Producing New Insights on Entrepreneurship through Data Integration

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Introduction

- As the National Statistical Office, the Singapore Department of Statistics (DOS) produces a wide range of statistics on the Singapore economy, population and households.

- The Statistical Business Register (SBR) is managed by DOS and serves as the backbone for the data collection and compilation of business & economic statistics and supports data integration for in-depth analysis.

- DOS has developed the integrated Longitudinal Administrative Database (LAD) on enterprises and individuals across diverse domains to support robust evidence-based policymaking in the Government.

- The integrated databases also enable DOS to compile new indicators and conduct statistical studies to meet emerging data demands.

Statistical Business Register (SBR)

- The SBR covers all entities registered in Singapore and serves as the foundational statistical database for the compilation of business and economic statistics.

- SBR's role in statistical production includes:

  - Providing survey frame production used in sample selections for business surveys

  - Facilitating the compilation of business indicators

  - Supporting data integration for in-depth analysis

- Administrative data are the primary sources in the SBR updating, supplemented by statistical surveys conducted by DOS and Research and Statistics Units (RSUs) in government agencies. DOS also explores the use of new data sources e.g. big data in updating the SBR.

- The SBR management is based on the principles and guidelines set out in the United Nations Guidelines on Statistical Business Registers.

Unique Identifier for Enterprises and Individual

- The enterprises in the Statistical Business Register are identified by **Unique Entity Numbers** (UEN)[1], a unique identifier issued by the Government to all Singapore-registered enterprises upon their registrations for their transactions with the Government.

- Similarly, the residents in the Population & Household Registers are identified by **Unique Identification Numbers** (UIN)[2], a unique identifier issued by the Government to Singapore citizens and permanent residents only.

- The UEN and UIN enable DOS to process and integrate various enterprise-level and individual-level data across administrative and survey data sources to:

  - Update the statistical registers with multiple administrative and survey data sources

  - Update the integrated Longitudinal Administrative Databases to support policy research

 - Compile new indicators and conduct statistical studies to meet emerging data demands

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Integrated Longitudinal Databases on Enterprises and Individuals

- DOS has developed the integrated Longitudinal Administrative Databases (LAD) on enterprises and individuals across diverse domains to support robust evidence-based policymaking in the Government.

- The UEN and UIN are the unique identifiers in microdata linking. The integrated databases are updated mainly using administrative data, augmented with survey data.

- The studies on high growth firms and women-owned companies are two examples of deriving new insights on entrepreneurship through data integration.

Exhibit 1. Integrated longitudinal database on enterprises and individuals

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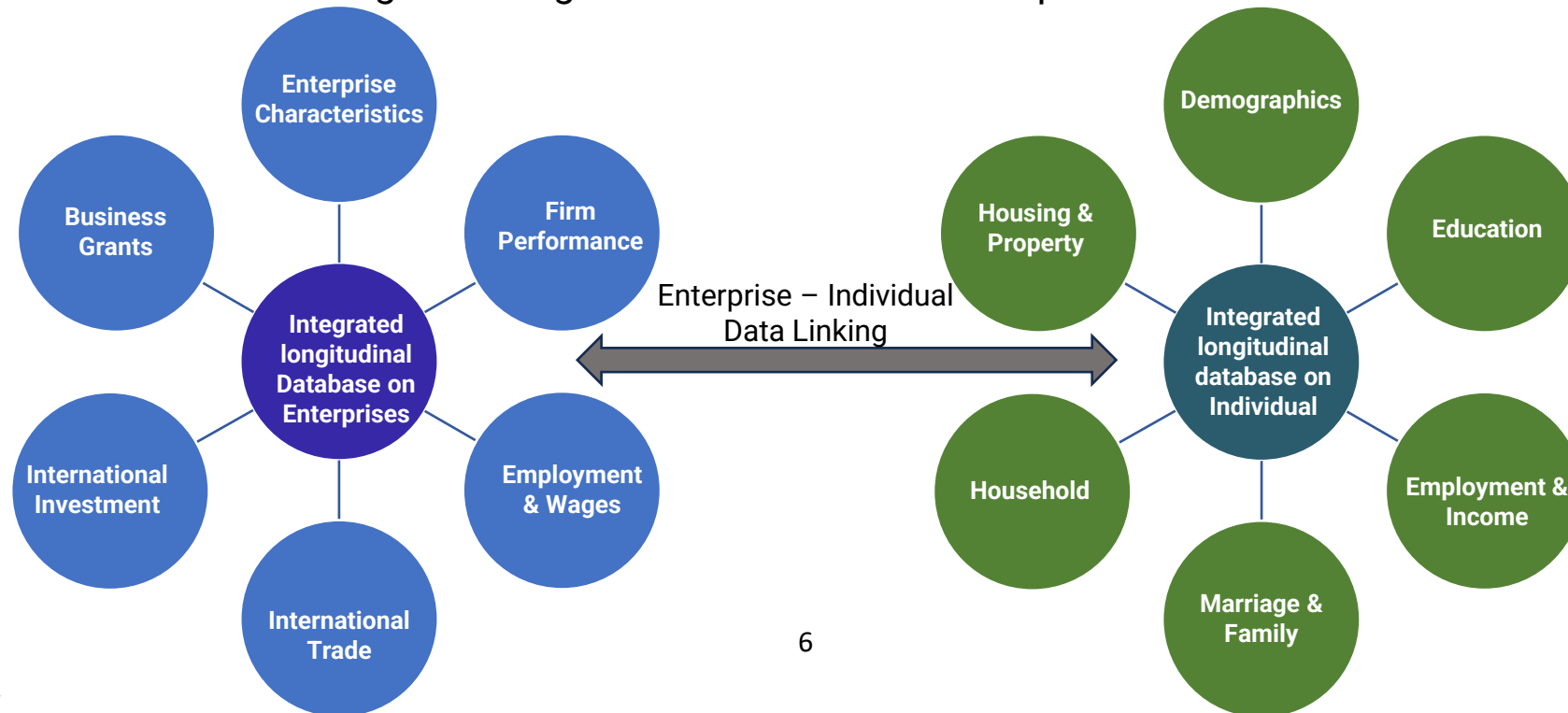
Integrate Enterprise Data to Profile High Growth Firms

- International studies found that high growth firms (HGF) are significant contributors to revenue and employment growths, and they tend to outperform non-HGF.

- In Singapore, policies have been made to support high-potential firms to grow and become globally competitive, which would contribute to economic growth and job creation.

- Using the integrated longitudinal database on enterprises, DOS has conducted a statistical study to examine the enterprise characteristics and economic contributions of high growth firms between 2016 and 2019.

- In this study, HGF are defined as firms with average annualized revenue growth exceeding 10 per cent over a three-year period and with at least 10 employees[1] at the start of the period:

$$\sqrt[3]{\frac{revenue_{t+3}}{revenue_t}} - 1 > 0.1$$

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1. The threshold of a minimum of 10 employees is meant to mitigate small firm bias, where a small increase in revenue results in disproportionately high revenue growth due to the small denominator.

Profile of High Growth Firms

- Half of high growth firms were aged 5 - 20 years old while 22 per cent were aged over 20 years. Young firms (≤5 years old) accounted for 28 per cent [Exhibit 2].

- A majority of HGFs were smaller firms in terms of revenue or employee size. Nearly half (48 per cent) had revenue between S$1 million to S$10 million, and 28 per cent had revenue not exceeding S$1 million. In terms of employee size, 55 per cent employed between 10 to 25 workers while only 5 per cent employed more than 200 employees.

Exhibit 2. Profile of firms with high growth between 2016 and 2019
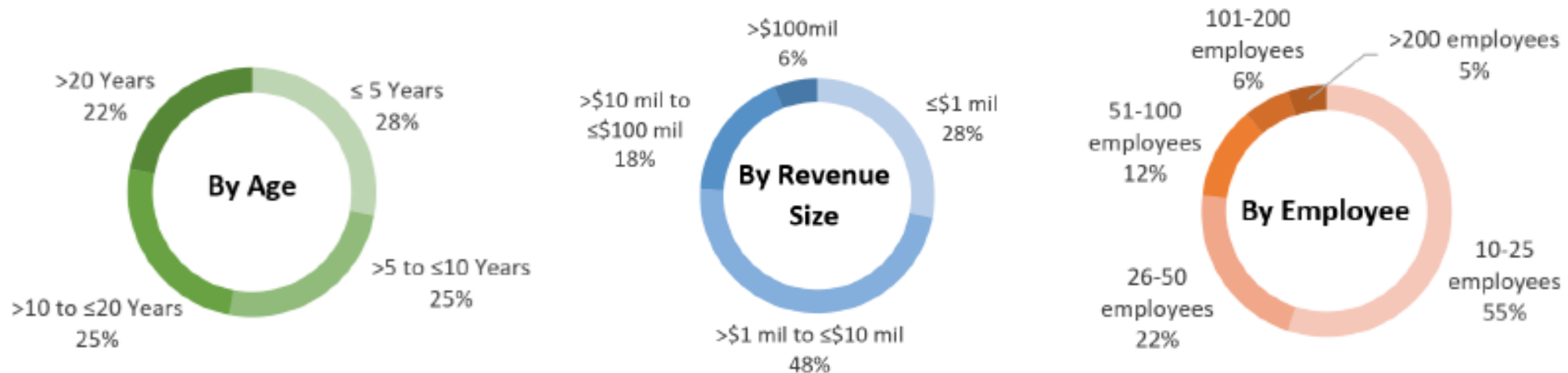
Profile of High Growth Firms

- Young firms are more likely to experience high growth compared to older ones. About 27 per cent of young firms (≤5 years old) experienced high revenue growth between 2016 and 2019 and this proportion declined progressively with older firms [Exhibit 3].

- The prevalence of HGF was generally similar across different employment size bands. About one in five firms experienced high revenue growth between 2016 and 2019 across employment size bands [Exhibit 4].

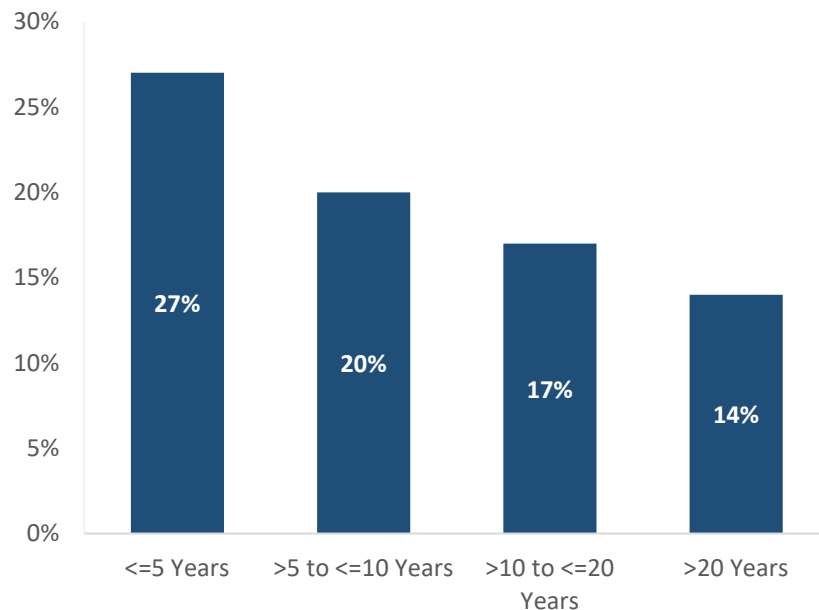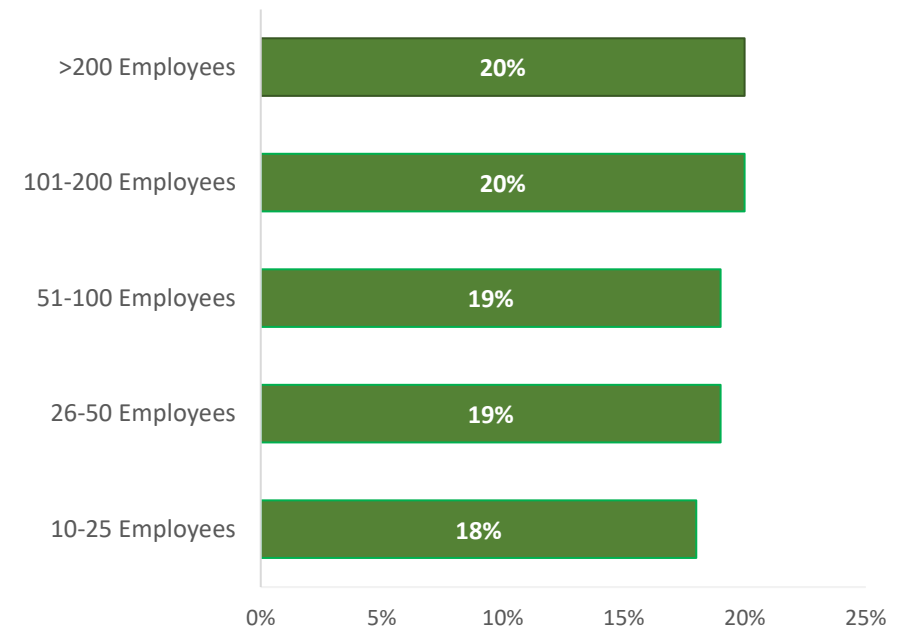Exhibit 3. Prevalence of firms with high growth between 2016 and 2019, by age in 2016

Exhibit 4. Prevalence of firms with high growth between 2016 and 2019, by employment size in 2016

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High Growth Firms Outperform Non-High Growth Firms

- On average, high growth firms (HGF) generated higher revenue and employed more workers as compared to firms with lower growth. The average revenue of HGF was more than 5 times the revenue of non-HGF [Table 1].

- HGF were more productive than non-HGF, with the average productivity[1] of HGF more than double of the non-HGF. The average annual wage per employee[2] of HGF was also higher than non-HGF.

Table 1. Average revenue, employees, productivity and
annual wage per employee of HGF and non-HGF, 2019

| Average Statistics	HGF	Non-HGF
Revenue (S$ Mil)	257	49
Employees (No.)	90	56
Productivity (S$'000)	233	105
Annual Wage per Employee (S$'000)	67	52

1. Productivity is measured as nominal value-added per worker.
2. Wage per employee is derived as total wages divided by total number of employees.

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Integrate Enterprise and Individual Data to Profile Women-Owned Companies

- DOS has conducted a study to profile women-owned companies in Singapore. The information the individual shareholders of Singapore registered companies are available from the administrative data.

- The study leverages on DOS's integrated databases on enterprises and individuals that provide rich information on Singapore registered firms and resident population. The unique business identifier (UEN) and unique individual identifier (UIN) are available in the respective databases to facilitate microdata linking.

Exhibit 5. Integrate enterprise and individual data to profile women-owned companies
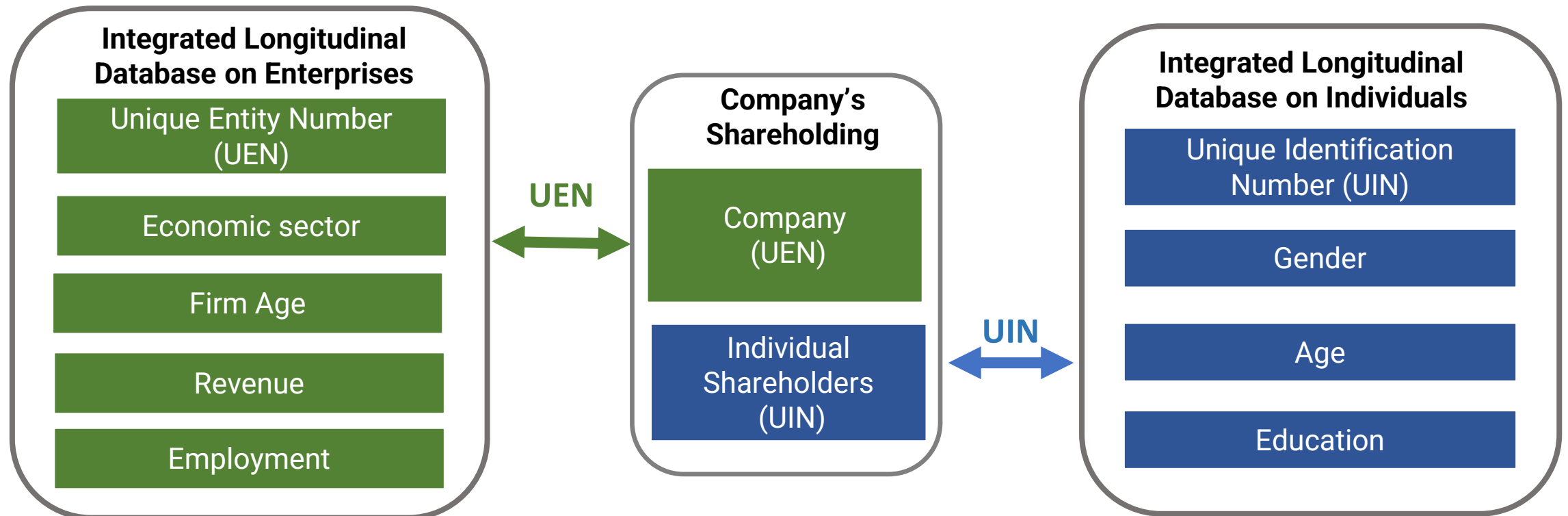
Growth of Women-Owned Companies in Singapore

- The study covers Singapore resident-owned companies with more than 50% of ordinary shares held by Singapore residents. These companies are further classified into three categories: majority men-owned, majority women-owned and others.

- The number of women-owned companies grew from 16,300 in 2010 to 36,000 in 2022, accounting for 25.6 per cent of Singapore resident-owned companies in 2022, higher than the share of 20.0 per cent in 2010 [Exhibit 6 & 7].

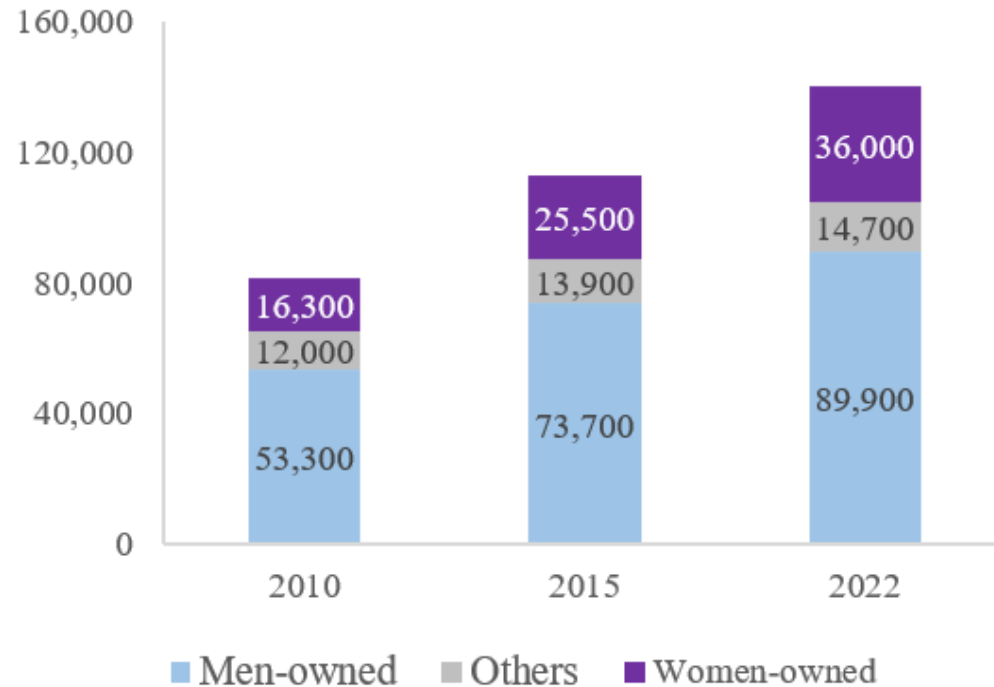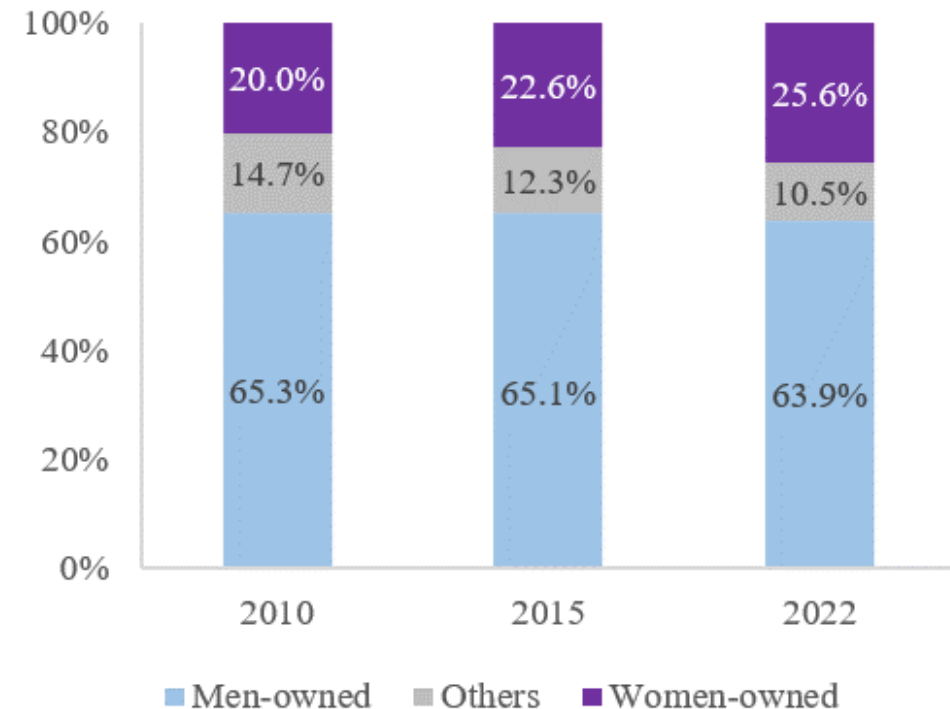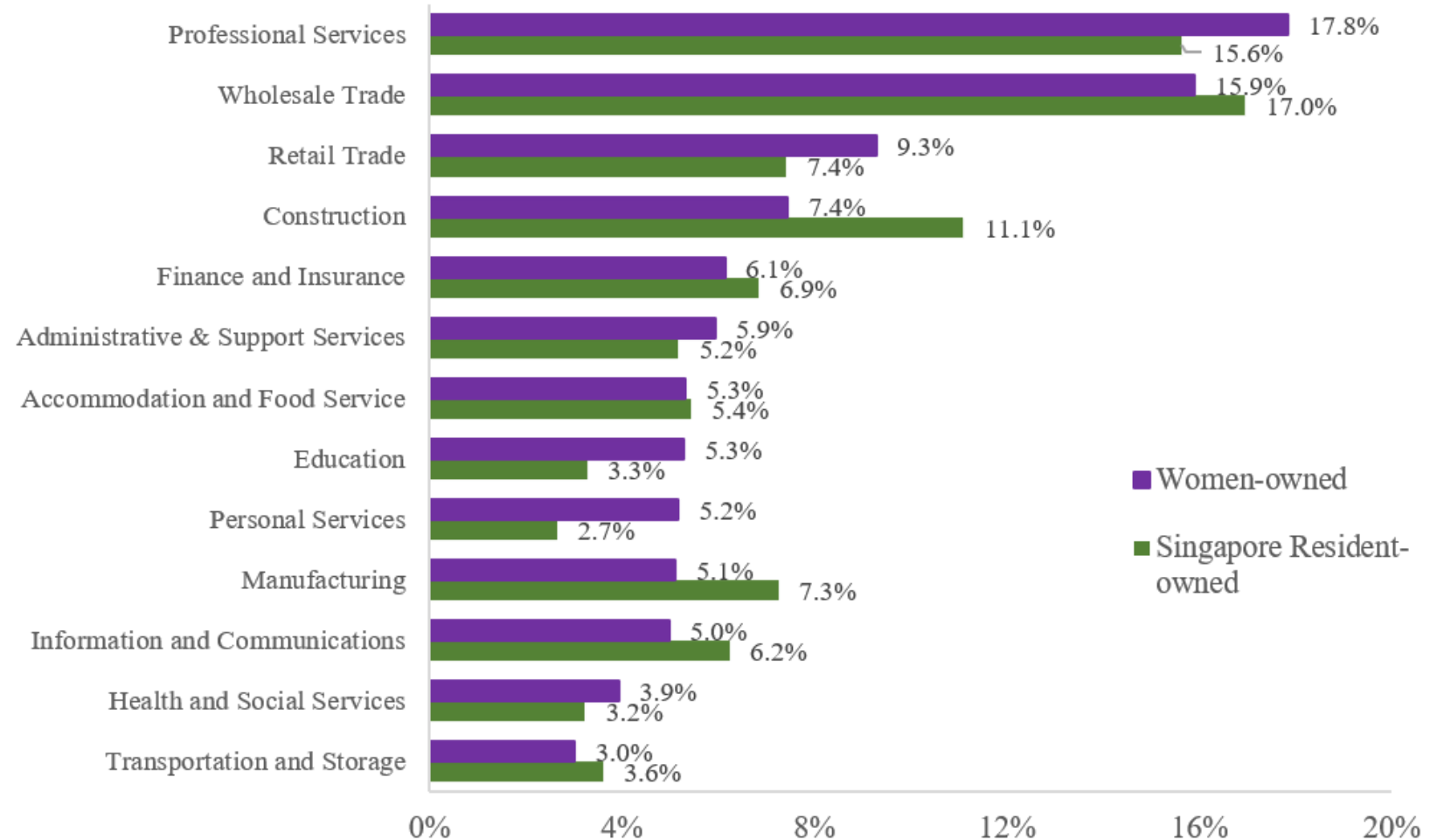Exhibit 6. Number of Singapore resident-owned companies by type of ownership

Exhibit 7. Per Cent distribution of Singapore resident-owned companies by type of ownership

Industry Distribution of Women-Owned Companies

- Women-owned companies tend to operate in service industries. The top three industries for women-owned companies were Professional Services (17.8 per cent), Wholesale Trade (15.9 per cent) and Retail Trade (9.3 per cent) [Exhibit 8].

- Compared to resident-owned companies, lower proportions of women-owned companies were in the goods producing industries, namely Construction and Manufacturing.

Exhibit 8: Singapore resident-owned companies and women-owned companies by selected industries, 2022

Profile of Women-Owned Companies

Women-owned companies tend to be younger and have smaller average revenue size and employment size, compared to the Singapore resident-owned companies [Exhibit 9]

Exhibit 9. Profile of Singapore resident-owned companies and women-owned companies, 2022
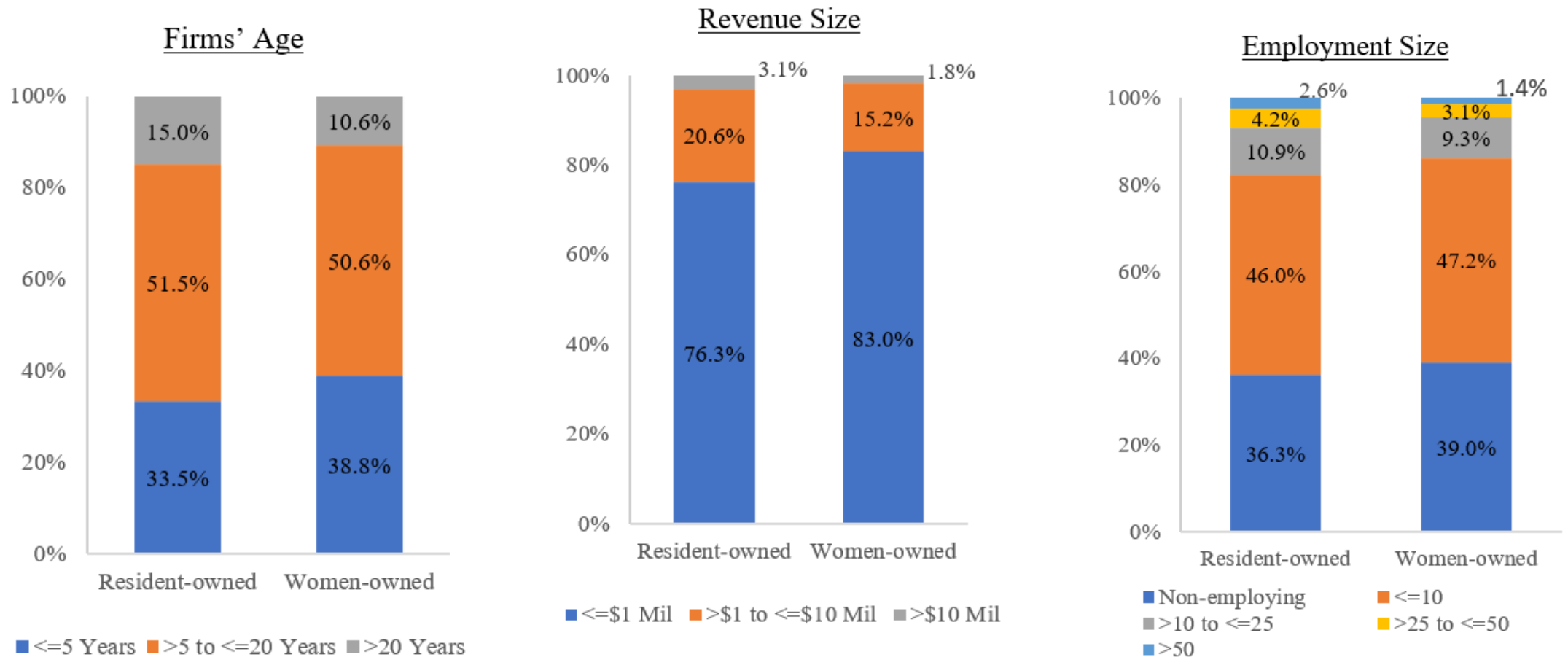
Contribution of Women-Owned Companies

- In 2022, women-owned companies generated S$85.3 billion in revenue and employed 202,000 employees. Compared to 2010, this was an average annual growth of 11.3 per cent and 4.8 per cent respectively [Exhibit 10].

- Women-owned companies accounted for 21.3 per cent and 18.5 per cent of the total revenue and employment of Singapore resident-owned companies in 2022.

Exhibit 10. Singapore resident-owned companies' revenue and employment by type of ownership, 2022
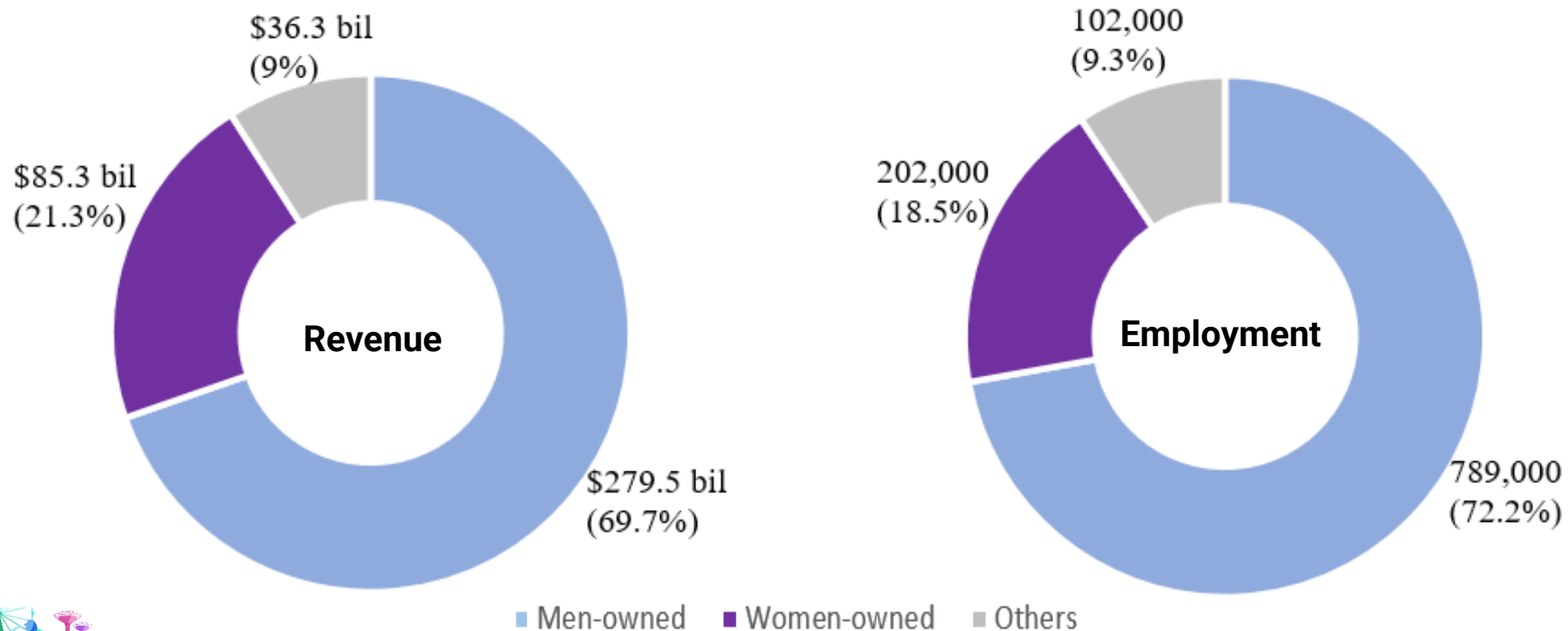
Learning Points

- Data integration enables DOS to:

  - Produce new policy insights on emerging topics cutting across statistical domains

  - Leverage existing datasets to meet new data demands promptly, without additional reporting burden

- The unique identifiers for enterprises and individuals are crucial for efficient microdata linking across various administrative and survey data sources.

- The international statistical manuals, e.g. UN Manual on Principal Indicators for Business and Trade Statistics, Eurostat Guidelines on Micro Data Linking, provide methodology guidelines on the compilation of new indicators and microdata linking, while the sharing at the Task Team meetings provide concrete examples on the data integration and statistical compilation.

- DOS will continue to produce indicators and new data insights on entrepreneurship and enterprise growth to support evidence-based policy making.

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- UNSD, [Manual on Principal Indicators for Business and Trade Statistics Volume 1](#)