

## Storable Goods, Chain Drifts, and the Cost of Living Index: New Methodology and Application to Japanese Data

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Chain drifts is one of the most serious issues in constructing price indexes based on scanner data. As shown by previous studies, the emergence of chain drifts is associated with temporary sale and consumers' stockpiling. Specifically, consumers purchase a lot on a sale day and far less on the other days, so that the Tornqvist weight associated with the price decline on the sale day is far greater than the weights on the other days, creating chain drifts. An important thing to note here is that this never happens in an economy only with perishable goods, simply because consumers cannot accumulate inventory on sale days in that economy. This implies that we need to discuss how to construct a cost of living index in an economy with *storable* goods, otherwise we will not be able to fully understand the mechanism through which chain drifts emerge and develop methodology to eliminate them. Given this understanding, we set up a model in which (1) goods are storable, (2) firms have incentive to conduct a temporary price reduction, and (3) consumers stockpile. Using this model, we discuss how to construct a chain-drift-free cost of living index.

The main contributions of this paper are threefold. First, we provide empirical evidence based on scanner data that consumers stockpiling plays an important role in accounting for consumers purchase (not consumption) behavior. Similar evidence is provided by Hendel and Nevo (2006) among others but we provide more direct and detailed evidence based on Japanese home scanner data. Second, we construct a model with storable goods and propose methodology to construct a chain-drift-free cost of living index. The basic structure of the model is similar to the ones used in previous studies, including Boizot, Robin, and Visser (2001) and Osborne (2018), but differ from them in that we model the role of warehouse firms. Warehouse firms do have inventory and conduct stockpiling depending on prices offered by manufacturers. However, consumers do *not* have inventory, and they purchase goods either from warehouse firms or from manufacturers to consume them immediately (i.e. on the day of purchase). This setting allows us to make clear distinction between purchase and consumption prices and to construct a cost of living index based on consumption price, which is free from chain drifts. Third, we use implications from model analysis to develop an algorithm to construct a chain-drift-free cost of living index. We apply this algorithm to Japanese scanner data to construct a chain-drift-free cost of living index.