

Revision in the Sample Design of TANKAN using the Economic Census of Japan

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- I. Overview of Tankan survey
- II. Sample Design of Tankan
- III. Improving the Sampling Methodology
- IV. Conclusion

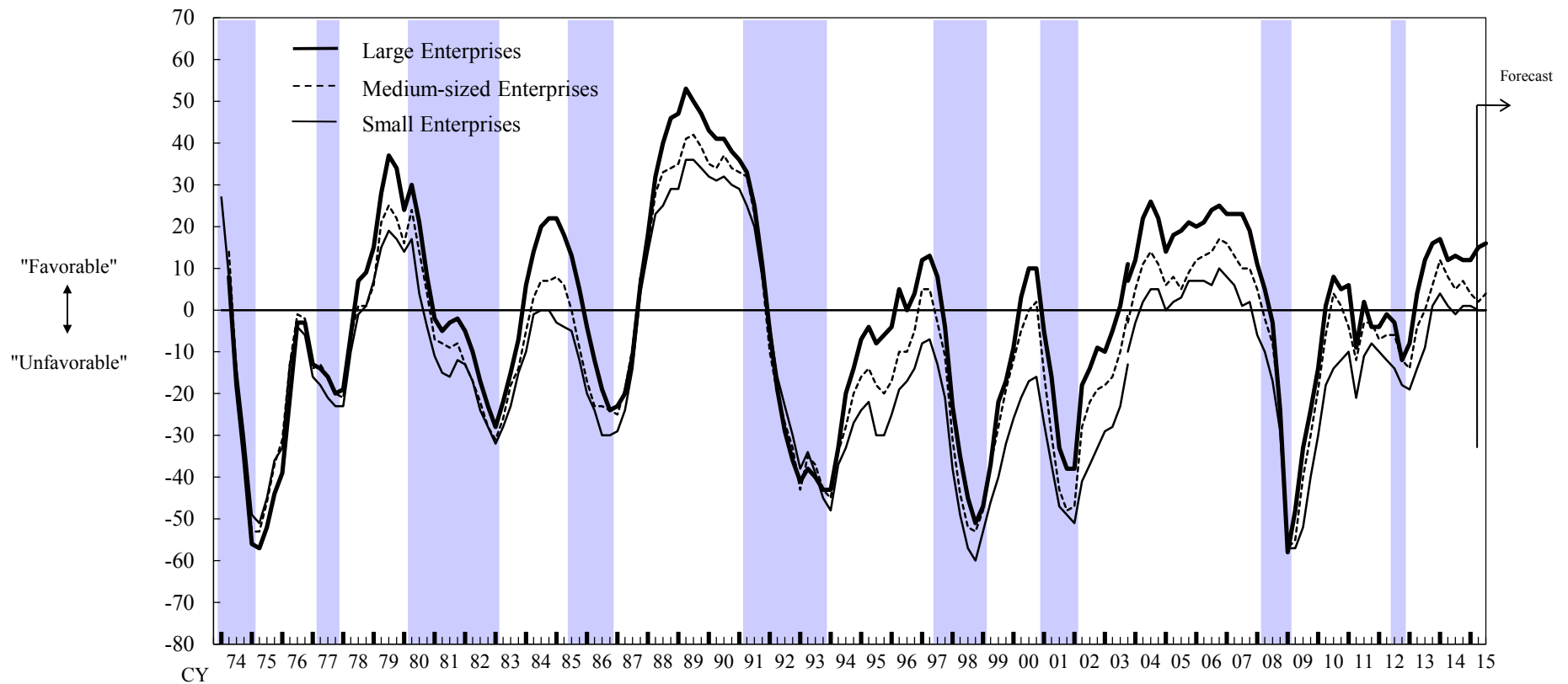
What is TANKAN?

Tankan = Short-Term Economic Survey of Enterprises in Japan

Purpose	Providing an accurate picture of business conditions ⇒ Contributing to the appropriate implementation of monetary policy
Survey Items	<ul style="list-style-type: none">▪ Judgement survey (e.g., Business conditions index)▪ Quantitative data (e.g., Sales, Fixed investment)▪ Inflation Outlook (Output Prices and General Prices)▪ Number of New Graduates Hired
Coverage	<ul style="list-style-type: none">▪ Sample enterprises : 11,066 (Jun. 2015)▪ Population enterprises : 212,277
Frequency	Quarterly (March, June, September, December)

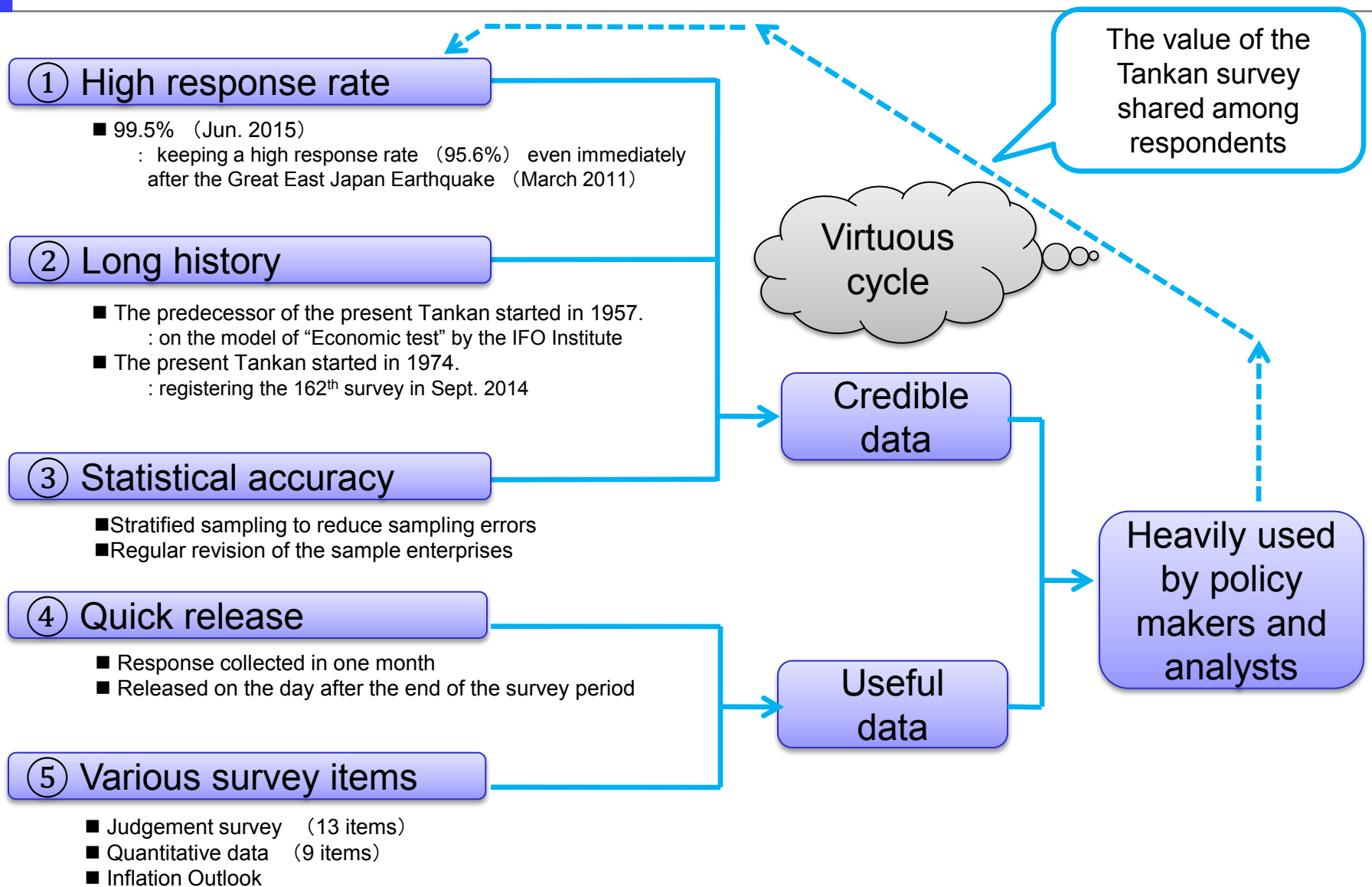
Business Conditions DI

(Diffusion index, % points) Manufacturing



Note: Shaded areas indicate periods of recession (according to the Cabinet Office).

Strength of the Tankan Survey



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Calculation Methods

- Judgment Survey

Aggregated into Diffusion Index (DI)

- Inflation Outlook

The percentage share of the number of respondents choosing each alternative

- Quantitative Data

The amount of "population estimates" is calculated by industry and size classifications

Error Ratio of the Sales

	Large		Medium-sized		Small		Sample size
	Manuf.	Non-manuf.	Manuf.	Non-manuf.	Manuf.	Non-manuf.	
2010	1.5%	3.1%	2.6%	4.3%	2.3%	3.8%	11,684
2015	1.0%	3.0%	2.7%	4.6%	2.5%	3.9%	11,126

Tankan has set the targets on error ratio of these 6 categories by industry and scale.

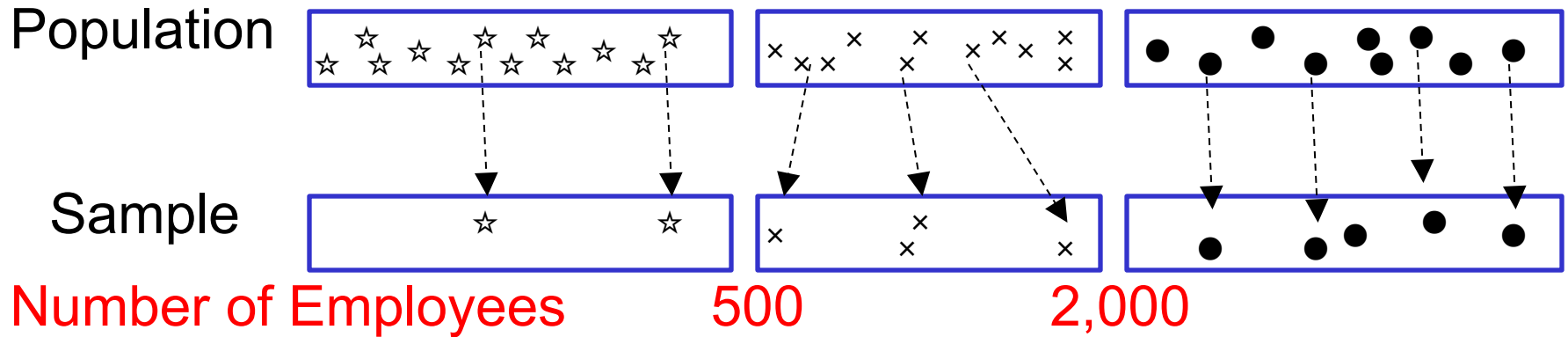
3 % for Manufacturing and 5% for Nonmanufacturing.

Economic Census

- In March 2015 survey, we made the first revision using the “*Economic Census*” as the population base for the Tankan survey.
- The “*Economic Census*” aims to provide a comprehensive overview of the actual business activities of establishments and enterprises in Japan.
- It surveys the economic activities of establishments and enterprises, with its survey items including accounting information. We can access detailed information for the target population of Tankan.

Stratified Sampling

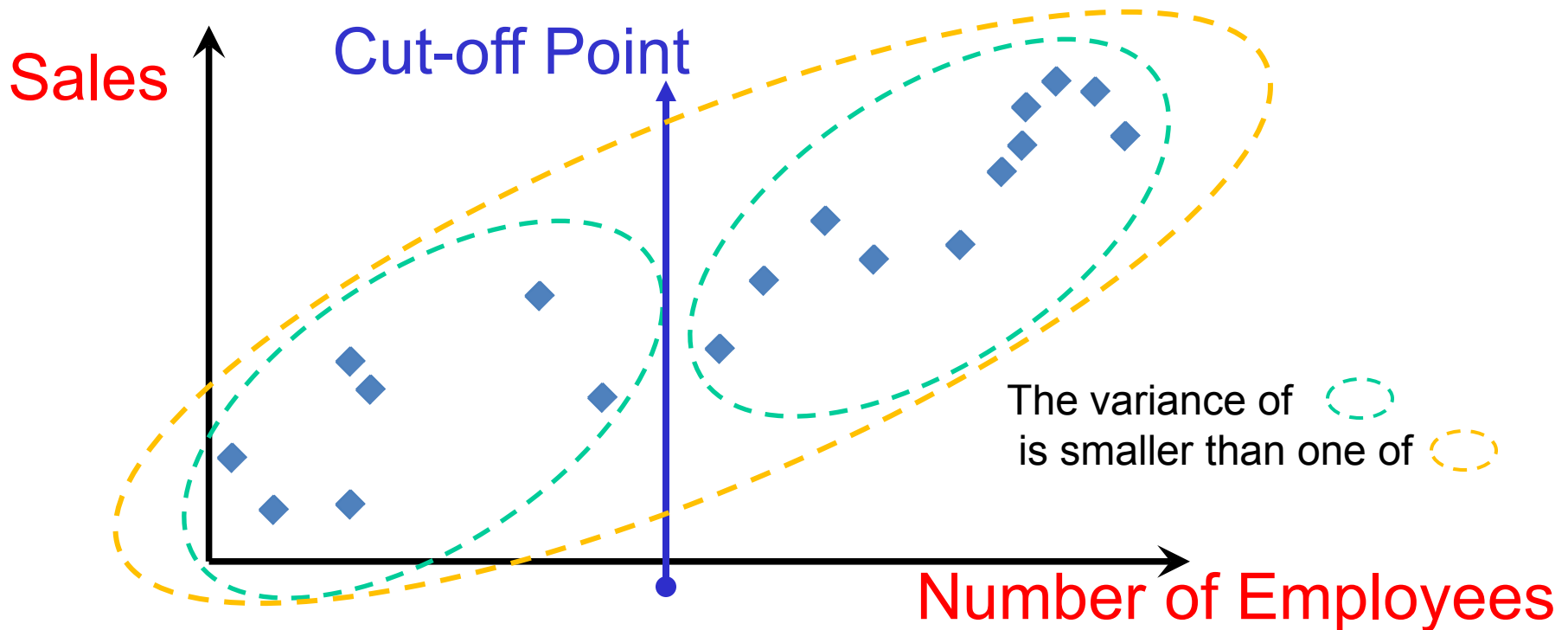
e.g. Large Enterprises, Automobile industry



- To achieve the accuracy target, we divide strata into smaller segments by “industry,” by “capital” and by “the number of employees” (stratified sampling).
- The number of employees was the only effective information to divide strata in the previous population base statistics for the Tankan.

Stratified Sampling

- If “sales” and “the number of employees” are highly correlated, we can decrease the population variance of sales for each stratum.



Why did error ratios increase?

- The *Economic Census* uses administrative record information to collect information on establishments and enterprises, and has resulted in greater coverage of enterprises.
- Using the sales data from the *Economic Census*, the population variance increases particularly sharply for the real estate sector and some other sections.
- Their number of employees are not highly correlated with sales. Thus, it is not an effective characteristic to decrease the error ratio of “sales.”

Sample Bias of the Tankan

- Using accounting information for all enterprises in the population, we can check the sample bias of Tankan results compared with the true value.

	Large		Medium-sized		Small	
	Manuf.	Non-manuf.	Manuf.	Non-manuf.	Manuf.	Non-manuf.
Sales	2.3%	11.3%	3.3%	19.8%	11.4%	26.4%
Fixed Investment	3.5%	9.8%	6.2%	20.2%	9.0%	13.7%

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Classified by Sales

- Applying the “*Economic Census*” as the population base for the Tankan, sales data for all enterprises in the population is available now. We can use it to divide the population into strata.
- By dividing the population into strata by sales, we can make a perfect ordering of groups by sales and thereby decrease the population variance of sales.
- The error ratios and the sample biases based on the sales classification are lower than those based on the employee classification.

Error Ratio (Strata Classified by Sales)

Items	Classified by	Large		Medium-sized		Small	
		Manuf.	Non-manuf.	Manuf.	Non-manuf.	Manuf.	Non-manuf.
Sales	Employees	1.0%	3.0%	2.7%	4.6%	2.5%	3.9%
	Sales	0.5%	0.8%	1.8%	3.1%	1.8%	1.6%
Fixed investment	Employees	3.0%	3.6%	6.5%	8.3%	10.1%	28.0%
	Sales	2.4%	3.1%	6.3%	8.2%	9.1%	11.8%

Sample Bias (Strata Classified by Sales)

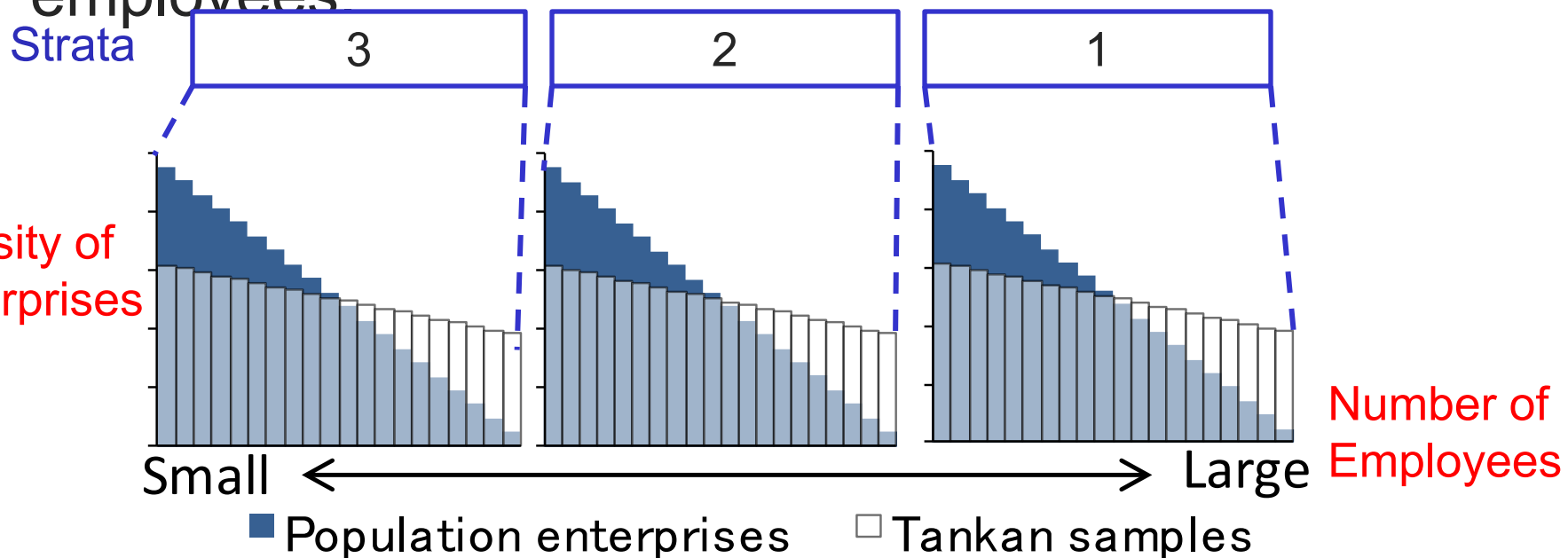
Item	Classified by	Large		Medium-sized		Small	
		Manuf.	Non-manuf.	Manuf.	Non-manuf.	Manuf.	Non-manuf.
Sales	Employee s	2.3%	11.3%	3.3%	19.8%	11.4%	26.4%
	Sales	1.8%	1.6%	1.2%	2.5%	10.0%	9.6%
Fixed Investmen t	Employee s	3.5%	9.8%	6.2%	20.2%	9.0%	13.7%
	Sales	3.4%	8.4%	10.9%	10.8%	6.6%	9.0%

Correlation with Fixed Investment



Overestimation

- There is still a problem of overestimation.
- the Takan samples in each stratum are biased towards enterprises with large number of employees



Takan Estimation (e.g. Sales) > Population Value

To reduce Statistical Bias

- The main reason is a difference in the acceptance rate for survey across enterprises with different numbers of employees.
- The acceptance rate for enterprises with very few employees is lower than for enterprises with dozens of employees owing to their insufficient resources for accounting and responding the Tankan survey.
- However, adding and eliminating a significant number of enterprises are controversial in as much as the post-revision results would end up differing significantly from the pre-revision results.

Acceptance rate: the ratio of the enterprises that agree to be in the Tankan sample to all enterprises that are asked to be in the sample.

Decreasing the Sample Bias

Item	Sample Size	Large		Medium-sized		Small	
		Manuf.	Non-manuf.	Manuf.	Non-manuf.	Manuf.	Non-manuf.
Sales	11,126	1.8%	1.6%	1.2%	2.5%	10.0%	9.6%
	10,826	0.4%	0.6%	0.3%	1.6%	8.2%	8.7%
Fixed Investment	11,126	3.4%	8.4%	10.9%	10.8%	6.6%	9.0%
	10,826	3.2%	5.1%	9.1%	11.2%	3.9%	8.4%

Eliminate just a few percent of enterprises, focusing on those that contribute the most to overestimation of the number of employees

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Conclusion

1. Using data from the “*Economic Census*,” we find that the true error ratio is higher than previous estimation, and that the Tankan results overestimate the population values.
2. By stratifying based on sales, we can decrease both the error ratio and the sample biases reflected in the Tankan results.
3. To eliminate just a few percent of enterprises that contribute the most to overestimation of the number of employees, we can decrease the biases for sales and fixed investment.