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Technical Guide for the Telecommunications Services Producer Price Indexes

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Technical Guide for the Telecommunications Services Producer Price Indexes

by **Zekai Shao** and **Norman Chalk**

Introduction

The telecommunications services producer price indexes (TSPPI) are quarterly series of producer price indexes that measure changes over time in the prices received by telecommunications service providers (TSPs) in Canada for the provision of four different telecommunications services.

The four telecommunications services included in the TSPPI are based on Statistics Canada's North American Product Classification System (NAPCS) 2022 and are classified as follows:

- Fixed telecommunications services (except Internet access) (FTS) (NAPCS 723321/723311)
- Mobile telecommunications services (MTS) (NAPCS 723323/723313)
- Cable, satellite and other program distribution services (CSOPDS) (NAPCS 723411/723412)
- Fixed internet access services (FIAS) (NAPCS 723322/723312)

This document details the price index methodology for all four telecommunications services.

The TSPPI series are deflators in the telecommunications services sector primarily used by the Industry and Canadian Macroeconomic Accounts (CMEA) to arrive at estimates of real value added for the industry and to measure changes in productivity. They also enable macroeconomic analysis by external stakeholders.

Note that the TSPPI should not be used to infer conclusions related to price trends faced by consumers. Certain telecommunications services are also measured by the Consumer Prices Division at Statistics Canada and their price trends should be used for the aforementioned purpose.

Data

In the absence of transaction-level data provided by telecommunications providers, data used in the calculation of the prices and the weights are collected by the Canadian Radio-television and Telecommunications Commission (CRTC) in partnership with Statistics Canada using the Quarterly Survey of Telecommunications (QST). Upon completion of the quarterly data collection, the data are shared with Statistics Canada's Producer Prices Division for purpose of creating the producer price indexes (PPIs).

The QST collects revenue and quantity information grouped by service from various providers. Each service covers several service types, and each service type may have one or more service groups (residential, business, wholesale). The current data availability for all services can be found in the table below.

Table 1
Data Availability

		Retail		
Service	**Service Type**	**Residential**	**Business**	**Wholesale**
FTS	Local and Access	✓	✓	✓
	Long Distance[1]	✓	✓	✓
MTS	Voice	✓		
	Data Only	✓		
	Voice and Data	✓		

Table 1
Data Availability

Service	Service Type	Retail		Wholesale
		Residential	Business	
CSOPDS	Cable	✓		
	Direct-to-home Television (DTH)	✓		
	Internet Protocol Television (IPTV)	✓		
FIAS	High Speed	✓	✓	✓
	Dial-up	✓	✓	✓

1. Long Distance will be discontinued due to data availability starting from 2026.
Source: "Statistics Canada: Quarterly Survey of Telecommunications"

Note that for MTS and CSOPDS, the revenue and quantity of residential and business are grouped together as a whole called retail. Additionally, wholesale data are used in index calculation whenever they are available. While these data have been unavailable as of recently, we expect some data to be reported soon.

The QST also collects the number of subscribers of residential and business high-speed internet plans, differentiated by the advertised speed. This information is used as part of the quality adjustment to the FIAS index, which will be explained later in this document.

With each release, data for the previous quarter may have been revised. These revisions may occur when late data are collected from an establishment or when an establishment revises previously reported data.

Pricing Methodology

Revenue[1] and quantity data obtained from the QST are used to derive prices using a unit value methodology. Unit value methodology is described as the ratio of revenues to quantity at the lowest level of aggregation for a homogeneous group of products (e.g. all mobile residential voice and data plans from a telecommunications provider). This methodology was chosen due to the nature of the source data and is one of the common international practices in measuring the telecommunications industry. Other international practices include component pricing methodology, hybrid methodology (component + unit value) and more.[2]

Unit prices are calculated for each telecommunications provider, by dividing the company's quarterly revenue, attributed to a service group at the lowest level of aggregation, by its corresponding quantity.

Fixed Telecommunications Services Unit Prices

The FTS is composed of two services: local and access services, and long-distance services. Unit prices at time t for group g of company c are calculated differently as follows:

Local and access services (LAC):

$$\text{Unit Price}^{t}_{g,c} = \frac{\text{Revenue}^{t}_{g,c}}{\#\text{ of Lines}^{t}_{g,c}}$$

1. The revenues used in the unit value calculation refer only to the revenues attributable to the telecommunications service, and not the associated equipment revenue (e.g. phones, routers, etc.). Equipment revenue is currently not tracked by the TSPPI.
2. Detailed descriptions of these methodologies, as well as their advantages and disadvantages, are available in OECD/Eurostat (2014), Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services: Second Edition, OECD Publishing, Paris, https://doi.org/10.1787/9789264220676-en.

Long distance services (LD):

$$\text{Unit Price}^{t}_{g,c} = \frac{\text{Revenue}^{t}_{g,c}}{\text{\# of Minutes}^{t}_{g,c}}$$

Mobile Telecommunications Services Unit Prices

The MTS index combines mobile voice and mobile data services in one measure. Revenue and quantity data are collected from each company providing retail telecommunication services. From there, the unit value, with the total number of mobile subscribers as the denominator, is adjusted using speed of data transmission over time. Unit prices at time t for group g of company c for all three types of MTS are thus calculated as follows:

$$\text{Unit Price}^{t}_{g,c} = \frac{\text{Revenue}^{t}_{g,c}}{\text{\# of Subscribers}^{t}_{g,c} \cdot \text{Quality}^{t}}$$

where

$$\text{Quality}^{t} = \log(\text{Speed}^{t})$$

Such that the faster the speed, the lower the unit price. Note that the speed is the average download speed of mobile internet across Canada over the reference period and is not distinguished by providers. Hence, the quality adjustment factor is the same for all providers in the same reference period. By taking a logarithm, we reduce the effect of the quality adjustment factor as the speed increases to better represent the diminishing improvement in user experiences.

Cable, Satellite and Other Program Distribution Services Unit Prices

The CSOPDS index covers three different service types, cable, direct-to-home television (DTH), and internet protocol television (IPTV). For each service type, the unit price at time t for group g of company c is calculated as follows:

$$\text{Unit Price}^{t}_{g,c} = \frac{\text{Revenue}^{t}_{g,c}}{\text{\# of Subscribers}^{t}_{g,c}}$$

Fixed Internet Access Services Unit Prices

As previously mentioned, in addition to the revenue and quantity data, the QST also collects the number of subscribers of high-speed internet plans (excluding wholesale). These numbers combined with advertised speed are used to calculate a provider-specific quality adjustment factor. Unit prices at time t for group g of company c are calculated as follows:

Dial-up & High Speed (Wholesale):

$$\text{Unit Price}^{t}_{g,c} = \frac{\text{Revenue}^{t}_{g,c}}{\text{\# of Subscribers}^{t}_{g,c}}$$

High Speed (Residential & Business):

$$\text{Unit Price}^{t}_{g,c} = \frac{\text{Revenue}^{t}_{g,c}}{\text{\# of Subscribers}^{t}_{g,c} \cdot \text{Quality}^{t}_{g,c}}$$

where

$$\text{Quality}^{t}_{g,c} = \log(\text{Weighted Average Speed}^{t}_{g,c})$$

and

$$\text{Weighted Average Speed}^{t}_{g,c} = \frac{\sum_{i} w^{t}_{g,c_i} \cdot \text{Advertised Speed}^{t}_{g,c_i}}{\sum_{i} w^{t}_{g,c_i}}$$

The weight w is the number of subscribers of the advertised speed plan. Note that only plans with the following advertised speeds (measured in Mbps) are collected in the QST: 10, 25, 50, 100, 300, 940. Starting in 2025 Q1, the advertised speeds collected are: 10, 25, 50, 100, 200, 500, 940, 1500, 2500. Again, logarithm is used as the speed of internet has diminishing returns on user experiences.

Index Estimation and Aggregation

Two types of chained price indexes, Laspeyres and Paasche, are derived for all four telecommunications services. The index reference period (index = 100) is 2020 Q1 currently. The index calculations at time t for service s are as follows:

Laspeyres:

$$\text{Index}^{t}_{\text{Laspeyres},s} = \frac{\sum_{j,c} \text{Unit Price}^{t}_{s_{j,c}} \cdot \text{Quantity}^{t-1}_{s_{j,c}}}{\sum_{j,c} \text{Unit Price}^{t-1}_{s_{j,c}} \cdot \text{Quantity}^{t-1}_{s_{j,c}}}$$

Paasche:

$$\text{Index}^{t}_{\text{Paasche},s} = \frac{\sum_{j,c} \text{Unit Price}^{t}_{s_{j,c}} \cdot \text{Quantity}^{t}_{s_{j,c}}}{\sum_{j,c} \text{Unit Price}^{t-1}_{s_{j,c}} \cdot \text{Quantity}^{t}_{s_{j,c}}}$$

Where j represents service type and c represents company.

Limitations and Improvements

The unit value method can only be applied if the denominator used in the calculation represents a homogeneous unit of measure. To best satisfy this for the TSPPI, quality adjustments are used to normalize revenues within a service. Currently, limitations imposed by the absence of data prevent quality adjustment for wholesale high-speed internet. Additionally, the lack of plan-specific revenues of high-speed internet limits the homogeneity of aggregation. For MTS and CSOPDS, residential and business data are grouped together, though different services may have been offered. These data gaps are being reviewed and may be covered in the future by the QST.