

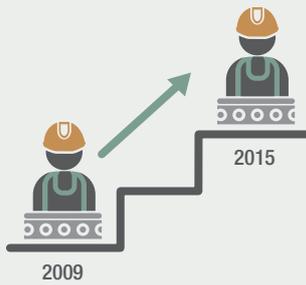
Trends in Manufacturing and Manufacturing-Related Services

The manufacturing sector is an important pillar of the Singapore economy

Manufacturing accounted for 20% of nominal GDP in 2015



Over the past 6 years...



Real VA per worker grew by 5.9%

Nominal median monthly income of

full-time employed residents grew by 5.5%

Manufacturing generates healthy positive spillovers to the rest of the economy

\$S\$1m increase in final demand for MANUFACTURING

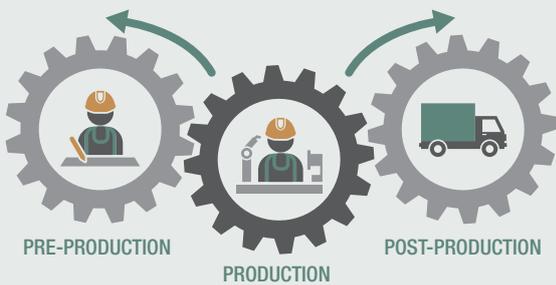


\$S\$81k VA

in NON-MANUFACTURING SECTORS

Over the years, manufacturing-related services activities have grown in tandem with manufacturing activities, enhancing the vibrancy of Singapore's manufacturing ecosystem

OVER THE YEARS...



Singapore's innovative capabilities will strengthen with the growth of upstream manufacturing-related activities such as R&D and product design



The government will continue to upgrade Singapore's manufacturing capabilities and attract firms that engage in high-value manufacturing-related services

While external headwinds weighed on manufacturing activities in 2015, the manufacturing sector continues to be an important pillar of the Singapore economy

In 2015, the manufacturing sector shrank by 5.2 per cent, due to external headwinds facing several clusters. Nonetheless, the sector continues to be an important pillar of the Singapore economy, with its share of nominal GDP increasing over the past two years, from 18.5 per cent in 2013 to 19.8 per cent in 2015 (Exhibit 1).¹ Singapore's manufacturing sector also remains attractive to investors. Despite the challenging external environment, total manufacturing fixed asset investment commitments secured by EDB in 2015 was S\$8.3 billion, higher than the S\$6.8 billion recorded in 2014.

The manufacturing sector also provides good jobs for Singaporeans, and contributes significantly to overall productivity growth

The manufacturing sector employed around 510,000 workers as of December 2015. While employment in the sector saw a decline in recent quarters due to sluggish global economic conditions and the tighter supply of foreign manpower, the median income for locals in the sector has continued to grow. In 2015, the nominal median monthly income of full-time employed residents in the sector rose by 5.4 per cent, from S\$4,210 in 2014 to S\$4,437. Over a longer 6-year period from 2009 to 2015, the nominal median monthly income of full-time employed residents in the sector increased by 5.5 per cent on a CAGR basis, higher than the 5.1 per cent growth per annum for full-time employed residents in the overall economy (Exhibit 2).

Given the need to be competitive in global markets, manufacturing firms have also seen relatively strong productivity growth in recent years despite the sluggish external environment. In particular, over the period of 2009 to 2015, real value-added (VA) per worker in the manufacturing sector grew by 5.9 per cent CAGR, higher than the 2.2 per cent for the overall economy.

Exhibit 1: Nominal Value-Added of the Manufacturing Sector

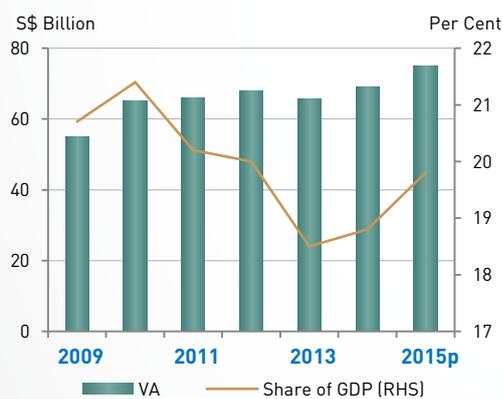
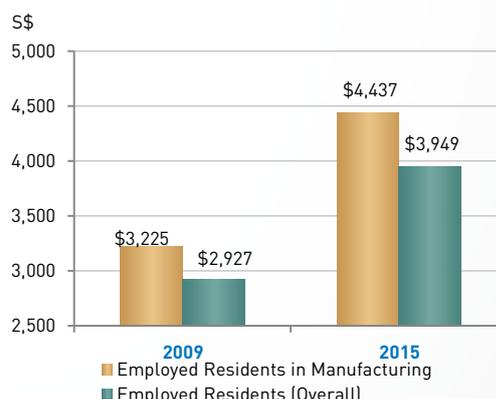


Exhibit 2: Median Gross Monthly Income of Full-time Employed Residents



¹ In 2015, even though the real value-added (VA) of the manufacturing sector declined, the sector's nominal VA increased. This was mainly due to price effects, which might have been affected by factors such as exchange rate fluctuations and higher product prices. The higher nominal manufacturing VA in the last two years was contributed mainly by the chemicals and biomedical manufacturing clusters

Moreover, the manufacturing sector generates positive spillovers to the rest of the economy

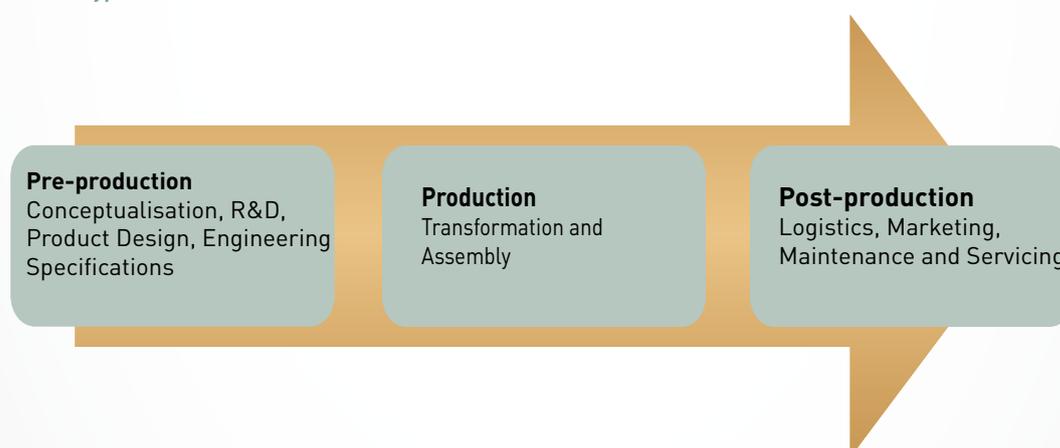
The manufacturing sector also generates healthy spillovers to the rest of the economy, given that various intermediate services inputs such as distribution, transportation, financing etc. are required in the production process. Using Singapore's Input-Output Tables, it is estimated that a S\$1 million increase in final demand for manufacturing generates S\$81,000 of non-manufacturing VA and 0.65 non-manufacturing jobs, benefiting particularly the wholesale trade sector. Comparatively, a S\$1 million increase in final demand for services generates S\$22,000 of non-services VA and 0.27 non-services jobs.

Over the years, the manufacturing ecosystem has evolved, with high-value manufacturing-related services growing in tandem with manufacturing activities

Over the years, the presence of a strong manufacturing base has enabled firms to incorporate more high-value manufacturing-related services into their business models. Such services occur at both the upstream pre-production stage, which include knowledge-intensive activities such as research and development (R&D), product design, engineering specifications etc., as well as at the downstream post-production stage, which encompass activities such as logistics, marketing, maintenance and servicing etc. (Exhibit 3).

The growth of manufacturing-related services alongside manufacturing activities will add to the vibrancy of Singapore's manufacturing ecosystem. For instance, the development of the Seletar Aerospace Hub to attract aerospace manufacturing activities will enable us to further support growth in maintenance, repair and overhaul services. Equally important, the growth in upstream pre-production activities (e.g., R&D and product design) will help to strengthen our innovative capabilities which are vital to the long-term competitiveness of Singapore.

Exhibit 3: Typical Production Value Chain



One aspect of the growth of manufacturing-related services is the rising prominence of factoryless goods producing firms in Singapore

In line with the trend towards high-value manufacturing-related services, factoryless goods producing firms (FGPFs) have become a more prominent part of Singapore's manufacturing ecosystem. Such firms are typically involved in pre-production activities (e.g., R&D and product design) in Singapore, but the actual production (e.g., the physical transformation and assembly of the products) is either entirely carried out by a related entity located overseas or outsourced to a third party such as a contract manufacturer located in Singapore or another country. A good example of an FGPF is a fabless semiconductor firm that engages in integrated circuits (IC) design in Singapore but outsources the actual production of the semiconductors to a contract manufacturer such as a foundry in Singapore or overseas.

FGPFs can be found in both manufacturing and services sectors. In accordance with existing international statistical convention, the economic contribution of FGPFs would be recorded under the manufacturing sector if the FGPF owns the material inputs² to production, and under the services sector if it does not. Regardless of their classification, FGPFs by the nature of their activities are important contributors to Singapore's manufacturing capabilities.

FGPFs tend to generate jobs that require a higher level of skills, and are also more productive

FGPFs are generally more prevalent in the biomedical and electronics clusters in the manufacturing sector; and in the wholesale trade and business services industries in the services sector.

On average, the FGPFs in the manufacturing sector are far larger than the non-FGPFs in terms of sales revenue, with sales of S\$247 million per FGPF as compared to S\$31 million for non-FGPFs in 2014 (Exhibit 4). Given the nature of FGPFs, the average employment size of FGPFs is lower than that for non-FGPFs. However, FGPFs are generally found to be more productive, partly due to them having a higher share of skilled workers. On average, FGPFs generate around S\$673,000 in nominal value-added per worker, as compared to S\$150,000 for non-FGPFs. In line with the higher productivity, the average remuneration per worker in FGPFs is also higher.

Exhibit 4: Average Characteristics of FGPFs in Manufacturing Sector, 2014

	Average sales (S\$ m)	Average number of workers	VA/worker (S\$ '000)	Wage/worker (S\$ '000)	% Skilled workers*
FGPFs	247	42	673	109	72.7
Non-FGPFs	31	46	150	52	68.4

Source: EDB

*Skilled workers refer to workers in the following occupations: professionals, managers, executive and technicians

Within the services sector, the average FGPF is significantly larger in terms of sales and employment compared to the non-FGPFs (Exhibit 5). In addition, the average productivity of FGPFs outstrips that of non-FGPFs by a large margin, possibly because FGPFs tend to engage in more technical or skills-intensive activities such as R&D, design, and engineering specification works. Unsurprisingly, the average wages in FGPFs are also relatively higher.

Exhibit 5: Average Characteristics of FGPFs in Services Sector, 2014*

	Average sales (S\$ m)	Average number of workers**	VA/worker (S\$ '000)	Wage / worker (S\$'000)
FGPFs	1,046	252	268	110
Non-FGPFs	25	11	111	48

Source: DOS

* Only services sectors that FGPFs appeared in are included

** Information on skilled workers is not available in DOS' survey of services

² Material inputs refer to raw or basic materials, chemicals and packing materials consumed in the production process.

Conclusion

The manufacturing sector is facing strong headwinds due to challenging global economic conditions in the near-term. However, it remains a key pillar of the Singapore economy, contributing almost 20 per cent to nominal GDP in 2015. It also generates well-paying jobs for Singaporeans, on top of healthy positive spillovers to the rest of the economy.

Over the years, Singapore's manufacturing ecosystem has evolved as firms incorporate more high-value manufacturing-related services such as R&D and product design into their business models. Business models such as FGPFs also add to the vibrancy of the manufacturing ecosystem. For instance, FGPFs typically engage in knowledge-intensive pre-production activities (e.g., design) that contribute to the growth of our innovative capabilities.

Going forward, MTI and EDB will continue to strive to strengthen Singapore's manufacturing base and capabilities, as this will help to open up new opportunities in areas like industrial data analytics and robotics. At the same time, MTI and EDB will continue to anchor firms that engage in high-value manufacturing-related services in Singapore.

Contributed by:

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