses to detect when elasticity is gone

Products will be monitored continuously through sensors and chips to ensure consistent quality and thereby reduce waste. Tracking and tracing of products will thus be at a much more granular level than the currently common batch tracking of products, which are tested mainly through sampling at only some points in the production process. E.g. using unique RFID tags to follow items through the production process

CONTINUOUS PRODUCTION steering will be possible based on internal data (e.g. plant, employees, inventories, etc.) and external data from interconnected partners (e.g. suppliers, clients, logistics companies, etc.). The availability of real-time data will increase the reactivity of the operations planning and steering and thus flexibility of production. The reactivity will be significantly higher than can currently be achieved through central steering, based on a limited set of distinct internal indicators (e.g. orders, inventory, forecasts, product quality, etc.), measured and translated periodically in planning. E.g. constant adjustment of production to minimize the time between harvesting and deep freezing of vegetables

VIRTUAL CONCEPTION will optimize at the same time the production processes and the product itself. Tools that integrate simulations of factory layout, material flows, operator ergonomic and resource consumption will reduce product development times, industrialization time and facilitate step-change improvement. This will allow faster and more global optimization of production in a relentlessly changing environment, compared to current one-shot improvement through distinct tools specialized per type of project as is for instance currently the case by using CAD for physical factory layout. E.g. use of virtual reality in product design and testing by car manufacturers

In our recent project experience, we have identified several Belgian companies that are already applying one or more of these principles, to greater or lesser extent in their operations. More importantly, these case examples were found in companies of different sizes, from large multinationals to founder-owned SMEs.

Several applications are very accessible, and potentially with a short payback time. Indeed, most of the technologies (like 3D printing) that are currently used in Industry 4.0 applications are already in use, but the internet allows to connect and integrate the entire manufacturing value chain.

Let's get started!

We believe Belgian companies in the manufacturing sector should embrace the new Industry 4.0 technologies to differentiate themselves from their competitors. All signs indicate that these advanced technologies of today will be the new normal of tomorrow. Better be well-prepared than get caught by surprise by their swift adoption.

Therefore, companies should start now by assessing their current status and readiness for Industry 4.0. To help them with this exercise, we have developed a simple self-test. This test measures the maturity of the company on each of the eight Industry 4.0 domains. Based on the results, they should identify which steps in their value chain can benefit from the application of Industry 4.0 technology. Benefits can be either increased differentiation or cost reductions, but of course the aim should be aligned with the strategic intent. Finally, its viability should be confirmed with a business case.

To conclude, only a differentiation strategy based on the new Industry 4.0 technologies will enable our Belgian manufacturing sector to create a sustainable competitive edge. But to succeed, they will need the full support of all policy makers, the social partners and research institutes.

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