



MIT SCALE RESEARCH REPORT

The MIT Global Supply Chain and Logistics Excellence (SCALE) Network is an international alliance of leading-edge research and education centers, dedicated to the development and dissemination of global innovation in supply chain and logistics.

The Global SCALE Network allows faculty, researchers, students, and affiliated companies from all six centers around the world to pool their expertise and collaborate on projects that will create supply chain and logistics innovations with global applications.

This reprint is intended to communicate research results of innovative supply chain research completed by faculty, researchers, and students of the Global SCALE Network, thereby contributing to the greater public knowledge about supply chains.

For more information, contact
MIT Global SCALE Network

Postal Address:

Massachusetts Institute of Technology 77
Massachusetts Avenue, Cambridge, MA 02139 (USA)

Location:

Building E40, Room 267
1 Amherst St.

Access:

Tel: +1 617-253-5320
Fax: +1 617-253-4560

Email: scale@mit.edu
Website: scale.mit.edu

Research Report: ZLC-2009-18

Estimating the Benefits of Framework Contracting in Public Health Commodity Purchasing

Jessica Yip

For Full Thesis Version Please Contact:

Marta Romero

ZLOG Director

Zaragoza Logistics Center (ZLC) Edificio

Náyade 5, C/Bari 55 – PLAZA 50197

Zaragoza, SPAIN

Email: mromero@zlc.edu.es

Telephone: +34 976 077 605

Estimating the Benefits of Framework Contracting in Public Health Commodity Purchasing

Jessica Yip

EXECUTIVE SUMMARY

While spending on pharmaceuticals accounts for less than one-fifth of total public and private health spending in most developed countries, it represents up to a third of health spending in transitional economies and up to two-thirds in developing countries compared to less than one-fifth in developed countries. Despite the substantial spending on drugs, the lack of access to essential drugs continues to be one of the most serious global public health problems.

A lack of robust procurement systems and dependable distribution networks, which are essential aspects of a reliable health and supply system, are the main reasons for the low availability of necessary medicines in the public sector. In most countries, procurement is not done in a cost-effective manner nor are goods distributed quickly and efficiently. Coupled with high variability in lead times and uncertainty in demand, these factors contribute to a lack of access to medicines and high overall costs for public health commodity supply chains in developing countries.

Objective

The objective of this paper is to address gaps in current procurement practices through the use of long-term framework contracts with the flexibility to adjust order quantities and stagger shipments in order to better meet demand. Such contracts enable a buyer to adjust order quantities by a certain percentage above or below the amount that is initially committed to. Our research focuses on the impact of such framework contracting on supply chain costs, procurement activities, and public health commodity distribution. Because public health commodities encompass a vast amount of medicines, supplies, and diagnostics, a basket of common medicines is used as a proxy for all public health commodities.

Methodology

We created a model, estimated costs, and analyzed benefits of the following scenarios:

- Annual Contracting with One Delivery per Year
- Annual Contracting with Two Deliveries per Year
- Quantity Flexible Contracting with Two Deliveries per Year

For the purposes of this study, we chose two countries, Cambodia and Zambia, which have high heterogeneity in how their health supply chains are organized and in the types of contracts they use for the procurement of health commodities. We applied our model to Cambodia and Zambia and used our findings from these two countries to develop broader insights into the potential advantages of using framework contracts for public health commodity supply chains in developing countries.

Results

Although Cambodia and Zambia have different characteristics, health needs, and cost structures, they exhibit similar trends. Our analysis provided the following insights on how contracts affect the availability of medicines in developing countries:

- **Multiple Shipments**
 - When there is only one delivery per year, review periods are longer, lead times may be variable, and demand can change, so uncertainty in the system builds up. This then requires higher levels of safety stock in order to meet demand between replenishments and results in higher average total cost.
 - However, by increasing the number of replenishments per year, expiry rates and average total costs decrease since inventory is stored for shorter periods of time.

- **Volume Flexibility**
 - In annual contracting, since there is no flexibility to adjust orders like there is for framework contracts with volume flexibility, stock-outs are common. This leads to higher-cost purchases in the spot market or in private pharmacies, or requires an emergency order. Thus, average total costs for both types of annual contracting are higher than for framework contracts with volume flexibility.
 - In framework contracts with volume flexibility, average total costs decrease due a reduction in holding costs at both the central and district levels. Costs are further reduced because a decrease in stock-outs leads to a decrease in costly emergency procurements.

Additional Considerations

Although these results show the potential of volume flexibility contracts with multiple deliveries to reduce costs while increasing the availability of medicines, it is important to consider several aspects before broadly applying these contracts.

- **Demand Data**

Although framework contracts provide the ability to adjust order quantities, this type of contracting requires decision makers to determine appropriate order quantities to commit to as well as to properly set a confidence range. Thus, these contracts require some level of demand forecasting, albeit not to the precision that is necessary for annual contracting.
- **Distribution System**

Multiple deliveries per year allow for inventory to be replenished before it is depleted, which results in lower rates of stock-out. However, such a delivery arrangement requires a well-managed distribution system and inventory monitoring.
- **Medicine Characteristics**

For items with short shelf lives, such as vaccines, multiple deliveries may be beneficial to reduce wastage. For items that are prone to demand uncertainty, such as anti-malarials, framework contracts may provide the flexibility to adjust to changes in demand. However, for items that are substitutable or can be purchased in the spot market (or private pharmacies) with little to no mark-up costs, framework contracts may not be the most suitable since buyers can mitigate stock-outs by purchasing from the open market.

Conclusion

Our results suggest that framework contracts can prove to be a valuable mechanism in increasing access to medicines while reducing overall costs in the health supply chain. With the use of such contracts in the procurement process, access to essential medicines and life-saving treatments can improve for those in developing countries.