Box Article 2.1

EXTERNAL DEMAND RELIANCE OF SECTORS IN SINGAPORE'S ECONOMY

Singapore is a small open economy that is highly dependent on external demand. Over the period of 2015 to 2019, external demand contributed to around 67 per cent to 72 per cent of Singapore's GDP.

This article examines the external demand reliance of the various sectors of the Singapore economy over time, using DOS' Input-Output (IO) tables for 2015, 2016, 2017 and 2019.[1]

The external demand reliance of Singapore's sectors can be measured by the sector's total export share of output

The external demand reliance of each sector of the Singapore economy can be measured by the total export share of its output (see Annex for the computation methodology). Sectors with higher total export shares are relatively more affected by external economic developments due to their larger reliance on external demand, whereas sectors with lower total export shares are relatively more affected by domestic economic developments (e.g., domestic labour market conditions and local property asset prices) due to their greater reliance on domestic demand.

For each sector, we further distinguish between (i) direct exports (i.e., exports produced by the sector) and (ii) indirect exports (i.e., sale of intermediate goods by the sector to support the production of exports in other sectors). This distinction allows us to assess whether a sector is affected by changes in external demand conditions directly or through its linkages to other sectors. For instance, a sector that only supplies to exporters in other sectors (e.g., no direct exports but high indirect exports) will still be indirectly affected by external demand changes.

Between 2015 and 2019, the total export share of most of the sectors in the Singapore economy remained broadly unchanged

Between 2015 and 2019, the total export share of most of the sectors in the Singapore economy remained broadly unchanged [Exhibit 1]. Throughout this period, the wholesale trade, manufacturing and transportation & storage sectors consistently had the largest total export share of output, reflecting their high reliance on external demand. By contrast, the construction, other services and retail trade sectors consistently had the smallest total export share of output, indicating that they primarily served domestic demand.

Among the sectors that are more reliant on external demand, the information & communications and finance & insurance sectors saw the largest increases in total export share from 2015 to 2019

Between 2015 and 2019, the information & communications and finance & insurance sectors saw the largest increases in total export share among the sectors that are more reliant on external demand[2] [Exhibit 1].

The increase in the total export share of the information & communications sector was primarily driven by an increase in both the direct and indirect exports of the computer programming, consultancy & information services segment, as well as the direct exports of the media entertainment and telecommunications segments. Drivers of this trend include increasing external demand for the digital tools (e.g., business administration software and e-commerce platform service) and games (e.g., development of mobile phone games) produced by the sector.

Meanwhile, the rise in the total export share of the finance & insurance sector was mainly due to an increase in the direct exports of the banking & finance segment and the indirect exports of the financial services (except insurance & pension funding) segment.

1 *At the time of writing, the latest available IO tables were for 2019. There were no IO tables for 2018. We have mapped IO industries to sectors reported in the Economic Survey of Singapore publication using the Singapore Standard Industrial Classification (SSIC) codes.*
2 *Broadly defined as those with total export share of output of more than 50 per cent.*

Exhibit 1: Total Export Share of Sectors from 2015 to 2019 (Per Cent)

Sector	2015	2016	2017	2019	Change between 2015 and 2019 (percentage-point)
Wholesale Trade	91.8	91.4	91.5	91.5	-0.3
Manufacturing	89.1	88.9	88.5	89.3	+0.2
Transportation & Storage	87.8	86.5	87.0	89.5	+1.7
Accommodation	72.7	74.4	73.7	73.8	+1.1
Administrative & Support Services	72.3	69.7	71.6	70.3	-2.0
Information & Communications	68.7	71.5	75.6	78.3	+9.6
Finance & Insurance	67.3	67.3	68.4	70.3	+3.0
Professional Services	66.6	66.4	67.7	69.4	+2.8
Food & Beverage Services	37.3	39.2	38.3	38.7	+1.4
Real Estate	29.4	32.4	35.4	39.6	+10.2
Retail Trade	23.0	25.5	26.2	25.5	+2.5
Other Services^	15.2	15.4	15.6	16.8	+1.6
Construction	5.4	5.8	6.6	8.4	+3.0

Source: Department of Statistics, Authors' estimates. Sectors ordered by largest to smallest total export share in 2015.
^ The other services sector comprises the education, health & social services and arts, entertainment & recreation segments.

Among the sectors that are more reliant on domestic demand, the real estate and construction sectors saw the largest increases in total export share from 2015 to 2019

Between 2015 and 2019, the real estate and construction sectors saw the largest increases in total export share among the sectors that are more reliant on domestic demand[3] [Exhibit 1]. In particular, the total export share of the real estate sector rose by 10.2 percentage-point (pp) over this period. This was driven primarily by an increase in its indirect exports (e.g., rental of properties to firms in external demand reliant sectors such as the finance & insurance sector). Meanwhile, the 3.0pp increase in the total export share of the construction sector between 2015 and 2019 was mainly on account of an increase in the indirect exports of the building construction segment (e.g., supply of building materials to firms in external demand reliant sectors such as the manufacturing sector).

The contribution of direct and indirect exports to total export share varied across sectors

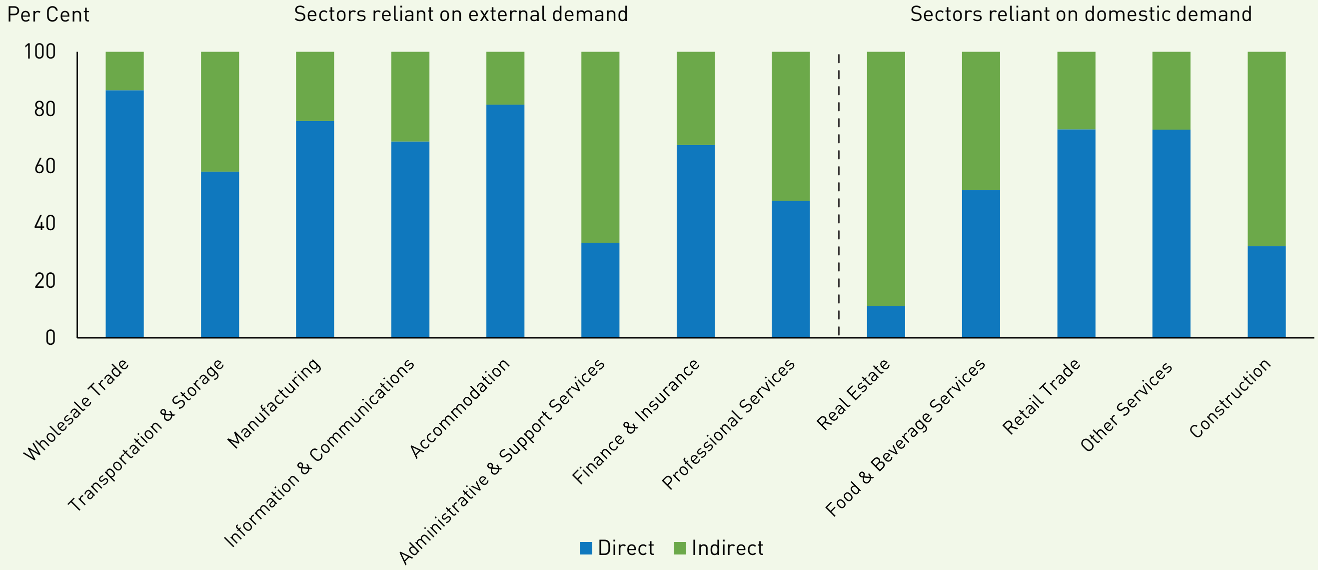
Among the sectors that are more reliant on external demand, the contribution of direct exports to total export share was the highest for the wholesale trade, accommodation and manufacturing sectors, at more than three-quarters [Exhibit 2]. This suggests that firms in these sectors would be highly exposed to changes in external demand conditions. For instance, the output contraction in the manufacturing sector in the first quarter of 2023 was due to weaker external demand, such as for semiconductors and semiconductor equipment amidst the global electronics downturn, and for chemicals due to sluggish industrial demand from China.

3 *Broadly defined as those with total export share of output of less than 50 per cent.*

On the other hand, more than half of the total export share of the administrative & support services and professional services sectors were accounted for by indirect exports, highlighting the important role that these sectors play in facilitating the exports of other sectors. Hence, while firms in these sectors are still susceptible to changes in external demand conditions, their exposure would come largely from their linkages to other sectors that are reliant on external demand. For instance, the real value-added of the administrative & support services sector in the first quarter of 2023 remained below its pre-COVID (i.e., first quarter of 2019) level partly because external demand for the air transport sector, and hence its demand for the rental of air transport equipment from the administrative & support services sector, had not returned to pre-COVID levels.

Among the sectors that are more reliant on domestic demand, the contribution of direct exports to total export share was the highest in the retail trade and other services sectors, at more than two-thirds [Exhibit 2]. By contrast, more than half of the total export shares of the construction and real estate sectors came from indirect exports, driven by intermediate demand from external demand reliant sectors such as manufacturing and finance & insurance.

Exhibit 2: Direct and Indirect Export Composition of Sectors in 2019



Source: Authors' estimates.
Note: Sectors are ordered by their total export share of output in 2019, with wholesale trade having the highest total export share and construction having the lowest share.

Conclusion

The total export share of the output of each sector of the Singapore economy shows the extent to which the sector is reliant on external demand, either directly or indirectly. Between 2015 and 2019, the total export share of most sectors of the economy remained broadly unchanged. Consistently, the wholesale trade, manufacturing and transportation & storage sectors were the most reliant on external demand, whereas the construction, other services and retail trade sectors were the least.

In turn, this analysis allows us to better understand how changes in external and domestic economic conditions are likely to affect the performance of the various sectors of the Singapore economy. For instance, the 2023 performance of sectors that are more externally reliant, such as the manufacturing and wholesale trade sectors, is expected to be dampened by weak external demand due to the global economic slowdown. On the other hand, the performance of sectors that are more reliant on domestic demand is likely to be more resilient in 2023. For example, construction output in 2023 is expected to be supported by major ongoing and upcoming public sector projects (e.g., BTO flats and MRT rail and associated works) as well as some remaining backlogs of construction works that were disrupted by the COVID-19 pandemic.

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References

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Annex A: Methodology to Compute Total Export Share of Output by Sector

In this article, the extent of external demand reliance of each sector is based on the sector's total export share of output (comprising both direct and indirect export channels), computed based on standard Input-Output (IO) table analysis.

Consider n number of sectors in the economy. The output of each sector r can be expressed as $X_r = X_{r1} + \cdots + X_{rn} + F_r$, where X_r is the value of gross output of sector r, X_{rc} is the value of intermediate goods sold by sector r to sector c and F_r is the value of final demand met by sector r.

X_{rc}, the value of intermediate goods sold by sector r to sector c can be divided by the gross output of sector c, X_c, to give the direct requirement coefficient, $a_{rc} = \frac{X_{rc}}{X_c}$. This coefficient captures the amount of input from sector r required to produce one unit of output in sector c. Using the direct requirement coefficient, the value of the gross output of sector r can be expressed as:

$$X_r = a_{r1} X_1 + \cdots + a_{rn} X_n + F_r$$

Stacking the equations across all sectors into a matrix, we have $\boldsymbol{x}_{n\times 1} = \boldsymbol{A}_{n\times n}\boldsymbol{x}_{n\times 1} + \boldsymbol{f}_{n\times 1}$, where $\boldsymbol{x}_{n\times 1}$ is a column vector of gross output, $\boldsymbol{A}_{n\times n}$ is a square matrix of the direct requirement coefficients and $\boldsymbol{f}_{n\times 1}$ is a column vector of final demand. Solving for $\boldsymbol{x}_{n\times 1}$ gives $\boldsymbol{x}_{n\times 1} = (\boldsymbol{I}_{n\times n} - \boldsymbol{A}_{n\times n})^{-1} \boldsymbol{f}_{n\times 1} = \boldsymbol{B}_{n\times n} \boldsymbol{f}_{n\times 1}$, where $\boldsymbol{B}_{n\times n} = (\boldsymbol{I}_{n\times n} - \boldsymbol{A}_{n\times n})^{-1}$ is known as the Leontief inverse matrix. The Leontief inverse contains the total requirement coefficients (also known as the output multipliers) b_{rc}, which considers the total output (considering both direct and indirect channels) of sector r required to fulfil a unit of final demand for sector c.

The column vector of total output exported (considering both direct and indirect channels) $\boldsymbol{e}_{n\times 1}$, can be expressed as $\boldsymbol{e}_{n\times 1} = \boldsymbol{B}_{n\times n} \boldsymbol{fe}_{n\times 1}$, where $\boldsymbol{fe}_{n\times 1}$ is a column vector of exports final demand in the IO tables. The total export share of sector r ($Share_r$) can then be calculated using $Share_r = \frac{E_r}{X_r}$, where E_r is the total output exported for sector r (i.e., element r in the column vector $\boldsymbol{e}_{n\times 1}$). We can also decompose this share into direct export ($\frac{FE_r}{X_r}$) and indirect export ($\frac{E_r - FE_r}{X_r}$) shares.