Logistics in Lagging Regions
Overcoming Local Barriers to Global Connectivity

Introductory Section of Draft Working Paper

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CONFFERENCE EDITION
1. Connecting Lagging Regions to Export Markets

Introduction

During the recent financial crisis more than a quarter of enterprises in North America and Europe that use third party logistics service providers decided to shorten their supply chains\(^1\). The firms also reduced their inventories. When enterprises have minimal buffers they then have little room for error in managing their supply chains and would have to rely on agile suppliers. Unless they have access to efficient logistics services, this tendency can work to the exclusion of producers in low income countries. In fact small scale farmers and enterprises in low and regions of middle income countries can easily lose out on the benefits of connecting to integrated global supply chains. The predicament of small sale producers is compounded by the fact that most live in areas that are remote from the core economic regions within countries and are not easily accessible. As a result, both scale and geographical alienation pose the risk that large numbers of people and significant chunks of territory in developing countries remain outside global supply chains. Obviously, this diminishes the opportunities for poverty eradication.

Globalization has had a tremendous effect on the level of integration of all countries into the international economy. It has generally provided huge opportunities for developing countries to achieve economic growth through international trade. Over the last few decades, reductions in formal barriers to trade have contributed to a dynamic export expansion that has improved incomes across the board in developing countries. Although the gains obtained from the elimination of trade barriers have been substantial, the logistics component of trade competitiveness has not received as much consideration until more recently. This is despite the fact that trade logistics is key to competitiveness by allowing goods to be shipped from where they are produced in one country to destination markets throughout the world.

Quite appropriately, the organization and performance of logistics in international trade in developing countries is now receiving a lot of attention. This stems from the need to better understand the constraints and weaknesses in the provision of trade support services to modern sectors and high value exports. There is evidence that the ability of producers in developing countries to benefit from international trade is generally compromised by high transaction costs. The producers are typically remote from global and in some cases domestic

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\(^1\) Robert C. Lieb and Kristin J. Lieb (2009) Executive Summary and Regional Comparisons 2009 3PL CEO Surveys
markets, a situation exacerbated by poor connecting logistics infrastructure and services characterised by high costs and unreliability.

**There is a High Cost of Shipping Small Volumes**

Logistics costs in lagging regions are high partly due to poor scale economies. The fundamental problem is of large areas, with ability to generate only small volumes of demand. There are low traffic volumes owing to thin economic density and this reduces consignment sizes on offer. The transaction lot size determines to a large extent the unit cost of transport (Figures 1a). As a result, small vehicles are used as otherwise larger vehicles experience high idle time, waiting for cargo consolidation. The use of small vehicles increases transport costs per unit carried. Thus, truck load costs more than rail wagon which costs more than unit train which costs more than shipping vessel, etc.

![Figure 1a Relative costs of modes of transport with different carrying capacities](image)
According to LPI 2010 data (World Bank, 2010) the marginal cost of shipping one additional tonne as part of a less than container load shipment is 47% higher than shipping the same quantity as part of a full container load. There is therefore a significant premium on small volumes and this presents a major hurdle to small scale producers who are not able to fill a container or a truck. Similar patterns are also observed in express shipping costs, where smaller quantities attract high costs than larger quantities (Figure 1b). When economies of vehicle size are important, as is apparent from the above, vehicles must be operated with high load factors. In areas with thin volumes this would only be possible between hubs. Less efficient or smaller capacity vehicles are then used to feed freight volumes to the hubs or to distribute from the hubs. The high themselves are connected by high capacity links and services.

Unless traffic volumes are high enough, consolidation and deconsolidation of traffic becomes important. However, the process of consolidation is itself not without cost. Shippers experience prolonged delays and increased costs while waiting for the volume of shipments to increase so as to be able for instance, to fill a container. The consolidation of shipments is typically handled by outside parties such as freight forwarders. Given these patterns, shipments involving small scale farmers and small scale enterprises are subject to high unit costs. Unless such enterprises consolidate volumes they may not be able to trade much beyond their immediate environs.

**Figure 1b Cost of express delivery from China to LAC, Africa, Central Asia**
In fact, there is a considerable amount of literature that shows that the probability of being an exporter increases with firm size (Wagner, 2003) and evidence also that the larger a firm is the easier it would be for it to engage in exporting (Bonaccorsi, 1992). However, this is often true for direct exports. There are also significant proportions of small firms that export indirectly, often through supplying inputs to other, larger firms. Further, there is some evidence that export intensity is positively correlated with firm size. However, some research findings suggest that this is only up to a certain maximum size where export intensity rises with size but beyond the limit there is a weak association. Small firms are argued to avoid international markets because they lack resources to manage market exchanges in distant locations unless they join in some kind of cooperative arrangement to gain critical mass. Therefore, in general small firms tend to trade locally and would not want to deal with the risks associated with exporting while large firms have to export to increase their sales.

This study explores the mechanisms that are available to small scale producers to reduce their costs of trade by adopting strategies to exploit scale economies. It focuses on the role of intermediaries who help facilitate market exchanges leading to international trade.

**Local Barriers to Global Connectivity**

Most of the existing and rapidly evolving body of work on trade and transport logistics has unsurprisingly focussed on the international dimensions of logistics of landlocked countries. Landlocked countries face special challenges in connecting to global supply chains deriving from long distances to seaports and the need to cross borders. These issues and their impacts have been studied intensively. It has been shown in Krugman (1991), Gallup et al (1998) and MacKellar et al (2000) that the distance to a seaport affects adversely a geographical area’s economic growth performance. Limao and Venables (2001) and World Bank (2010) have shown that the volume of trade flows of landlocked countries is smaller than those of others not similarly handicapped primarily due to high logistics costs and lower global economic integration. Hausmann (2001), Raballand (2003) and Raballand et al. (2010) establish that the costs of crossing borders are usually high, and the existence of a border often also imposes infrastructure costs if transport corridors on either side of it are not well coordinated. As a supporting corollary, the absence of frontier controls and informal cross border trade in some commodities can lead to substantial economic benefits through enhanced food security in certain cases (Ackello-Ogutu et. al. 2002; Schwartz, 2009).

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Beyond the variation in performance at the global scale, there is also considerable evidence that the problems faced at the local level can at times be worse. Krugman (1991) maintains that external economies of scale can be realized at the local as much as at the national and international levels. It is important to understand the factors that lead to increased competitiveness at the local level and it that regard, sensitivity to geography is important. Without serious efforts to improve their logistics and transport systems and the provision of trade support services at this level, large numbers of people in developing countries will not be able to take advantage of opportunities provided by globalization and lower rules-based barriers to trade (Carana, 2001). The key issue explored in this study is how small scale producers organise to overcome the friction of distance in a manner that enables them to connect to domestic and global supply chains.

As illustrated below (Figure 2), there are two scales at which to explore trade logistics, a sub-national scale that deals with how territories within a country are connected to the core regions and to logistics infrastructure and services for international connectivity and an international scale that encompasses global connectivity. Much more work has been done on the international logistics chains than on the local dynamics (e.g Teravaninthorn and Raballand, 2009). Yet there are regions even within large coastal countries that face as serious logistics problems as some landlocked countries. Improving access for such regions to core national and global markets can have a significant positive effect on incomes and poverty reduction. However, this is not easy to achieve given the geographical dispersion of the communities, who often produce goods in quantities that are not large enough to justify significant investments in services.

This paper explores how logistics systems are designed in lagging areas of large middle income countries. A sub-national scale is used to better understand the local-level constraints to and opportunities for enhancing export trade volumes and competitiveness. The focus is on the intermediaries who are involved at the early steps of a supply chain and how they influence freight volumes and costs.
There are five main reasons why the study is at the sub-national scale. Firstly, there has been a significant increase in governments and donor agency resources being invested in improving international trade corridors. The investment is either to increase production or to improve accessibility. The assumption is that following the investment there will be an improvement in trade flows following a reduction in logistics costs. The evidence of this happening is mixed, and in fact in some cases the infrastructure that is developed is not always appropriate to the demand that exists. It is important to understand the factors that shape service provision to better anticipate what the supply response is likely to be.

In an attempt to generate the virtuous cycles involving access improvements and demand generation there is increasing attention being paid to integrated approaches to corridor and regional development. The Spatial Development Initiative approach in Southern Africa and the concept of economic corridors as used in the Greater Mekong Sub-region (GMS) in East Asia are integrated planning tools aimed at promoting investment in regions that are underdeveloped but have potential for growth. The approach involves an initial upgrading of infrastructure followed by crowding-in of further public and private sector investments and a deepening of the sub-regional economic base to support local economic development. In developing the corridors, investments are focused on the same geographic space to maximize development.
impact while minimizing development costs. The success of the approach is conditional on there being sufficient latent potential in the project locality. An example of the concept in operation is the Maputo Development Corridor linking South Africa and Mozambique. There has been significant investment in farming and mining that was unlocked by the development of core infrastructure in what was originally only a transport corridor. Logistics systems at the local therefore have to be seen as part of the same continuum leading to international trade logistics. Integrated planning and development is therefore necessary.

Secondly, high logistics costs at the local level reduce the chances of success of regional development strategies succeeding within countries. Many Governments have tried to institute policies to transform lagging areas through dirigisme in industrial development i.e. through subsidies and tax breaks. The basic premise is that industrialisation of lagging areas would result in the movement of goods and services related to industrial products, including semi-finished or value added goods, rather than raw outputs from farm gates or agro-industrial inputs.

Lagging regions are largely rural, where agriculture and related occupations (horticulture, fishing etc.) constitute the main economic activities and livelihoods. The flows of goods and services between lagging and leading regions therefore tend to be related to agricultural production. Efforts to have such regions connect to global chains at a higher level face many challenges. For example, Lall et. al. (2009) analyse internal migration from the lagging North East to the leading South East region in Brazil and find that “push” factors related to lack of access to services and basic infrastructure in the lagging region (piped water, electricity, sewerage, healthcare, transportation to areas of high economic density) are the most important, as is the attraction factor of economic opportunities in the leading region. They propose that the need to enhance inclusive growth should be accompanied by improved services in lagging regions, to reduce the push effect. Understanding the push factors necessarily requires a local scale approach so as to understand those parts of supply chains with a more immediate link to producers.

Thirdly, in some countries, domestic transport costs are higher than on some international corridors (e.g. Raballand, Kunaka and Giersing, 2007). Limited competition on domestic routes has been identified as an explanatory factor behind the high prices that are charged for

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1 In 2000 China launched its Western Development Strategy to address the problems of its lagging regions. These provinces constituted about 71% of China's area, but only 29% of its population and 17% of its output in 2003. The policies included investments in transport, energy, and telecommunications, concessions for foreign investment and improvement of educational facilities.

domestic shipments. However, what has not received as much attention is the effect small volumes of demand have on supply. Thin demand, concentrated over a few months in a year is unattractive to highly contestable markets. The small volumes lead to minimal supply which in turn leads to high prices (Arvis, et al. 2007).

Fourthly, there are a few global trends that require an ability to trace how the various links in a supply chain are connected. There is a strengthening trend in international trade towards traceability. This requires that suppliers, including small scale producers connect transparently to international supply chains. This would necessarily imply a push towards more vertical integration in supply chains. However, the high costs, for producers, of dealing with vertically coordinated global commodity chains are a potential threat to the future of smallholder production systems. For instance, there are specific concerns about the marginalization of smallholder tea growers in the global tea economy due to the entry barriers associated with traceability requirements. The experience of the fresh fruit and vegetable sector, where traceability initiatives are perhaps most advanced, suggests a potential loss of competitive advantage held by smallholders in developing countries (Dolan and Humphrey, 2000; Weatherspoon and Reardon, 2003; Brown, 2005). The renewed emphasis also on carbon footprint will likely exacerbate these pressures.

Lastly, there are no well defined measures of logistics at the local level. It is apparent that some of the most widely used measures of rural access, such as the Rural Access Index are designed to indicate spatial access to transport infrastructure but do not deal adequately with the level and quality of logistics services that are available. Ultimately such infrastructure only has impact if there are transport services provided along it. As such, the indices would have to be complemented by other measures that reflect logistics services as a whole. This may require a rethink of the types and characteristics of logistics infrastructure that is provided. This paper proposes a methodology for estimating logistics costs to complement the available measures.

**The Challenge of Coordination**

Unlike large enterprises which use logistics intermediaries to handle international shipments, small scale producers use different types of intermediaries at the first steps of the supply chain, in the agricultural sector that would mean starting at the farmgate. Fafchamps and Hill (2005) found that in agricultural markets, selling produce is more likely when the quantity to be sold is large and the market is close by. In fact they establish that selling at the farmgate is not driven by the need for self control but by the need to minimize transaction costs. Even when selling at the farmgate is not as remunerative, farmers may not be able to afford the cost of transporting
their produce to the market. They acknowledge that there has not been much research on how farmers sell their produce and what measures they can take to minimize their costs. Nevertheless, even though the evidence that is available may not be definitive, in some cases wealthy farmers are found to prefer to travel to distant markets where they can fetch higher prices while at the same time poor farmers, who have low opportunity costs of time, also prefer to do the same.

The notion that the costs of arranging market exchanges can be so high as to prevent trade has been explored for several decades. Transactions costs include, inter alia, the costs of searching for a partner with whom to exchange, screening potential trading partners to ascertain their trustworthiness, bargaining with potential trading partners (and, in some cases officials who can hold up trade) to reach an agreement, transferring the product (this typically involves transportation, processing, packaging, and securing title, if necessary), monitoring the agreement to see that its conditions are fulfilled, and enforcing (or seeking damages for any violation of) the exchange agreement. There have been numerous analyses of these costs including exploration of market approaches to organizing economic activity in terms of various forms of coordination costs or transaction costs (e.g. Coase, 1937, Williamson, 1987).

Coordination costs take into account the costs of gathering information, negotiating contracts and protecting against the risk of opportunistic bargaining (Benjamin, et al, 1986). Kopicki (2010) argues that the spatial and temporal parameters that determine the economic viability of any transaction involving primary commodities is determined in the main by two parameters: a) production cost at the supply end and b) the transaction cost between the supply and demand ends of the chain. The higher the transaction costs the smaller the geographical extent of the feasible market. Based on this logic, competitiveness can be increased by increasing productivity or by reducing transaction costs or both.

Investigating the role of transaction costs in trade especially the importance of both the price mechanism and the entrepreneur as coordinating instruments in trade between firms has been a subject of analysis for several decades. Coase (1937, p390) argued that “the most obvious cost of organizing production through the price mechanism is that of discovering what the relevant prices are”. There is a cost attached to discovering, negotiating and concluding an exchange. Generally, long term contracts would cost less than several short term contracts. Coase demonstrated that all things being equal, a firm will be larger if the costs of organizing reduce with an increase in the transactions organized; the number of mistakes an entrepreneur will make does not increase with the number of transactions organized; and the less the rise in supply prices of factors of production to firms of a larger size. The first two characteristics are
typically called “diminishing returns to management”. In fact, Demsetz (1997) argues that Coase’s theory is focussed more on managing coordination than it is about firm specialization.

Generally, apart from prices, the costs of organizing and the losses through mistakes will tend to increase with an increase in the spatial distribution of the transactions organized, in the dissimilarity of the transactions and the possibility of changes in the relevant prices. As Wagner (2003) argues, there is a limit to the advantage of size that the firm derives as the costs of coordinating amongst many small suppliers as costs can increase to a point that renders the enterprise unprofitable.

An understanding of the network economies is important. Typically each transaction entails several logistics components. If producers are able to consolidate the small volumes then they can reduce unit transport costs. The consolidation of cargoes is an important activity in logistics in developing countries. It is the only way to develop synergy with higher volume-lower cost transport services to the nearest trade gateway. Though there is some empirical evidence of this (e.g. Raballand, 2010) what is often not fully explored is how such consolidation would take place. It cannot be assumed that cooperation to trade will necessarily take place on its own accord (Gibbon, 2001). Working in Uganda, Fafchamps and Hill (2004) found that farmers do not trust each other sufficiently to empower one of them to carry all neighbourhood produce to the market for sale, even though doing so would reduce everyone’s costs.

One of the major considerations is access to timely information. Grabowski (1999) explores the role lack of information plays in influencing the decision on when and where to sell or buy. In deciding to undertake production an individual has to have advance assurance that he will find a market, but his customers are also in a similar position in that they have to assume they will find suppliers. Therefore, some external coordination mechanism may be needed to bring buyers and sellers simultaneously into market exchange leading to integration of exchange over large geographical areas.

Exploring how coordination evolves in localized regions would be a valuable complement to the generalized approach adopted in most studies (e.g. Gonzales, Guasch and Serebrisky, 2008; Devlin and Yee, 2005; Amiot and Salama, 1996; Banomyong, 2007) or in terms of definition of

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logistics costs (e.g. dealing with inventories as a general proxy to logistic issues as in Gonzales et al., 2008) and also to understand the network dynamics that would enable small scale producers to trade internationally. Obviously, in the absence of international border posts service providers have greater freedom to connect locations than they do with international transactions. As such, logistics services at the sub-national level are about network dynamics to connect nodes as efficiently as possible while minimizing cost. Further, a focus on the organization aspects of logistics and how export supply chains work (credit, service providers, brokers, warehousing, etc) would complement also the studies that focus on infrastructure and transportation issues (e.g. World Bank 2006, Gonzales et al., 2008).

Indications are that most global supply chains do not develop deep roots at sub-national level and local chains do not always reach leading regions. Consequently, it is important to have detailed analysis of what happens in supply chains between small scale producers and their integration into national and regional corridors or markets. Detailed assessment at that level can reveal the logistic constraints in sub-national areas.

Over large scales, market integration may fail to develop sufficiently to reduce transaction costs. In such a case, the alternative is to use an intermediary. Intermediaries establish social relationships which can bridge different parties through gathering information on potential market exchanges. The advantage of intermediaries stems from the fact that market exchange is subject to increasing returns for two respects:

a) Information on buyers and sellers can be used repeatedly meaning the cost of gathering information can be spread over time; and

b) A large number of transactions will take place which will reduce the cost per transaction.

However, in reality the role of intermediaries is controversial. In some instances they are seen to play a benevolent role and in others an exploitative one. An example of the former is Wei et al. (2003) who found a win-win relationship between farmers and traders in Indonesia while elsewhere they are deemed to play a detrimental role as they survive through arbitrage (e.g. Masters (2007))

Methodology

The methodology of the study has two main dimensions, a geographical one to explore the spatial aspects of interactions over geographical space and time and an organizational assessment to analyse the relationships between the different players.

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**Spatial Dimension**

The theoretical underpinnings to the study are found in the World Development Report (2009). The WDR makes a distinction between leading and lagging regions and makes the observation that while economic growth in regions is unbalanced, development can be inclusive. Its proposes that one of the ways to achieve this goal is improved connectivity and reducing economic borders to allow easy market entry to take advantage of scale and specialisation. The policy framework that is proposed in the WDR has transport as a connecting infrastructure. Research shows that transport infrastructure has the most important external impact on firm level costs. Improving connectivity, through appropriate services can reduce the tariff barrier effect of long distance from major markets. The WDR makes the argument that there is a virtuous circle between transport and trade – transport costs reduce as trade increases which in turn lowers transport costs. Therefore, increasing local interactions and reducing distances within a country and globally contributes to these virtuous circles.

Given the problems with border crossings noted above, the research on which this report is based deliberately focused on lagging regions within large middle income countries, India and Brazil. These are countries with highly developed core logistics systems but have at the same time large territories that are poorly developed. It is accepted that some federated states such as India have internal border controls and tax collection points, though these are not of the same magnitude as found at international border crossing points. Understanding domestic logistics in middle-income countries in particular is becoming increasingly important as they endeavour to move up the value chains. However, unless these efforts are inclusive, they will exacerbate disparities between the core and lagging areas and diminish the opportunities to reduce poverty.

The study explores the influence of geography on the logistics flows, patterns and costs. Spatial analytical techniques were used to explore the links between the road and rail transport networks, location of storage and processing facilities and the spatial patterns of costs, prices and quantities of the products traded. The study used soybean trade in Madhya Pradesh, India and the sisal chain in Bahia, Brazil as case studies. The spatial dimension of the methodology was used to investigate the physical network dynamics of the two supply chains.

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9 World Bank 2009, *World Development Report 2009*, World Bank, Washington DC. See Chapters 1 and 2, in particular pages 72-79. In summary, economic density is output generated per unit of land. Economic distance is the ease or difficulty for goods, services, labor, capital, information, and ideas to traverse space. Though related, it is not identical to physical distance.

**Logistics Organization**

A strong logistics system comprises several interconnecting elements, starting at the local level connecting to national and international supply chains. Elements of the logistics systems are therefore found at the sub-national, national and regional levels. In order to explore how the different elements are tied together the study uses global commodity chain (GCC) analysis. GCC has its roots in the 1970s theories of dependency and how agents in lower value segments of trade can link to global chains. Coordination is important to how effectively the chains function, and in this case to how producers in developing countries link to the chains. While some researchers such as Cramer (1999) argue that the GCC approach places limits on economic activity in developing countries, the study adopted the view promoted by Gibbon (2001) that the GCC approach provides a coherent device for arriving at case-specific account of conditions for economic upgrading. The study focussed on the opportunities and constraints to global integration of specific commodities on the basis of studies of the specific chains, namely, soybean chain in India and sisal fibre chain in Brazil.

Products of both commodities are traded internationally after some processing, typically within the countries of production. The producers therefore have some options as to the position at which they want to connect to the global chains. The GCC framework is useful therefore to appreciating how export opportunities in the lagging regions are generated.

Based on the two dimensions of the methodology, detailed data were collected from players involved in the logistics chains including producers, intermediary service providers, processors, and government agencies. The data covered the characteristics and key challenges faced in the logistics system and how they connect internationally. Some of the data were collected by questionnaire while some were collected through detailed interviews of logistics service providers and users in the study areas. The data were analysed to identify the key logistics determinants, costs and volumes. The study did not cover logistics costs beyond the international gateways.

**Summary**

The full Working Paper will identify the effects of two main forms of intermediation on logistics in lagging regions, namely, electronic collaboration which is an innovative approach to the concept and the more traditional approach based on a cooperative arrangement. The paper then identifies the roles that intermediaries play before drawing some conclusions and lessons for developing countries in general. An outline of the Table of Contents is presented below.
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