

What role for manufacturing industries in the urban knowledge economy?

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Introduction

The share of manufacturing in urban economies has declined. But is this a problem? And will the decline continue? And how does manufacturing fit in the new 'knowledge economy'? This article discusses the new role of manufacturing industries in various types of cities. It is based on a comparative urban study¹ in 10 cities in Europe, Asia and Latin America.

Manufacturing is declining

In many countries, the share of manufacturing has declined drastically in the last decades –see figure 1-, and the share of services has grown. Many manufacturing plants have closed, downsized, or moved to lower-cost locations. Manufacturing is pushed out of cities because of space constraints, rising costs of land and real estate, and an increasing environmental awareness; at the same time it is pulled to other regions because of costs advantages, emerging market opportunities, availability of space, improved transportation possibilities, and attractive incentives. The ongoing process of globalisation seems to speed up the shift of manufacturing employment to lower-costs locations. "Routinized" activities tend to disappear more rapidly than complex manufacturing. And the process has not yet stopped; figure 2 shows some more recent data, which indicate that employment in manufacturing is still in decline. Meanwhile, our cities still full of industrial heritage. Over the last years, as we all know, much of it has been transformed into something else: offices, shopping centres, TV studio's or tourists attractions.

Is it a problem?

Is the decline of manufacturing employment a problem? Is the production of physical goods the ultimate basis, the pillar that supports our economies? Many people nowadays would say yes. And they are in good company: Adam Smith and also Karl Marx believed the same. For them, manufacturing was the driver of economic growth. They considered services as non-productive: in their view, people like traders, financial experts and office workers are parasites that ultimately depend on manufacturing. If they are right, we have a problem if manufacturing is going down....

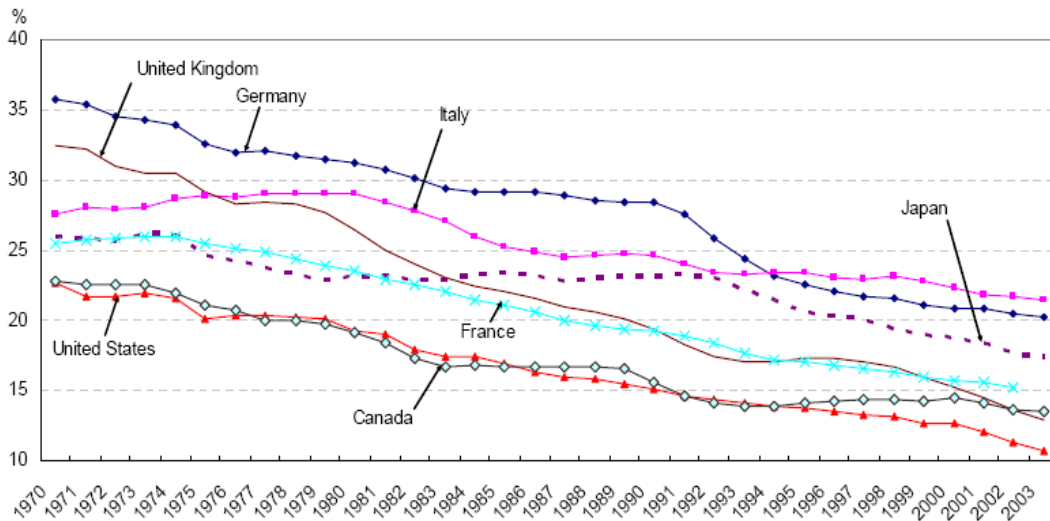
There is something more to say however. First of all, it is true that manufacturing employment has declined, but at the same time, output has grown dramatically. In other words, with fewer people, we produce more goods, thanks to technological and organizational innovations. One example in our study demonstrates how big the productivity gains are. In Paris, Renault still has a big car plant. The number of workers there dropped from 20,000 people in 1980 to 5,000 in 2006, but the number of cars produced at the site has grown, and the quality of the cars have improved a lot.

Second, we can see the relative decline of manufacturing as a natural tendency when a society gets richer. To put it simply, the more money people have, the more they spend on services like culture, travel, education, entertainment and

¹ Van Winden, W., L. van den Berg, L. Carvalho and E. van Tuijl, (2010), *Manufacturing in the New Urban Economy*, Routledge, London

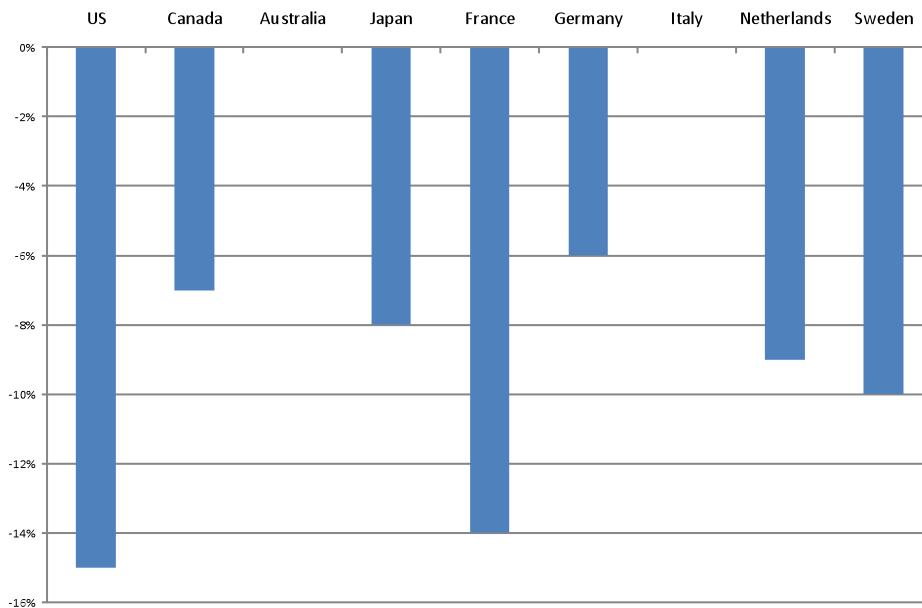
health. It is not only consumers who spend more on services: the same is true for the business sector.

Figure 1. Share of manufacturing in total employment, G7 countries, 1970-2003, in %



Source: OECD, 2006²

Figure 2 Employment growth in manufacturing industries, 2001-2008



Third, the manufacturing sector itself has become more service intensive. Industrial firms spend enormous amounts of money on marketing, research, finance, product development and co-ordination functions. And the products

² OECD (2006), The changing nature of manufacturing in OECD countries, OECD science, technology and industry Working Papers, 2006/9, OECD Publishing

they sell often include a big service component. For example, the high-tech company ASML from Eindhoven (NL) makes highly complex machines that produce chips for computers and smartphones. It sells its machines all over the world, but it does not only sell machines: with the machines comes a package of services for maintenance, upgrading etc. In Eindhoven, the company has a special centre in which it is monitoring in real time if all the machines work properly, and this centre is linked to its support centers worldwide.

The process of deindustrialisation can be seen as part of the shift towards a 'knowledge based economy'. In this new economy, countries or cities do not earn their money only by manufacturing real things, but rather by creating concepts and packages, or solutions for clients. In some cases, the concept or solution is fully virtual (like a software programme, or a business service), and sometimes it has a physical appearance (like a car, or a TV), but this is not a fundamental difference. The creation of 'abstractions' and concepts relies on knowledge, information and ideas. And indeed, most cities now rely on R&D, headquarter functions, business services, and information technology. Recently, we see the rise of the "creative industries" like design and fashion. Entrepreneurs create and sell concepts for which there is a market.

One may conclude that manufacturing has become irrelevant. And many policy makers act in this spirit: in their policy documents, you read a lot about how they want to develop promising new fancy growth sectors, and very little about manufacturing industries.

A comparative study in 10 cities

We started an international study to analyse the issue a bit more carefully. Our key aim was to understand the new role of 'old' manufacturing industries in the urban economy. We analysed 10 case cities, and divided them in 4 city types:

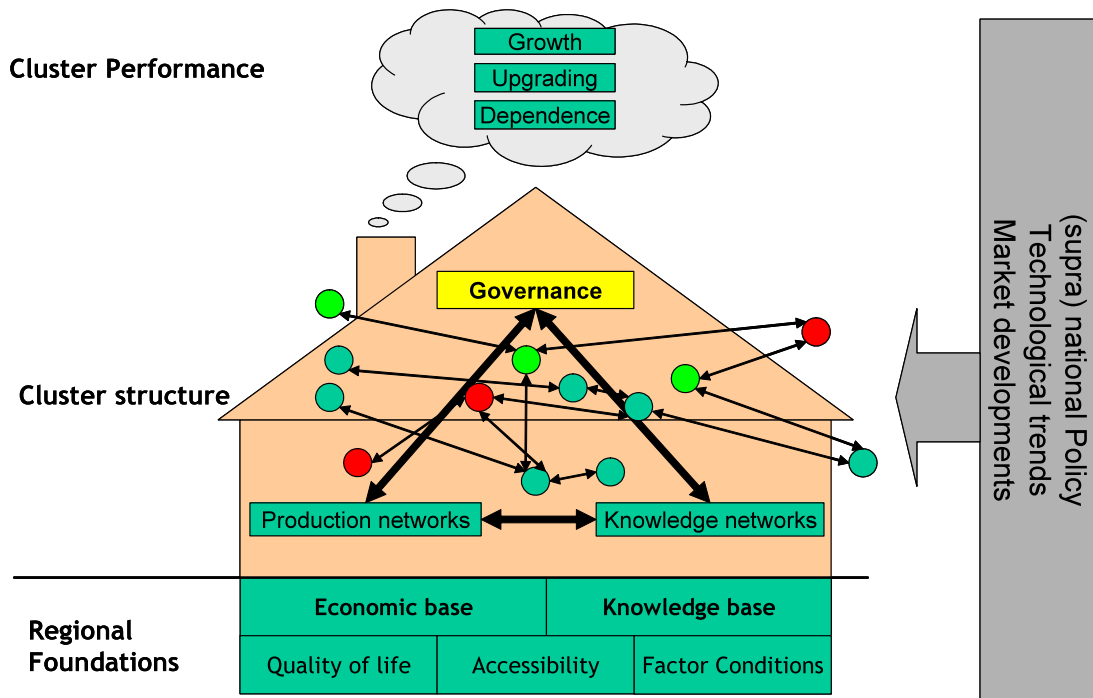
- Industrial cities in emerging economies (Ostrava, Shanghai, Sao Paulo)
- 'traditional' industrial cities (Porto, Dortmund, Rotterdam)
- Advanced diversified cities (Munich, Paris)
- Smaller industry cities (Eindhoven, Turku)

It is reasonable to assume that structural changes in global value chains have a different impact on different types of cities. In our study,, we systematically analysed whether this is the case. In each city, we focused on one industrial sector. We interviewed a number of company managers, and asked them a lot of questions, like: Where do you make your products, and why? Which suppliers do you use, and where are they located? How do you develop new products, and with whom do you co-operate? Do you have relationships with local universities? How is globalisation affecting your industry?

We also asked company managers to give their view on the city in which they are located: we asked questions like: can you find enough skilled people here? Do you work with the local universities? What are the costs of producing here? What about transport connections to other region? Can you find business partners locally? How is the general business climate here? Are you satisfied

with local policies? Of course we also looked at new investments. We asked companies where they invest, and why. By asking these questions, we got a better idea about the future of region as a location for manufacturing firms. Figure 3 depicts the frame of analysis that we used.

Figure 3 Frame of analysis



Does R&D follow manufacturing?

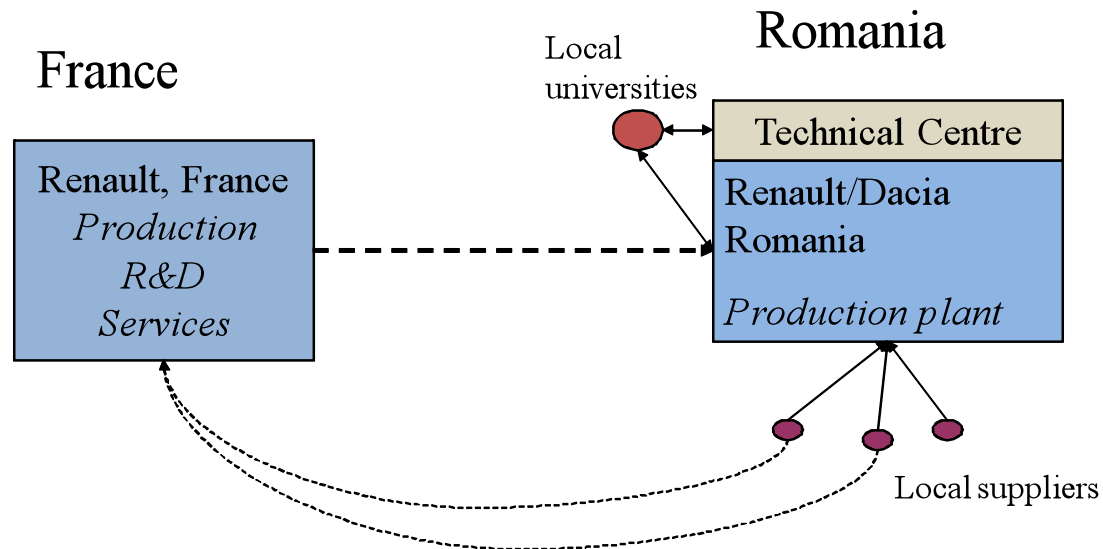
Our case study approach revealed an enormous diversity in business strategies, and big differences between cities and sectors. There are no straightforward, general patterns. But nevertheless, some conclusions can be drawn.

Let's first reflect on one of the key fears of policy makers: If firms open plants abroad, does R&D follow manufacturing? Will the urban knowledge base erode as well? Here is an example that shows how a manufacturing plant in Eastern Europe can evolve into a more knowledge intensive cluster.

Some 10 years ago, Renault opened a plant in Romania, to produce cheap cars for the Eastern European market under the Dacia brand. The company found out that it was very fruitful to work with local suppliers: they were relatively cheap, but their quality was not always good enough. Therefore, Renault started a special programme to educate local companies to meet basic quality standards. If successful, they could win contracts not only for the Romanian plant but also to deliver to the plants in France. This implies that French suppliers are losing business to Romanian ones. But Renault goes further: recently, it has invested in a technological centre in Pitesti that employs about 3000 people. The centre develops vehicles and powertrains for new growth markets. Also, it has set up links with the local university. So gradually, Renault's plant in Romania has

become important for development work, that perhaps otherwise would have been done in Paris.

Figure 4 Renault and Dacia



More in general, our study confirms that emerging urban regions in Eastern Europe and Asia are developing rapidly, also in terms of R&D competences. In China, the government actively promoted technology transfer by forcing companies like Bosch and Siemens to share technology with local partners. But also, many Western companies want to tap the growing pool of talented people there. Nokia, for example, had an active policy to open up branches in cities with technological universities.

What is the implication of this for cities in Western Europe? Our study does not indicate that this growth goes at the expense of R&D in the west: we observed no job losses in R&D in our Western European case cities. Rather, the total amount of research and development activity in the world is increasing, leading to an even higher pace of technological change, and an even more competitive business environment for industrial firms worldwide.

The broader picture

Now let's look at the broader picture. Figure 5 shows the development of manufacturing and R&D in our case cities. The vertical axis shows the share of manufacturing in the urban economy; The horizontal axis depicts the expenditures on research in each city. The arrow shows the change in five years time. In most of our case studies, the share of manufacturing in the economy has fallen. At the same time R&D spending has increased almost everywhere.

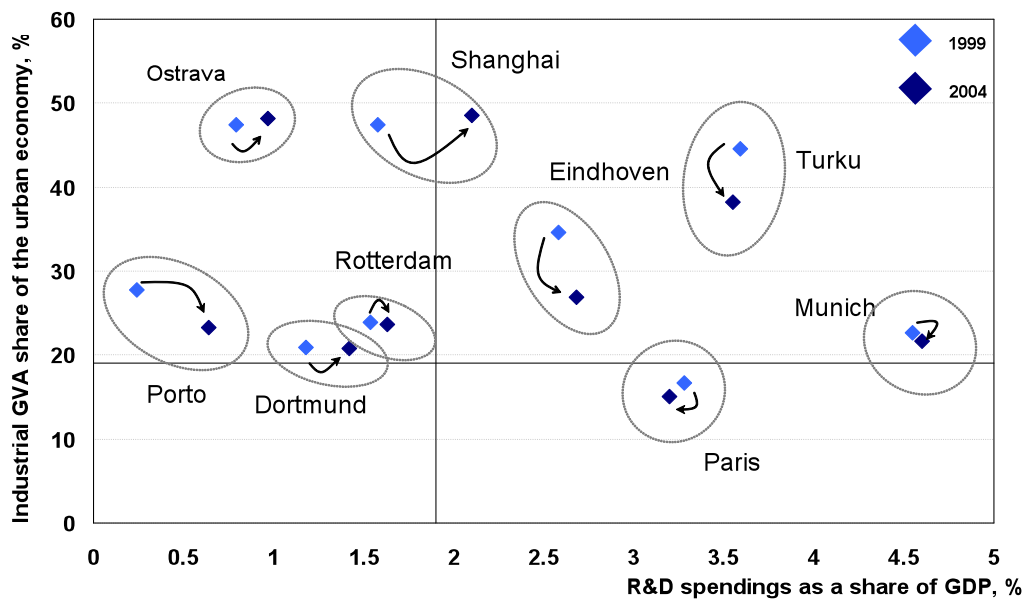
Some other remarkable things can be seen in this picture:

- The traditional industrial cities (Rotterdam, Dortmund, Ostrava) still spend relatively little on R&D, but they are catching up. In Rotterdam and Dortmund, the decline of manufacturing has slowed.

- The small industrial cities (Eindhoven and Turku), the drop of manufacturing has been very fast, but R&D is resilient
- Cities in emerging economies (Shanghai and Ostrava) have a high share of industry, and their R&D expenses are growing fast. Note that in Shanghai, the R&D intensity is already higher than the European average.

Now we turn to the more general question: What is the new role of manufacturing in the urban economy? There are significant differences between city types.

Figure 5 manufacturing and R&D in our case studies



For **industrial cities in emerging economies**, like Ostrava and greater Shanghai, manufacturing is a driver of regional growth, with strong impacts on other sectors. In Ostrava, the massive inflow of plants give a boost to the regional economy, and good staff has become a scarce commodity. Also, the service sector is growing fast: there is a boom in the construction of new hotels and apartments, and many business service companies locate in Ostrava in the slipstream of industrial firms. The same was true for Shanghai since the 1990s, but in the last years Shanghai is making a transition towards a knowledge- and service based economy, and manufacturing shifts eastwards to cheaper locations in China.

In the **traditional industrial cities** in Western Europe, we see a different pattern. Here, manufacturing is not the driver of growth, but it is still an important economic sector, with significant links to other sectors. In these cities, the transition towards a service economy continues but manufacturing is likely to remain resilient. Industrial activity in this type of city will probably focus on two main segments. The first one is the 'knowledge intensive' manufacturing of complex and specialised products, in small volumes, for global niche markets,

with an important services component. The classical example is machine building. This type of manufacturing depends on skilled engineers, and it is embedded in global networks of knowledge. In this segment, the physical 'production' can hardly be separated from R&D and services. These cities will also remain attractive for a second type of manufacturing: one for which access to consumer markets plays a role. Examples are food production, value added manufacturing, and some process industries. Cities with a favourable location (such as Rotterdam and Dortmund) have opportunities in this domain. This type of manufacturing is less knowledge-intensive and is often steered from far-away headquarters.

In '*advanced diversified cities*', like Munich and Paris, the remaining manufacturing activities are highly knowledge intensive, and this will remain the case. The main asset of these cities is their knowledge base: a highly skilled labour force and excellent knowledge institutes. These cities are the home of 'leader firms', that work at the edge of the technological frontier, and organise networks around them. They are 'decision centres' from which global production networks are controlled. In these urban regions, mass production –if it still exists- will be further hollowed out. Factories will be supplied from far-away regions, as we have seen in the case of Paris. But this tendency will not affect the strength of their knowledge base. They will remain attractive environments for small-scale, sophisticated production, and remain important 'competitors' for industrial cities. At the same time, these cities face more competition from emerging economies. Our study shows that urban regions in Central Europe and Asia are rapidly developing R&D competences on a strategic level. This may imply that these cities will have to specialise on a fewer number of core competences in which they are really world class.

Cities in this category are also the places where new types of small-scale manufacturing activities are emerging, related to the presence of creative industries. An example from New York City may clarify this point.

Brooklyn Navy Yard, New York

Brooklyn Navy Yard, is a 300-acre site on the East River, established by the U.S. Navy in 1801. Since the 60s, when the Navy pulled out, it's been a city-owned industrial zone. It is a central location, just across the river from Manhattan. Currently, the Navy Yard contains a fascinating mix of about 240 companies, and only a few of them have anything to do with ships.

In one of the warehouses, there is a company called Ferra Designs, a metal shop specializing in architectural fabrication and metal objects. Most of the 15 employees studied industrial design at nearby design school. Many of them were no longer content to just design things, and most of them are under thirty. In the words of the director, "They're into craftsmanship; they want to know how to build things. 'It's a renaissance.'", The company appears to be a typical dirty, noisy metal shop. But the director shows a highly complex CNC machine, and an extremely precise water-jet cutter and a press brake, good for making intricate folds. His current project is a series of shiny, eight-foot-tall, metal fragrance

bottles for Marc Jacobs, exactly the sort of high-end, quick-turnaround, small-batch job that is the strong suit of New York's remaining manufacturing sector.

The director sees the potential for a genuine revival. "The cost of doing business is going up in China," he says. "Shipping costs are rising. There is nothing remotely green about buying anything made overseas. Prices will not stay low indefinitely. This country has an opportunity to regain some of its manufacturing base, using cutting-edge technology and a new generation of interested youth." The most exciting thing about the Brooklyn Navy Yard is that it's a true community. If one shop can't make something a customer wants, the shop down the hall can.

Is this a model for other cities? The Navy Yard's precise circumstances are impossible to replicate, but this historic manufacturing cluster seems like a perfect model of what a 21st-century industrial community could be. "We've demonstrated here that urban manufacturing is back," the director says. "It doesn't look anything like the days of the smokestacks. It tends to be small-scale, with very nimble businesses that tap into the creative class ..."

Give enough people who are passionate about making things the stability to invest in equipment and hire workers, and you might slow, or even reverse, the death spiral.....

Source: Metropolis Magazine, June 2010;

<http://www.metropolismag.com/story/20100616/made-in-brooklyn>

The ***smaller industrial towns*** in our study (Turku and Eindhoven) have been very successful in constantly modernising their industry, and nowadays they excel in specific industrial niche markets. Industrial companies in these towns have moved up in the value chain (now, they specialise in R&D, design, assembly, and marketing), and have outsourced a large part of physical production. They benefit from growing global demand for sophisticated industrial products. These cities are very strongly embedded in global production and knowledge networks. As a result, their economic future depends heavily on international economic developments. Traditionally, the economies of these cities were dominated by one large industrial company (Philips in Eindhoven, Aker Yards in Turku), but our research suggests that this dominance has decreased. One reason is the increased international orientation of suppliers: they no longer depend on assignments from the big local multinational, but have successfully developed their own niche markets and exploit them internationally. For these cities, a key challenge is to keep talent in the region or attract it from outside. In this 'battle for brains', they compete with all the other city types. A second issue is international accessibility: these cities score poorly compared to larger places, and this is increasingly felt as a disadvantage in the industrial network economy.

Some conclusions and policy implications

The key point in our study is that manufacturing has become an integrated part of the urban knowledge economy. New industrial landscapes are emerging. Manufacturing used to be a space-intensive and rather polluting activity.

However, the emergence of the knowledge-based economy has brought a much more differentiated landscape of manufacturing activity.

The regional knowledge base becomes the lifeline for manufacturing industries. In all our case studies, higher education and research institutes are a source of new talent for manufacturing firms. Industrial firms increasingly work with local universities in applied research, to develop new products and processes together. The trend towards open innovation will reinforce this tendency. Access to knowledge will become a more important location factor for industrial activity.

Passenger transport connections become more important. Transport connections have always been key for manufacturing plants and this will remain the case. Many companies increasingly depend on inputs from far-away suppliers, and just-in-time production methods further increase the logistical complexities. This makes heavily congested urban areas (like Paris) less attractive for types of manufacturing that require frequent and reliable deliveries.

At the same time, passenger transport connections become more important location factor for factories. Many of the managers that we interviewed stressed the growing importance of international air and train connections for their work. They have frequent meetings with clients, suppliers, or 'sister' companies that belong to the same industrial group. Thus, manufacturing industries will prefer areas that are well accessible by air and high-speed trains.

Skills shortages have to be addressed. Industrial companies across all our cases studies complained about a lack of skilled staff, especially with intermediate technical qualifications. An important concern is the ageing of the workforce. On average, workers in manufacturing plants are relatively old, and many are to retire in the coming years. At the same time, young people are reluctant to take their places and prefer jobs in other sectors. Young people saw their parents struggling in plants, associate manufacturing with dirty and heavy work and long work days against low salaries. Although working conditions and salaries have improved strongly over the last decades, plants still have problems to attract workers. The shortage of employees also relates to the higher qualification demands in the manufacturing sector. In the highly sophisticated manufacturing plants in Western Europe, non-qualified jobs have virtually disappeared, whereas the demand for high qualified people has increased. Modern plans need technically skilled controllers, maintenance engineers, experts in ICT, quality control, robotics and logistics. For traditional 'industrial' cities (like Dortmund), the upgrading of manufacturing work poses some challenges. The qualification level of the workforce in these cities is relatively low, and (youth) unemployment is high. Many lower-skilled people have become redundant. The manufacturing sector has ceased to be a refuge for people without formal education: it has become part of the urban 'knowledge based economy'.

As manufacturing becomes more knowledge intensive, urban quality of life becomes a key location factor. Urban quality of life is a key asset to attract or retain the knowledge workers on which industrial cities increasingly depend. Cities like Paris or Munich score well here, which helps them to attract the best

brains. 'Traditional' industry cities have more problems in this respect. Many of them have grown fast during the industrialisation age, and became typical working class cities. They still struggle with a legacy of a poor housing stock, they still have fewer high-level amenities like culture and fancy shopping areas. They have a less developed 'intellectual climate', which makes it more difficult to attract the kind of workers needed for the knowledge economy. Post-socialist cities like Ostrava face the additional challenge to address the problems of polluted industrial sites and air pollution. Cleaning up is costly and complex, but necessary to safeguard the liveability of the urban region in the long run.

At the same time, overall, *manufacturing industries have become cleaner*, thanks to technological innovation and stricter regulations. Air quality and water quality has improved dramatically in most cities. Furthermore, many types of manufacturing have become less space intensive. This makes it much easier to integrate manufacturing activity in the urban fabric, offering challenges for urban policymakers how to do this.