

Statistics New Zealand - Te Tari Tatau

Article: **Changes to the Quarterly Wholesale Trade Survey**

1. Introduction

The Wholesale Trade Survey (WTS) has been redesigned. The previous design operated from the March 1995 to September 2002 quarters. Sample surveys require periodic redesign to ensure that the sample adequately represents the contemporary composition of the population.

The redesign of the WTS incorporates a number of methodological enhancements aimed at improving the reliability and quality of the results of the survey, while reducing the overall respondent load.

The existing WTS time series terminated at the September 2002 quarter. To assist users in moving to the redesigned survey, Statistics New Zealand has produced an analytical series, from the September 2002 quarter back to the March 1995 quarter. To provide the information necessary to produce this analytical series, a dual run of the September 2002 quarter was conducted, whereby the survey was run on both the old and the redesigned designs. The back-casting method incorporates a number of features:

- A graduated shift accounting for the level differences identified between the old and new level estimates for September 2002. This assumes that the differences between the new and old series observed at the September 2002 quarter have occurred gradually over the life of the previous survey. These differences have been smoothed back by a method that has ensured, where possible, the direction of quarterly changes of the historical series has been maintained.
- A level shift in the sales variable to account for the inclusion of royalties and patent fees.

The back-cast series are provided in an Excel spreadsheet attached to this article.

As a result of the analysis undertaken during the introduction of the new design, a number of errors were identified in the existing time series. In some instances it has been necessary to revise the previously published WTS series to incorporate this new information. The revised series are also provided in an Excel spreadsheet attached to this article.

2. Summary of changes

The previous WTS series was based on a statistical sample that was first surveyed in the March 1995 quarter. The last quarter of the old WTS was the September 2002 quarter. The WTS was a panel survey. Businesses had one chance of selection at their birth, and those that were introduced then remained in the sample until either they ceased operation in the wholesale industry or the panel was reselected.

Over time, sample designs become less effective in representing the current population. While the original samples are maintained to include a representative selection of new businesses, periodically, panel samples need to be refreshed to reflect changes in the composition of the population.

The WTS has been redesigned to provide better and more up-to-date coverage of the wholesale population. The new WTS design will, over time, allow changes in the composition of the population to be better represented in the survey.

Changes to the WTS (which will be discussed in more detail in section 5 below) include:

- a redesign of the survey questionnaire
- the inclusion of royalty and patent fees within the definition of operating income
- additional industry detail as the basis for the sample design
- the use of administrative (tax) data for small to medium-sized businesses in place of direct surveying
- the adoption of periodic re-selection of the survey sample population
- the use of bi-variate stratification in the sample design
- improvements in non-response imputation methodologies.

These changes have been made to ensure that the future estimates produced from the WTS accurately reflect activity in the wholesale sector of the New Zealand economy.

During the September 2002 quarter, the WTS was calculated on both the old and new basis. The primary purpose of this 'dual run' was to enable the comparison of the surveys run under the previous and redesigned methods, so that the two series could be linked at a single point in time. This facilitated the production of an analytical back series for the redefined output industries. Another important function of the dual run was to measure level shifts in the results coming from the two different designs, so that the results can be verified and explained.

The dual run exercise highlighted the importance of undertaking regular reselection of panel surveys in order to maintain their representativeness of the contemporary population.

3. Dual run and linking

For the September 2002 quarter, the WTS was run on both the old and new basis, providing an overlap quarter to allow for linking the old and new survey estimates.

There are a number of factors that have contributed to the difference in level estimates between the old and new surveys for the September 2002 quarter. These include:

- conceptual differences in the variables collected (eg royalty and patent fees)
- conceptual differences in the derivation ANZSIC classification
- the previous sample becoming less effective in representing the current wholesaling population
- sample error
- non-sample error

Of the above reasons, differences due to conceptual changes have been able to be directly measured and allowed for in the back-casting of the new survey results.

Non-sampling errors in the survey data may result from errors in the sample frame, respondent error; mistakes made during processing survey results; and non-response imputation. Statistics New Zealand adopts procedures to detect and minimise these types of errors, but they may still occur and where not detected are not quantifiable.

Sampling error is a measure of the variability that occurs by chance because a sample rather than an entire population is surveyed.

The old WTS sample was designed to give statistics at the following levels of

accuracy (at the 95 percent confidence interval limit):

- 4 percent for total sales and total stocks
- 3 percent for inter-period movement in total sales and total stocks
- 15 percent maximum for storetype sales.

The new WTS sample was designed to give statistics at the following levels of accuracy (at the 95 percent confidence interval limit):

- 5 percent for total sales and total stocks
- 2.5 percent for inter-period movement in total sales and total stocks
- 10 percent total sales and total stocks at the detailed industry level.

4. The back-cast series

The following graphs provide a comparison of the back-cast series from the new survey, along with data derived from the old survey.

The series labelled "Original" reflect the estimates that came from the old WTS design. In many instances the new published industries are more detailed than those that were originally published. In these cases, the old survey data has been re-compiled on the new industry basis.

The series labelled "Linked" represent the final analytical back series for the new WTS. The difference between the "Original" and "Linked" series at the September 2002 quarter represents conceptual differences, the aging of the sample that has occurred over the life of the old survey, and possible sample and non-sample error. This difference has been smoothed back over the historical back series. The smoothing methodology employed has ensured that where possible the inter-period direction of the movement in the "Original" series is preserved.

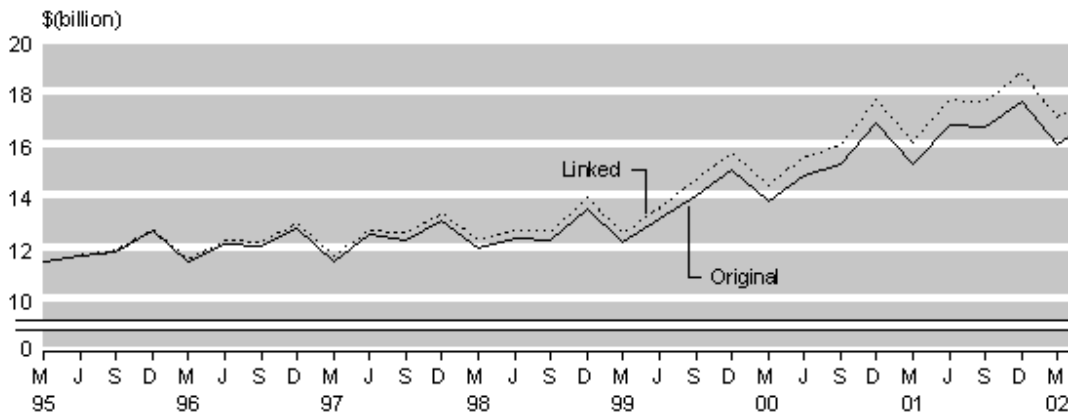
Link factors were calculated explicitly for each of the three variables for which an analytical back series was produced. The link factors are calculated as the ratio of the new survey estimate for the variable to the "Original" estimate for the old series. A link factor of greater than one represents an estimated under-coverage in the old survey estimate.

The link factors for the operating income variable at the September 2002 quarter are summarised in the table below.

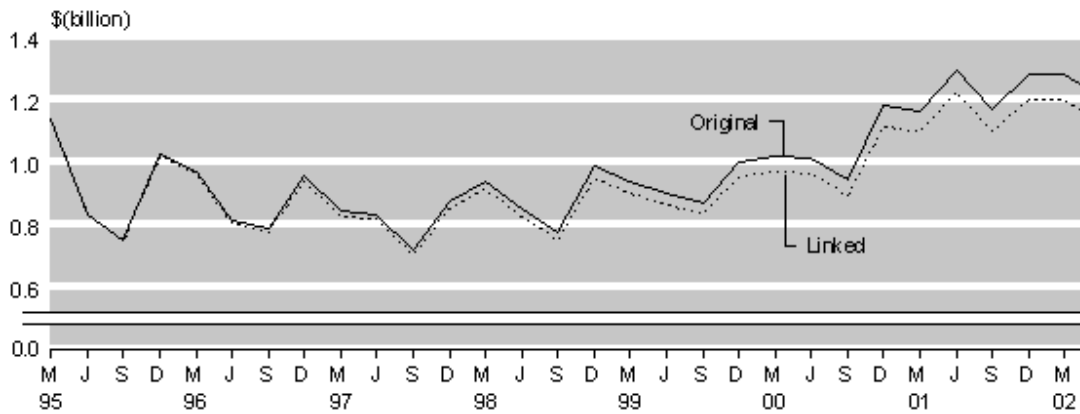
Link Factors for Operating Income – September 2002 quarter

Industry	Link factor
Unprocessed Primary Products Wholesaling	0.93
Petroleum Product Wholesaling	0.97
Metal and Mineral Product Wholesaling	0.94
Chemical Wholesaling	1.16
Builders Supplies Wholesaling	0.85
Farm, Construction, Professional & Business Equipment Wholesaling	1.16
Electrical and Electronic Equipment Wholesaling nec	0.86
Machinery and Equipment Wholesaling nec	1.34
Motor Vehicle Wholesaling	1.19
Primary Products Wholesaling	1.05
Food and Grocery Products Wholesaling	1.13
Textile, Clothing & Footwear Wholesaling	1.02
Household Good Wholesaling	0.96
Wholesale Trade nec	1.24
Books and Paper Product Wholesaling	1.04
Pharmaceutical and Toiletry Wholesaling	1.14
Total Wholesale Trade	1.06

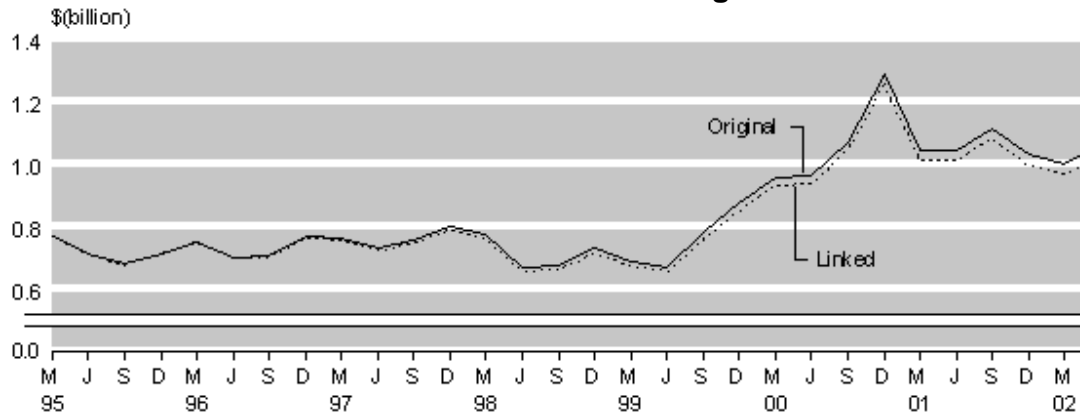
Wholesale Trade Sales



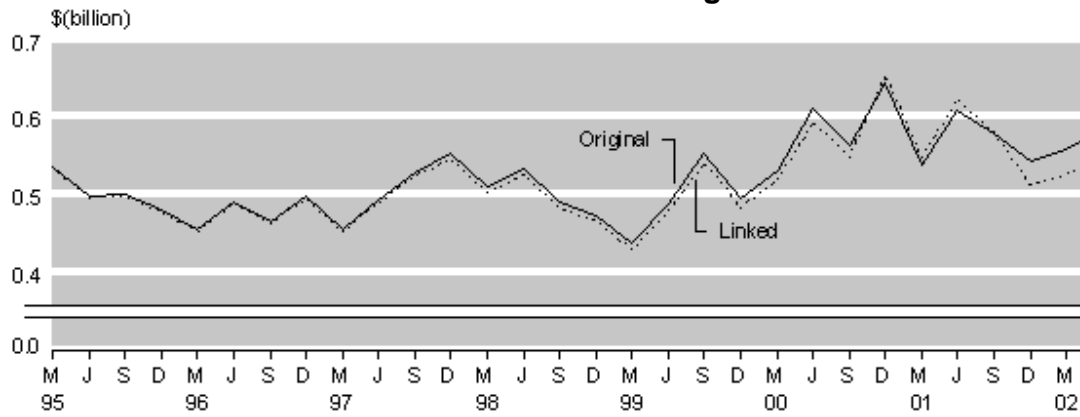
Unprocessed Primary Products Wholesaling Sales



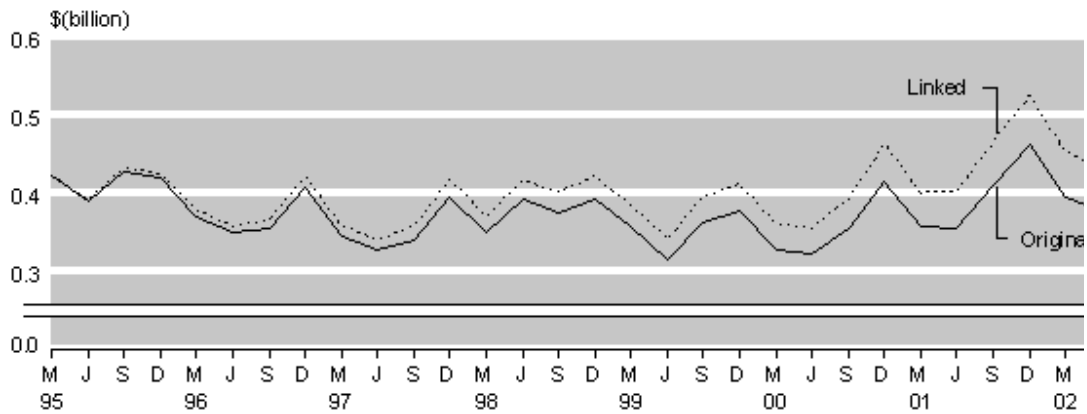
Petroleum Product Wholesaling Sales



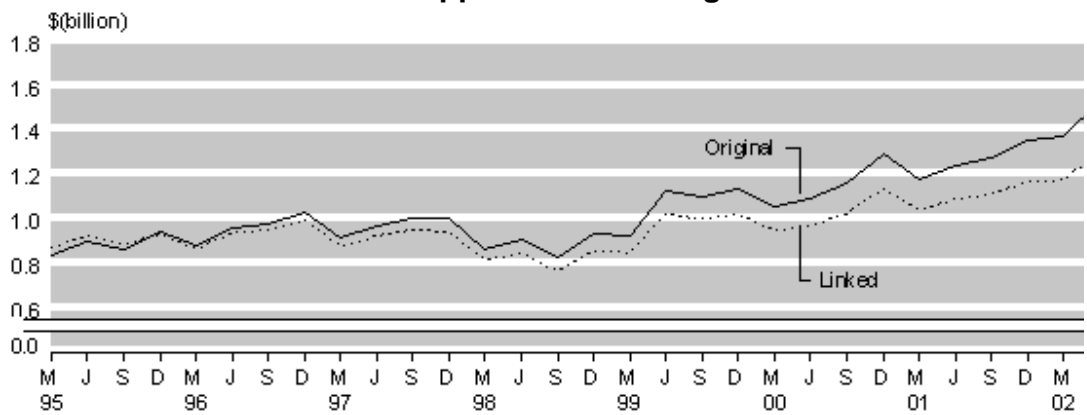
Metal and Mineral Wholesaling Sales



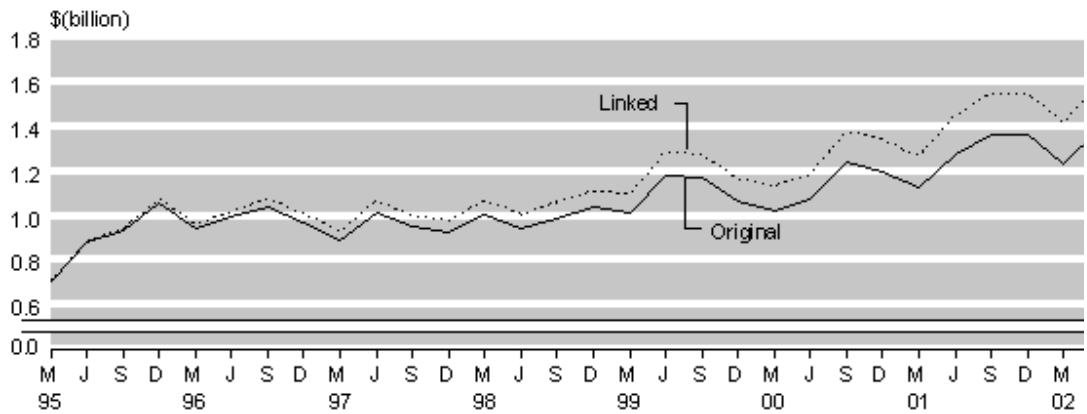
Chemical Wholesaling Sales



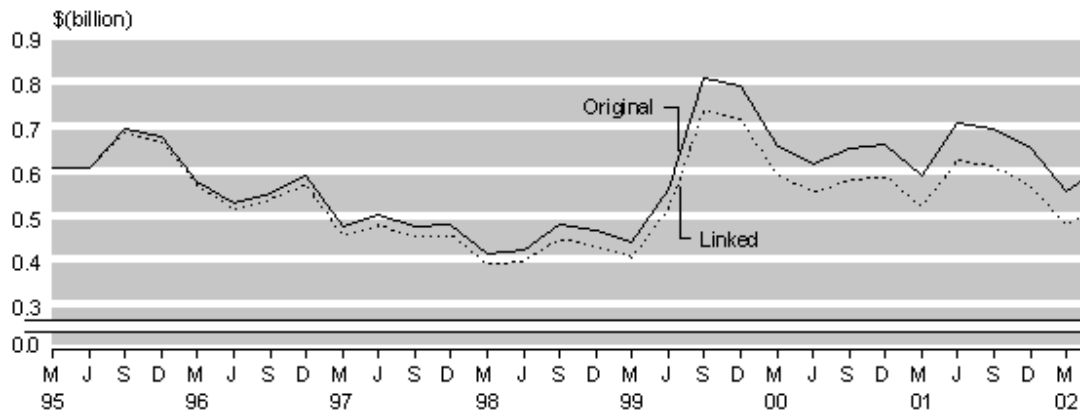
Builders Supplies Wholesaling Sales



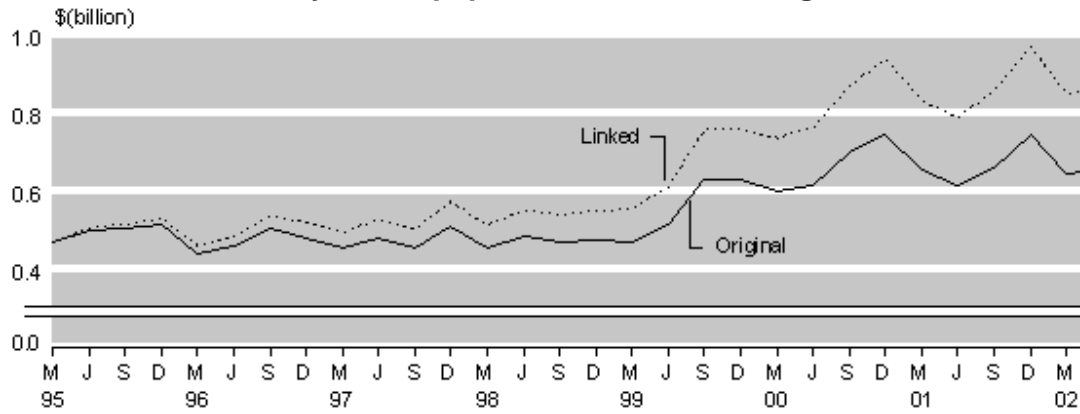
Farm, Construction, Professional & Business Equipment Wholesaling Sales



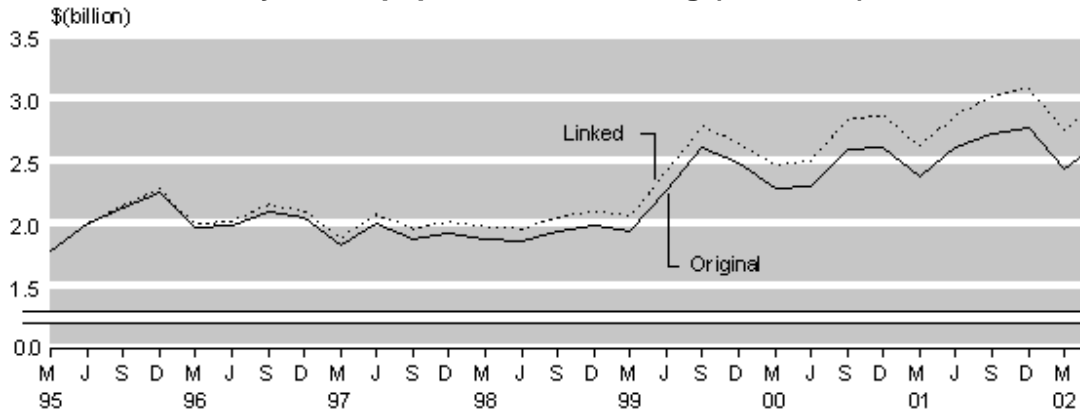
Electrical and Electronic Equipment Wholesaling Sales



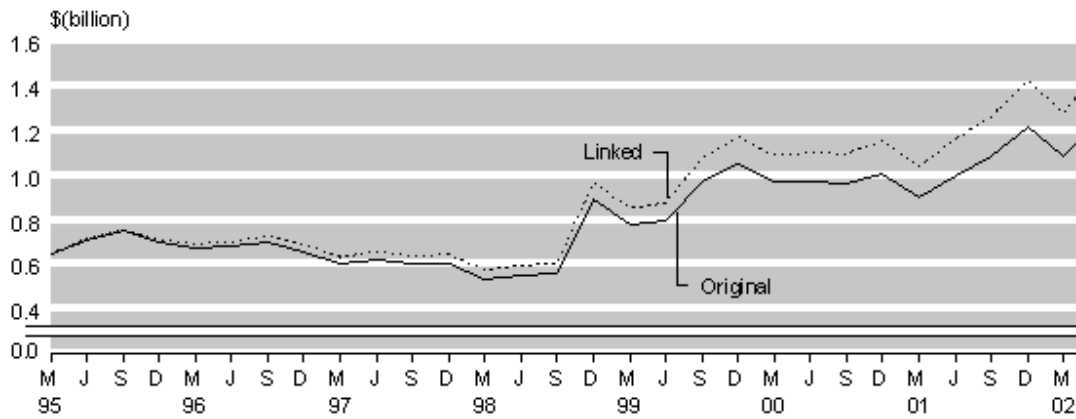
Machinery and Equipment nec Wholesaling Sales



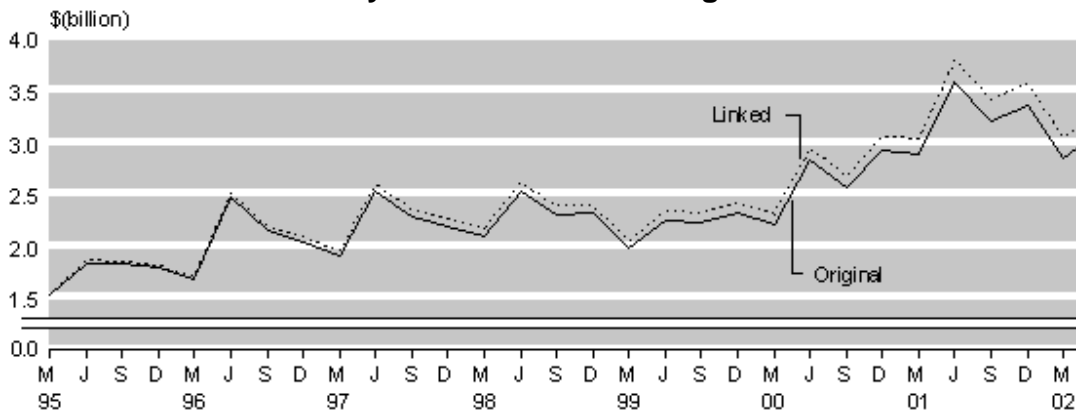
Machinery and Equipment Wholesaling (old basis) Sales



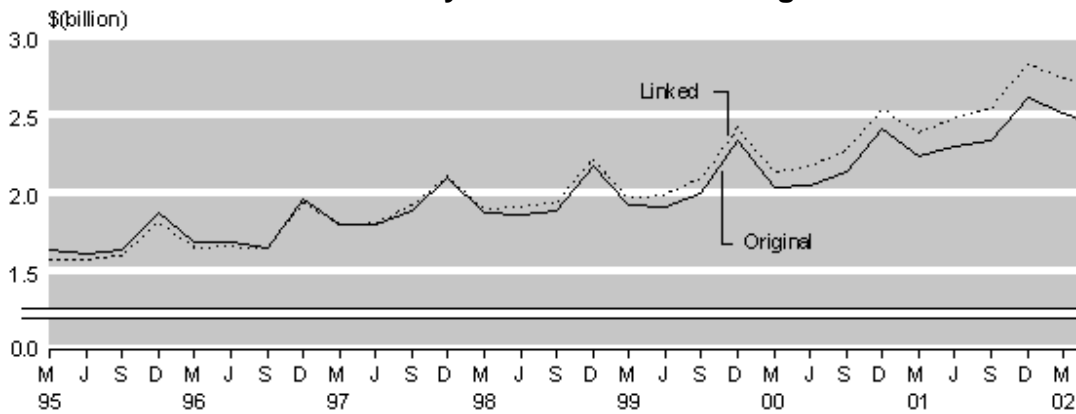
Motor Vehicle Wholesaling Sales



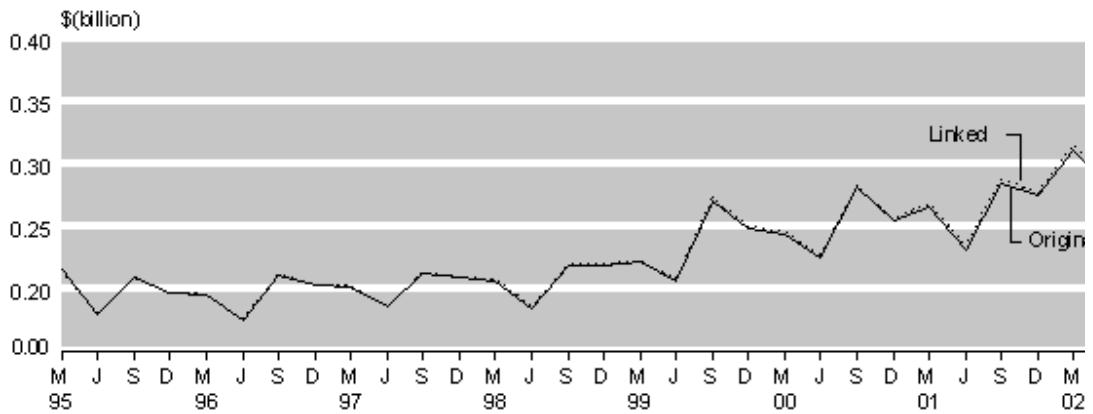
Primary Products Wholesaling Sales



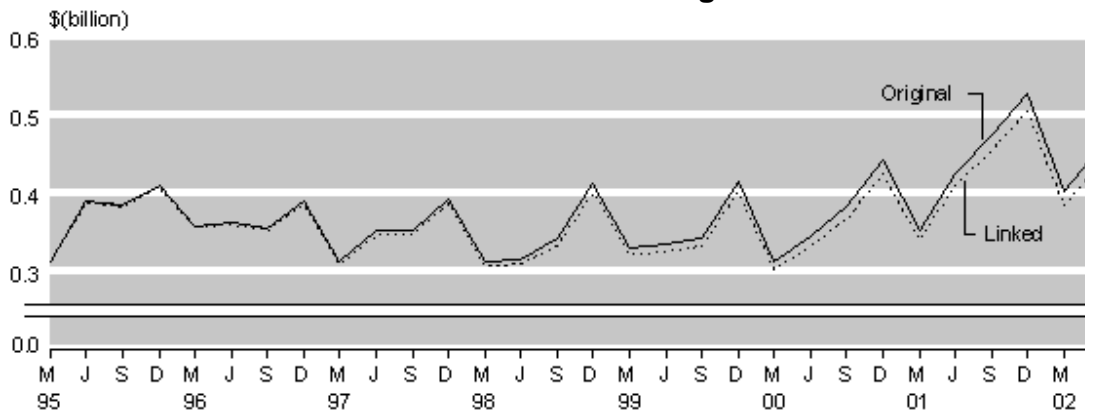
Food and Grocery Products Wholesaling Sales



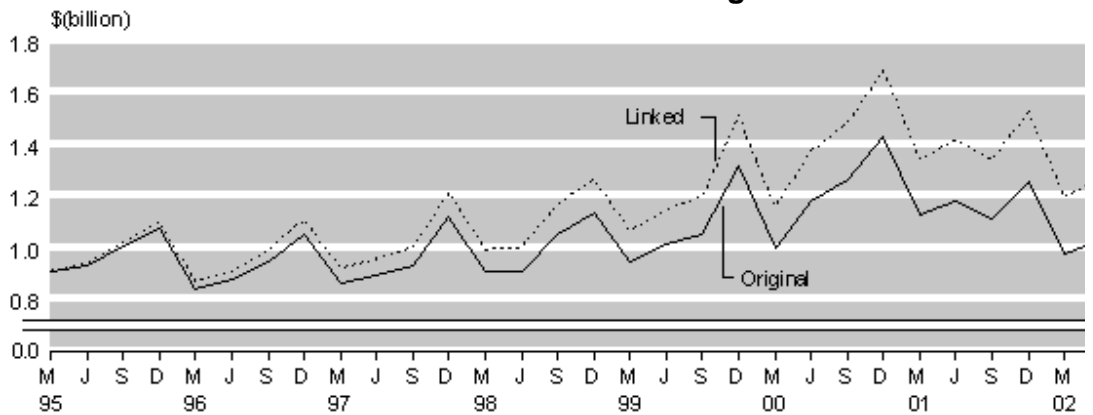
Textile, Clothing and Footwear Wholesaling Sales



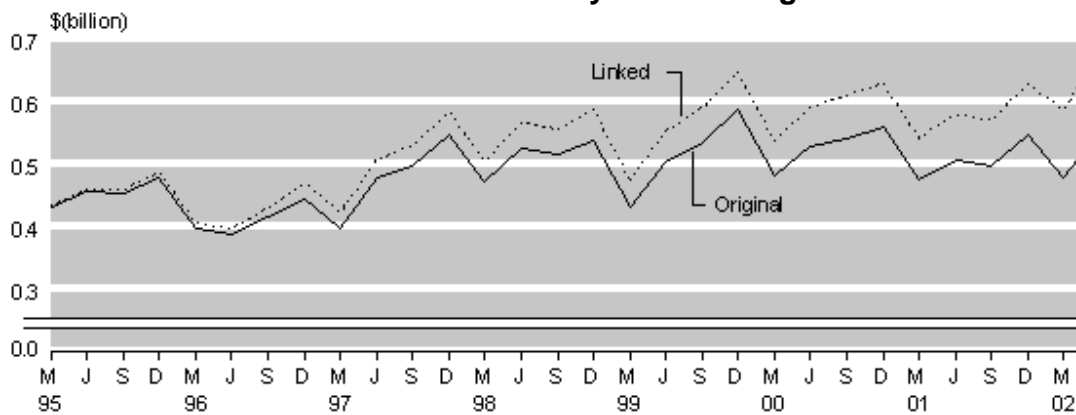
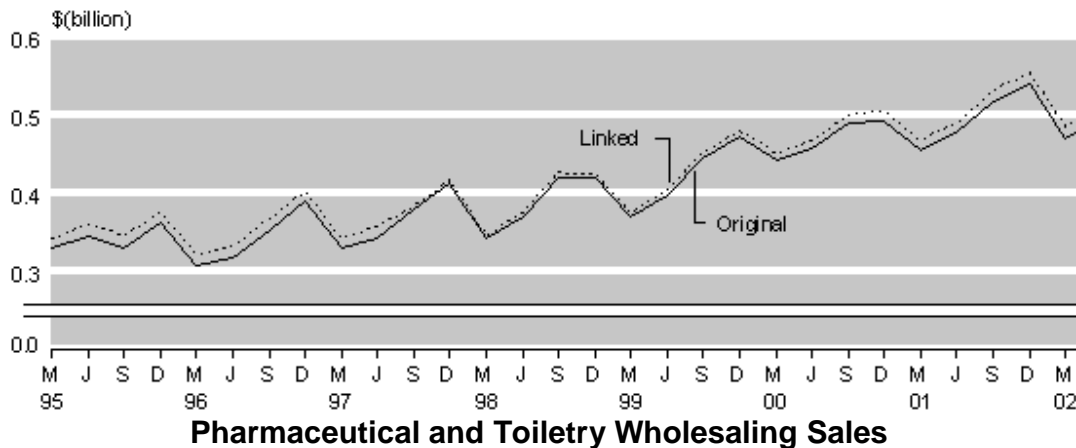
Household Good Wholesaling Sales



Wholesale Trade nec Wholesaling Sales



Books and Paper Product Wholesaling Sales



5. Details of changes

There were a number of distinct changes made to the WTS during the redesign process. These are detailed as follows:

5.1 Questionnaire redesign

Following consultation with key users of the WTS and extensive pilot testing of the questionnaire with respondents, both the content and the format of the questionnaire have been revised.

The content of the questionnaire was reviewed with a focus on meeting the core data requirements of users, while being mindful of the burden that such collection places on respondents. Initial testing had the following variables of interest included in the questionnaire:

- operating income
- operating expenditure
- salaries and wages
- closing stocks (raw materials)
- closing stocks (finished goods, work in progress and trading)

stocks).

Following questionnaire testing and consultation with users, it was determined that the inclusion of the operating expenditure and salaries and wages variables would impose a level of additional respondent load that could not be justified. Consequently, the final questionnaire collects the following variables:

- operating income
- closing stocks (raw materials)
- closing stocks (finished goods, work in progress and trading stocks).

The content of the questionnaire and the format have also been updated to allow for variable inclusions/exclusions to be more clearly specified. The questionnaire was also designed to allow for scanning to be used as a data capture mechanism in the future.

5.2 Royalties and patent fees

In the previous WTS design, royalties and patent fees were excluded from the conceptual definition of operating income.

The New Zealand System of National Accounts (NZSNA) treatment of royalties and patent fees was updated in 2000 to include these fees within the definition of operating sales and expenditure. In order to maintain consistency with the NZSNA treatment of these items, the operating income question was revised.

During the operation of the September 2002 quarter survey, respondents provided details of the amount of royalty and patent fees included in their responses. This information has been used to calculate link factors for the September 2002 quarter, which have also been incorporated into the back-cast series.

5.3 Change to ANZSIC design level

The previous WTS had been designed to provide estimates for 13 ANZSIC industries. While ANZSIC has again been used as the basis for the industry definitions, the redesigned WTS has used the 16 industry definitions under which Statistics New Zealand produces estimates of the gross domestic product. In most instances, the new industries are either a one-to-one match with the previously published industries or a straight disaggregation of those industries. There are two instances, however, where an industrial activity has 'moved' between industries.

ANZSIC F4712 – Poultry and smallgood wholesaling

Under the previous design, this activity was included under food and grocery product wholesaling. The 2002 redesign has included this activity under primary products food wholesaling.

ANZSIC F4739 – Household goods wholesaling nec

Under the previous design, this activity was included under building materials supplies and hardware wholesaling. The 2002 redesign has included this activity under household good wholesaling.

The table below presents a concordance between the old and new industries.

ANZSIC	Previous Storetype	Redesigned Industries
	Unprocessed Primary Products - non Food	
4511	Wool Wholesaling	F0111 – Unprocessed primary products wholesaling
4512	Cereal Grain Wholesaling	
4519	Farm Produce and Supplies Wholesaling	
	Primary Products Food	
4711	Meat Wholesaling	F0164 – Primary products food wholesaling
4713	Dairy Produce Wholesaling	
4714	Fish Wholesaling	
4715	Fruit and Vegetable Wholesaling	
	Food and Grocery Products	
4712	Poultry and Smallgood Wholesaling	F0164 – Primary products food wholesaling
4716	Confectionery and Soft Drink Wholesaling	F0165 – Food and grocery products wholesaling
4717	Liquor Wholesaling	
4718	Tobacco Product Wholesaling	

4719	Grocery Wholesaling nec	
	Textiles, Clothing and Footwear	F0171 – Textile, clothing and footwear wholesaling
4721	Textile Product Wholesaling	
4722	Clothing Wholesaling	
4723	Footwear Wholesaling	
	Household Appliances, Furniture and Floor Coverings	F0172 – Household good wholesaling
4731	Household Appliance Wholesaling	
4732	Furniture Wholesaling	
4733	Floor Covering Wholesaling	
	Building Materials, Supplies and Hardware	
4531	Timber Wholesaling	F0131 – Builders supplies wholesaling
4539	Building Supplies Wholesaling	
4739	Household Good Wholesaling nec	F0172 – Household good wholesaling
	Paper and Paper Products	F0174 – Books and paper product wholesaling
4794	Book and Magazine Wholesaling	
4795	Paper Product Wholesaling	
	Petroleum and Petroleum Products	F0121 – Petroleum product wholesaling
4521	Petroleum Product Wholesaling	
	Pharmaceuticals and Chemicals	
4523	Chemical Wholesaling	F0123 – Chemical wholesaling

4796	Pharmaceutical and Toiletry Wholesaling	F0175 – Pharmaceutical and toiletry wholesaling
	Metals	F0122 – Metal and mineral wholesaling
4522	Metal and Mineral Wholesaling	
	Motor Vehicle	F0151 – Motor vehicle wholesaling
4621	Car Wholesaling	
4622	Commercial Vehicle Wholesaling	
4623	Motor Vehicle New Part Dealing	
4624	Motor Vehicle Dismantling and Used Part Dealing	
	Machinery and Equipment	
4611	Farm and Construction Machinery Wholesaling	F0141 – Farm, construction, professional and business equipment wholesaling
4612	Professional Equipment Wholesaling	
4613	Computer Wholesaling	
4614	Business Machine Wholesaling	
4615	Electrical and Electronic Equipment Wholesaling nec	F0142 – Electrical and electronic equipment wholesaling
4619	Machinery and Equipment Wholesaling nec	F0143 – Machinery and equipment wholesaling
	Wholesale Trade nec	F0173 – Wholesale trade nec
4791	Photographic Equipment Wholesaling	
4792	Jewellery and Watch Wholesaling	
4793	Toy and Sporting Good Wholesaling	
4799	Wholesaling nec	

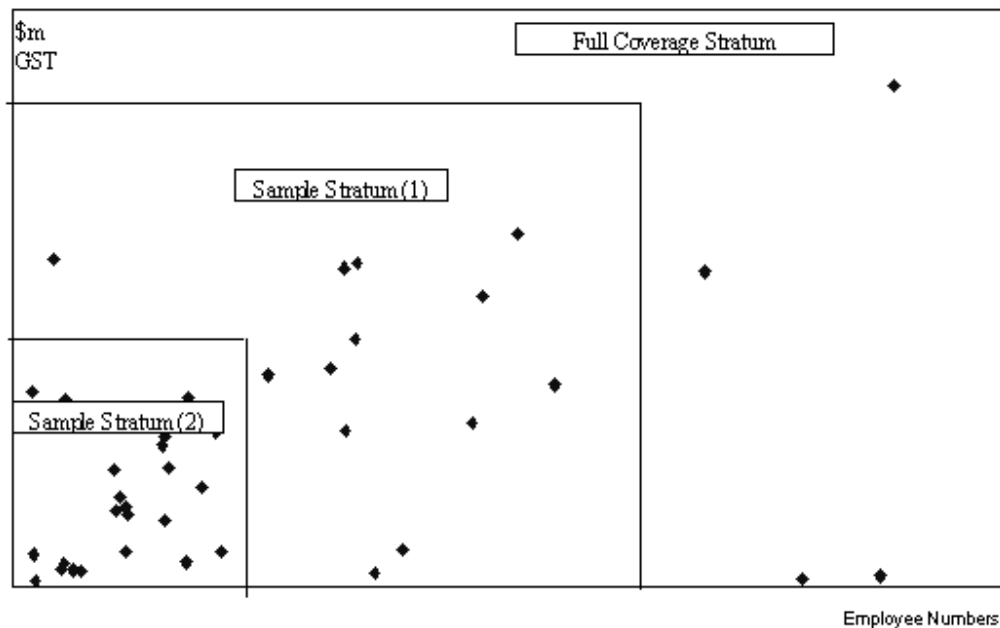
5.4 Bi-variate stratification

The previous WTS design used Full-Time Equivalent Employees (FTEs) as the sole stratification variable in specifying the sample strata boundaries.

The 2002 WTS redesign has made use of both FTE and annualised GST data in specifying the sample strata boundaries. Bi-variate stratification has been used in the Annual Enterprise Survey in recent years, and in the Economic Survey of Manufacturing (QMS) redesign in 2001. It has enabled sample design and selection to be more efficient.

During the 2002 WTS redesign, bi-variate stratification, together with the use of tax data as a survey substitute for smaller businesses, has allowed Statistics New Zealand to lower the postal sample size by approximately 35 percent from 1,750 to 1,100 units, while maintaining the desired levels of accuracy.

A diagrammatic representation of bi-variate stratification appears below.



5.5 The use of administrative data

One of the challenges facing Statistics New Zealand is the desire to reduce compliance costs, particularly for small and medium-sized businesses. With this in mind, the redesign of the WTS undertook a thorough investigation into the potential use of existing administrative data sources in place of collecting

data by direct survey. This follows a similar investigation with respect to the redesigned QMS in 2001.

As a result of this research, the 2002 WTS redesign has resulted in a survey design that makes extensive use of taxation data sourced from Inland Revenue. It should be noted that while Statistics New Zealand has been given access to taxation data for statistical purposes, there is no reciprocal flow of respondent information from Statistics New Zealand to Inland Revenue.

The first use of administrative data has been in the bi-variate stratification as previously mentioned. GST data has also been used in place of directly surveying for small businesses in the wholesaling population. Using this approach, the GST (sales and purchases) data is used to model the variables, which would otherwise have been collected by a postal questionnaire.

For each of the units that fall within the tax stratum, their GST data is used to provide the variables that are contained in the postal questionnaire. For each variable a different approach is used, as summarised in the following table.

Method of Modelling Variables for Tax Stratum	
Variable	Modelling method
Sales	GST sales used
Closing Stocks – Raw Materials	Ratio of Raw Materials Stocks to GST purchases from surveyed units within the same detailed industry is applied to GST purchases.
Closing Stocks – Finished Goods & Work in Progress	Ratio of Finished Goods Stocks to GST purchases from surveyed units within the same detailed industry is applied to GST purchases.

Within each of the 16 publication industries, the contribution of the tax stratum to the industry total varies. The contribution depends upon such things as the size of the industry participants, as well as their distribution and concentration within the various strata defined for that industry.

The contribution of administrative data to the WTS sales results for the September 2002 quarter is provided in the following table.

Contribution of Tax Strata to Industry Sales – September 2002 quarter	
Industry	% Contribution
Unprocessed Primary Products Wholesaling	15.2
Petroleum Product Wholesaling	2.4

Metal and Mineral Product Wholesaling	7.3
Chemical Wholesaling	17.3
Builders Supplies Wholesaling	14.5
Farm, Construction, Professional & Business Equipment Wholesaling	16.3
Electrical and Electronic Equipment Wholesaling nec	18.1
Machinery and Equipment Wholesaling nec	15.3
Motor Vehicle Wholesaling	14.8
Primary Products Wholesaling	12.4
Food and Grocery Products Wholesaling	8.1
Textile, Clothing & Footwear Wholesaling	15.3
Household Good Wholesaling	14.6
Wholesale Trade nec	17.7
Books and Paper Product Wholesaling	13.7
Pharmaceutical and Toiletry Wholesaling	19.6
Total Wholesale Trade	13.2

It is interesting to note that while the overall contribution of the tax stratum is only 13.2 percent of the total wholesale trade sales, it accounts for approximately 84 percent of the units in the wholesale trade population, as shown in the table below.

Units in the Wholesale Trade Population – September 2002 quarter	
Treatment in WTS	% of Total population
Sampled (ie received a questionnaire)	6.9
Non-sample	9.0
Tax	84.1
	100.0

5.6 Periodic reselection

Statistics New Zealand conducts panel surveys to provide the best estimates of movements between periods. This is because, where possible, the same businesses are reporting from period to period.

One of the acknowledged drawbacks of a panel sample survey is that over time the initial selection of units will become less representative of the contemporary population. This means that the results from the survey can become similarly less representative.

A comprehensive study was undertaken by Statistics New Zealand to assess a range of options to overcome this issue, and hence improve the ongoing quality of the survey estimates from the QMS that was redesigned for the June 2001 quarter. This investigation recommended that, as part of the 2001 QMS redesign, a periodic reselection policy be adopted. The investigation and its recommendation were peer reviewed and approved by the methodology unit of the Australian Bureau of Statistics. This approach has also been applied to the WTS redesign.

Under periodic reselection, the underlying strata boundary definitions remain unchanged, while the units in the population of interest are re-assigned within these strata based on their current values for the stratification variables. The weights applied to sampled units are then re-calculated.

Reselection is beneficial because units that are growing (or shrinking) can be promoted or demoted between the appropriate strata, and move in or out of postout as required. This ensures representative coverage of units growing faster than average, especially for births, and is expected to reduce potential bias.

Another conclusion from the study was that reselection should be done every quarter, rather than less frequently (eg annually) to reduce the level of discontinuities that occur when different units are selected or not selected.

5.7 Imputation and estimation methodology changes

The 2002 WTS redesign has also taken the opportunity to introduce an enhancement to the range of non-response imputation methods.

Previously, the WTS used either historical or mean imputation in the event of non-response. It is now possible to make use of the tax data for non-response imputation using regression techniques. In many instances, this has been found to produce superior imputation results to the traditional historical and mean methods.

The following table provides an indication of the degree and nature of the imputation that took place for the September 2002 quarter.

Total Wholesale Trade Operating Income – September 2002 quarter		
	(\$ million)	% of Total
<i>Medium to large businesses</i>		
Actual responses	13,346	79.9
Regression imputation	997	6.0

Historical imputation	42	0.3
Mean imputation	103	0.6
<i>Small Businesses</i>		
Administrative data	2,210	13.2
		100.0

6. Series available on request

The analytical back series for the new survey, and the revised survey results for the previous WTS design are available either as downloadable files on the Statistics New Zealand website or can be supplied in hard copy on request.

7. Attachments

7.1 Analytical back series

The following spreadsheet contains the analytical back series from the March 1995 quarter.



TSM download.xls

The following spreadsheet contains the standard *Hot Off The Press* tables for the analytical back series.



All tables (new series).xls

7.2 Revised WTS series

The following spreadsheet contains the previous WTS series that have been revised.



All tables (old WTS revised).xls

These attachments can be downloaded from our website www.stats.govt.nz.

Alternatively, contact Rochelle Barrow on (03) 964 8982.

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<http://www2.stats.govt.nz/domino/external/pasfull/pasfull.nsf/7cf46ae26dcb6800cc256a62000a2248/4c2567ef00247c6acc256cde007ac608?OpenDocument>