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THE ROLE OF FREIGHT TRANSPORT IN ECONOMIC DEVELOPMENT: AN ANALYSIS OF THE INTERACTION BETWEEN GLOBAL VALUE CHAINS AND THEIR ASSOCIATED TRANSPORT CHAINS

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ABSTRACT IN ENGLISH

The purpose of this paper is first to discuss the paradox that freight transport, which so clearly is an important prerequisite for the processes of regional development and economic internationalisation and globalisation, since the 1970s has almost vanished from mainstream economic geography and development studies, and is most often hardly mentioned in studies of international industrial development and global commodity or value chains. Secondly, the paper discusses the consequences of leaving freight transport out of the value chain analyses and argues that it has had serious consequences for economic development especially in the peripheral parts of the world, not least in Africa, and for our understanding of rural poverty.

ABSTRACT IN DANISH

Formålet med dette papir er først at diskutere det paradoks, at godstransport - der så klart er en vigtig forudsætning for økonomisk regional udvikling, internationalisering og globalisering - stort set er forsvundet fra økonomisk geografi og udviklingsstudier, og meget sjældent behandles i studier af international industriudvikling og globale vare- og værdikæder. For det andet diskuterer papiret konsekvenserne af ikke at inddrage overvejelser om godstransporten og dens organisering i de globale vare- og værdikædeanalyser, og det konkluderes, at det har haft alvorlige konsekvenser for den økonomiske udvikling i de perifere dele af verden, ikke mindst i Afrika, og for vores forståelse af fattigdommen i ulandenes landdistrikter.

1. Introduction

Until the early 1970s freight transport was generally considered as one of the most important explaining variables in economic geography and theories of location and regional development. However, then it disappeared almost overnight out of mainstream economic geography, and has since then largely been absent from studies of regional and international industrial development, globalisation and even global commodity or value chains. Transport geography has become a niche with few if any linkages to mainstream economic geography.

The purpose of this paper is first (in Section 2) to look at the reasons why transport has disappeared. Then in Section 3, we shall focus on the often serious consequences following from leaving transport out of the analysis, especially for the low income developing countries, and also discuss two different attempts during the late 1980s and the 1990s to reintroduce transport into development thinking. However, these attempts met limited success. An important reason for this is that the role of transport in development has changed dramatically since transport was ousted from economic geography and development thinking in the early 1970s. Until the end of the 1960s transport was seen as a separate activity technologically independent of the production processes. This is no longer the case. Transport has become much more integrated into the processes of production and distribution. In Section 4 we shall discuss these changes in more detail.

From a transport point of view the theory of global commodity or value chains[1] is especially interesting because it focuses specifically on how the flows of goods between the developing and the industrialised countries are organised. However, interestingly global value chain analyses generally have had almost nothing to say about how the goods are transported. Transport is simply taken for granted. In many low income countries this is highly problematic. Still the global value chain framework is relevant for the study of freight transport because by necessity there is a chain of transport attached to any value chain of physical goods, and the global value chain framework can be used to study the interaction between the transport chain and the more production- and organisation-centred value chain. In Section 5 we shall discuss this interaction between the transport and value chain, and in Section 6 use this to analyse the role of transport in three agriculturally-based African value chains, namely Coffee in Tanzania, Cocoa in Ghana and Cotton in Zimbabwe. This analysis apparently supports the viewpoint that transport costs play a minor role in

[1] Since around 2000 the global commodity chains have increasingly been renamed as global value chains (see e.g. Gibbon and Ponte 2005). For our purpose the distinction is not very important and we shall here primarily use the term value chain

the value chain. However, there are a number of reasons why the role of transport tends to be under-estimated with serious consequences not least for rural areas in the low income countries. This is discussed in Section 7. Finally, in Section 8 we shall draw some conclusions on the new role of transport and logistics in development.

2. Why has transport disappeared from mainstream economic geography and development theory?

FALLING UNIT COSTS OF TRANSPORT - FROM TRANSPORT TO COMMUNICATION COSTS

The immediate reason most often given for the disappearance of transport was an increased realisation that for most industries in the industrialised world transport costs were no longer important. Improved transportation had led to 'a shrinking world', and with the internationalisation of production taking place during the 1970s it seemed evident that transport costs had now become so low that they were no longer a serious constraint to development (Dicken 1986). An increasing number of studies even showed that improved transport to peripheral regions might have negative consequences for development because it opened up for increased imports which often threatened local industries and led to emigration of the most qualified labour (see e.g the discussion in Hilling 1996). Therefore, even if improved transport was a necessary condition for development it was certainly not a sufficient condition. This showed that the role of transport in development was less important and certainly much more complex than assumed in the old development theories.

At the same time there had been already during the late 1960s in urban and regional studies a shift in focus from freight transport to person transport and communication costs, and with Williamson's (1975) introduction of the concept of transaction costs there was developed an analytical tool which rapidly subsumed communication and transport costs. Although transport and communication costs clearly should be part of transaction costs, especially transport costs but often also communications costs were in effect dropped completely from the analysis, and transaction costs tended to become synonymous with costs resulting from administrative and organisational problems and corruption.

FROM REGIONAL GEOGRAPHY TO ENTERPRISE GEOGRAPHY

However, there are other more indirect reasons why transport disappeared out of economic geography in the early 1970s. My suggestion is that an important reason for this was a theoretical shift of focus taking place in the early 1970s from regional geography to enterprise geography. While most of the research on regional development during the 1950s and 1960s was based on the point of view of public policy for regional and national development (e.g. Myrdal 1957 and Friedmann 1966) the research focus shifted during the 1970s to strategies of enterprise owners and managers for the development of large private and most often multi-national enterprises. This enterprise focus has dominated mainstream economic geography during the last 30 years, from Massey's theory of industrial reorganisation in the 1970s (Massey and Meegan 1979) through Dunning's (1981) and Dicken's (1986, 1998) theories of internationalisation of production and the development of multi-national firms during the 1980s to Storper and Walker's (1989) theory of the development of production clusters and regional development and Gereffi's (1994) theory of global commodity chains (later supply or value chains) during the 1990s. In all these theories public policies are generally not seen to play an independent role and they are often left out completely (see e.g. Gibbon and Ponte 2005). Similarly transport has generally been excluded from the analyses or treated as unimportant.

The shift of focus from regional geography to enterprise geography led to a shift in which actors and data sources were considered relevant. Interviews with enterprise owners and managers became more important than public statistics and interviews with politicians and civil servants. This shift in actors and data sources has had consequences for which factors were considered relevant because when people are asked about their strategies they tend to think only on those variables which they are able to influence and manipulate, while factors which they cannot influence are taken for given. A result of this is that public policies and infrastructure investments, including investment in transport and communication infrastructure, appear to play a minimal role in the strategies of most enterprises and are therefore seen as unimportant[2]. However, whether this is

[2] The shift of focus from public policy to enterprise strategy was undoubtedly linked to the shift from liberal to Marxist economic theory, which tended to see the bourgeois state as subordinated to the capitalist class and therefore without any independent role of its own. However, Marxist theory with its strong focus on circulation of capital and goods in the economy hardly can be used to justify the elimination of transport and communication from the analysis (Harvey 1982). During the 1970s a number of critical studies of transport and development also appeared (e.g. McCall 1977a and b), but they were not followed up and never integrated into mainstream economic geography and development studies, and most of the few articles on the role of transport in development published since 1980

actually true is an open question, and it is contradicted by an often very active lobbying activity by large enterprises and enterprise organisations for improved transport infrastructure.

THE DYNAMICS OF TRANSPORTATION

The new theories of industrial geography developed during the 1970s and 1980s were largely developed in reaction to the old Weberian location theories which, based on neoclassical economics, saw industrial location and development as a result of local factor endowments and the costs (including transport costs) of accessing non-local resources. Instead the new theories focused on the role of innovation and technological development in production. It was shown how new technology could result in very rapid restructuring and shifts in the location of industries, but did not result in a general spread of development, as foreseen by the neoclassical equilibrium theories. Rather it led to new concentrations of industries at locations where external economies could be developed. As Storper and Walker (1989) wrote in an important work on the new theories: 'access to a given spatial distribution of pre-existing factors of production' is not decisive because over time 'industry produces its own conditions of localisation' (p. 21). Due to high profits new dynamic industries are able to 'break through existing confines, leap over price and quantity barriers, and to do things previously unimagined' (p.97). Thus good transport is not an important factor of location, because 'transport links can be built up as an area grows, as can labour skills, supplier firms and other inputs whose costs appear to be prohibitive at the periphery' (p. 33). Focus should therefore be on the production technology, not on transport. However, the argument here tend to become self-contradictory because a large number of Storper and Walker's historical examples of technologies which have led to industrial relocation in fact are transport technologies (e.g the impact of refrigerated railway freight cars on the meatpacking industry in the 1870s, the effect of the tugboat and barge on the water transport industry around 1900, and the impact of jet aircraft on air transportation after 1960). Because of the high level of integration between production and transport one can of course perceive of these technologies as a part of both the production system and the transport system. However, technologies which are part of the transport system generally have a much wider applicability than technologies which are part of specific production systems and therefore generate larger external economies.

Storper and Walker's argument is therefore not an argument for leaving transport out of the analysis but rather for investigating it as a much more dynamic and integrated part of the production

have been published in specialised transport journals (e.g. Taaffe and Gauthier 1994; Leinbach 1995; Janelle and Beuthe 1997; Banister and Berechman 2001).

system than it was in the classical location theories of Weber (1929), Christaller (1932) and Lösch (1954).

3. The consequences of leaving transport out of economic geography and development studies and recent attempts to reintroduce it

Thus although there were good reasons for dethroning transport as the main explaining factor which it had in the old Weberian location theories it has for a number of reasons been generally problematic to leave transport out of economic geography and development studies. Firstly, although it is true that the average unit costs of transport (e.g. measured as costs per ton-km) have generally decreased, transportation costs as part of GDP have not decreased because due to the low unit costs more goods have been transported over still longer distances. It is therefore not true that transport costs as a whole have become less important than before. On the contrary, increasing physical transport is resulting in increasing environmental problems and increasing demands for infrastructure.

Secondly, in most of the literature on economic geography, internationalisation and globalisation, the role of transport has been perceived via the metaphor of the shrinking world (see e.g. Dicken 1998). This is problematic because unit costs of transportation have not decreased equally much everywhere (Pedersen 2001a; Knowles 2006). Low unit transport costs increasingly depend on heavy investment in infrastructure, which is only feasible on transport routes with large flows of freight and passengers. On a global scale this has benefited the large world cities and the triad consisting of North America, Europe and Japan, while it has had serious consequences for peripheral areas of the globe located outside the main transport routes, not least in Africa.

Thirdly, although communications have increased much more rapidly than physical transport they have only to a limited extent substituted for transport. This is at least partly because a large share of communications are directly or indirectly related to the planning and controlling of physical flows and therefore depend on the existence of efficient transportation.

In many low income countries the down-grading of the role of transport in economic geography was used to justify decreasing investment in transport infrastructure during the 1970s and 1980s.

In development theory this was further accentuated by the shift in focus from transfer of technology from the industrialised countries to basic needs strategies and strategies for "development from below" focusing on local, often rural development (Stöhr and Taylor 1979) and attempts to reduce the demand for transport by increasing local self-sufficiency. However, in reality development in the transport sector became highly politicised and complex. In some African low income countries the new development paradigms led to the introduction of important donor-led rural roads programmes based on labour intensive road construction technology. However, in most African countries they were counteracted by the development of large crop parastatals which focused on the production of crops for export and food supplies for the cities, and therefore attempted to reduce competing local trade. In many countries inter-district rural trade was illegalised, and in order to make it difficult, trucks for hire were generally concentrated in the urban areas where they could be used to collect crops in the rural areas but would be too expensive to use for local inter-rural trade and transport. This was done, partly by giving truck import permits to the parastals and large urban-based companies, and partly by using the truck licensing system to keep trucks for hire out of the African rural areas, as the British had done before independence. For instance, in Zimbabwe there was still in the mid-90s only one truck for hire in each of the two large rural districts of Gutu and Gokwe, each with 300-400,000 inhabitants (Pedersen 2004).

At the same time, in many countries the new paradigms coincided with mounting economic crisis during the 1970s and early 1980s. As a result government investment in the transport system, and especially in long distance transport, fell dramatically, resulting in rapidly decaying transport systems. Of course, the effect of this was not the same in all African countries. We shall here briefly look at the development of land transport in four African countries, namely Ghana, Kenya, Tanzania and Zimbabwe.

In Ghana there was a considerable road building programme during the last years before and the first years after independence in 1958. However already in 1961 there was a drastic cutback in the road budgets which signalled a long period of deterioration in both the road network and the motorised traffic. It lasted until the government started a road rehabilitation programme, as part of the Economic Recovery Programme launched in 1983 with considerable donor support (Pedersen 2003).

In Tanzania road transport was also encouraged during the first decade after independence. It became government policy to build up the main road system to an all-weather standard and attend to feeder road improvement on a limited scale. A major trunk road network, consisting of three north-south and three east-west roads, were almost established by 1969 when the policies

shifted in favour of feeder road development (Mwase 1990). This started a long period of trunk road deterioration which lasted until a donor financed road rehabilitation programme started in the early 1990s. By this time only 5% of the 45,000 km of roads were tarred, 13% were gravel and 82% were earth roads. As a result of insufficient maintenance passability had declined from 70% of the roads in 1970 to only 30% in 1991 (Mwase 1994; Pedersen 2001b), and in spite of the formal focus on feeder roads, rural access had become very poor.

Kenya did not experience the same deterioration of the road system as Ghana and Tanzania. Here both the truck fleet as well as the networks of tarred and rural feeder roads continued to grow until the late 1980s, although the number of feeder roads grew more slowly during the 1980s. Kenya then had a better road infrastructure and lower transport rates than most African countries. Due to the development of the matatu system of minibuses and pick-ups, which developed with government support after 1973, rural access to transport was also better than in most other African countries. However, since the late 1980s the quality of the road network has deteriorated rapidly due to financial and administrative constraints, partly imposed by the structural adjustment policies introduced under World Bank and donor pressure, which led to inadequate maintenance and gradual erosion of the capacity to plan, finance a transport infrastructure facing rapidly increasing traffic volumes, and high and increasing axle loads due to uncontrolled overloading (Alila et al. 2005).

Zimbabwe inherited at independence in 1980 railway and road networks which were probably the best in Sub-Saharan Africa (apart from South Africa), but which only served the urban and the white settler rural areas. One of the most important actions of the independence government therefore was to extend and upgrade the road network into the more densely populated rural areas of African settlement in order to increase their market access. Thus during the late 1980s a large proportion of the state road network was upgraded from earth roads to tarred or gravel roads. Thus the share of earth roads among the 18,400 km state roads decreased from 35% to 20% between 1985 and 1990. There were also plans to upgrade some of the existing feeder roads in the rural areas, but this only occurred to a limited extent before the economy tightened in the late 1980s and the structural adjustment policies in the early 1990s almost completely stopped further improvement of both state and rural feeder roads (Pedersen 2004).

Although developments differed from country to country the result in all the countries has been a deteriorated transport infrastructure. On the other hand, liberalisation of the transport sector seems to have improved rural access to transport, especially in areas with growing agricultural incomes. This is because access to trucks and other motorised transport for hire as well as the number of bicycles and oxcarts has increased.

Since the late 1980s there have been two different attempts to re-focus on the role of transport in development. First, there has been increased research (mostly by NGOs and international organisations, e.g. ILO and the World Bank's Sub-Saharan Africa Transport Policy Program) on rural non-motorised transport, which has documented that rural transport in the form of head carriage and other non-motorised forms of transport (of water, fuel, agricultural produce and fertiliser) is a major consumer of labour, which is often seasonally scarce in the rural areas, and thus a source of rural poverty (Leinbach 1995, 2000; Porter 2002). Especially NGOs have also been experimenting with different intermediate, non-motorised means of transport in order to reduce the labour required by transport tasks, but so far this has had only limited impact on the pattern of rural transport. Most of the research on rural transport has focused on local transport to and from the fields and for fetching water and fuel, which is shown to be responsible for the largest share of rural transport. However, poor rural transport also makes up the first and often relatively costly link in the transport chains necessary to reach wider national and international markets, and it is therefore a major hindrance for the integration of the rural areas into the larger national and international markets.

Secondly, and probably more important, there was especially during the 1990s in connection with structural adjustment policies a renewed donor interest in transport infrastructure investments (although the tight economies resulting from the structural adjustment policies also contributed to the decaying transport infrastructure, as the cases of Kenya and Zimbabwe above showed). At the same time the World Bank's drive for export-oriented development policies and the development of new economic growth and foreign trade theories led the economist Krugman (1997) to talk about a new economic geography where location and transport received new attention. As a result a number of empirical studies of African development and foreign trade were carried out which seemed to show that poor infrastructure and high transport costs were a major constraint to the development of African export and economic development (see e.g. Amjadi and Yeats 1995; Sachs and Warner 1997; Limão and Venables 2001; Wood and Mayer 2001; Wood and Jordan 2001; Longo and Sekkat 2004). Thus studies from recent years show that transport costs have become a relatively more important barrier to trade as the custom barriers have been reduced (Milner et al. 2001). However, there are at least two major problems with Krugman's and other economists' attempt to reinstate the role of transport in economic geography. Firstly, they have tended to focus on infrastructure investment rather than on the transport services in which they may or may not result; and secondly, they perceive transport as something external to the production process, just as the old theories did, and thus do not take into account that the way transport interacts with production and distribution has changed dramatically during the last 30 years. Therefore they also seem to have had little impact outside economics.

4. The changing role of transport in development

In order to reintroduce transport into economic geography and development theory it is important to realise that both the structure and perception of transport have changed since transport disappeared from mainstream economic geography in the early 1970s. When transport disappeared in the early 1970s it was perceived as an activity external to the production process. With Massey's theory of industrial reorganisation and the theories of internationalisation or globalisation of production this changed (Massey and Meegan 1979). Where regional development earlier had been seen as a result of location or relocation of complete independent production enterprises, development now came to be seen as a result of a division and internal reorganisation of the production in large multi-regional or multi-national enterprises where individual production functions could be moved to branch plants or outsourced to independent subcontractors in those regions or countries where the production cost were lowest. As a result transport became a much more integrated part of the production process. Through outsourcing, internal transport within the enterprise could be substituted with external transport. As a result of new forms of production organisation, such as *just-in-time* and lean production, transport time became often more important that pecuniary transport costs. Design of products and packaging to reduce transport costs also became increasingly important. At the same time containerisation of freight transport opened up for new scale economies in transport, but scale economies which required large flows of goods to be realised. In order to organise cheap and timely transport a new rapidly growing forwarding industry developed which undertook to organise multi-modal door-to-door transport and at the same time helped to secure sufficiently large flows of freight to fill the increasingly large freight- and container ships. Telecommunication and electronic data processing became increasingly important in controlling this new organisation of freight transport, and the integration between production and transport.

A result of this is that production processes, transport and communication have become increasingly difficult to separate. The cost of poor and expensive transport consists not just of the prices paid to the transport companies. It shows up in increased storage costs, reduced quality of produce or a larger share of products destroyed under transport and difficulties in serving contracts with narrow time windows of delivery. For instance, in a detailed empirical study of the Indian car industry (Guliany 2001) showed that the increased storage cost necessitated by the poor transport infrastructure in India was more than twice as large as the transport bill itself. As a result Indian car assembly plants attempt actively to induce their suppliers to set up production plants within 80 km of the assembly plant.

However, even the simple transport bill in practice tends to be underestimated because much of the transport in the commodity chain paid for by subcontractors and hidden in payments to them. At the same time many of the new advantages created by improved telecommunication, such as e-trade, depend on the existence of efficient and reliable physical transport; and in the developing countries bottlenecks in the transport system are a major source of corrupt practices which result in large transaction costs.

However, that transport has become increasingly physically and technically integrated in the production processes does not necessarily mean that it is organisationally integrated with production. On the contrary, transport is increasingly outsourced to specialised transport and forwarding companies serving many production companies and sectors, and uses infrastructure operated either by the state or other public bodies or increasingly by the transport industry itself.

To leave transport out of the consideration therefore seems highly problematic. However, the role of transport in development clearly has become much more complex than it was assumed to be in the economic development and location theories. The role of transport cannot be reduced to a simple cost figure, but must be seen as the outcome of the dynamic interaction between transport, production and distribution.

5. The interaction between value chains and their corresponding transport chains

In the following we shall use global value chain analysis to investigate in more detail the role of transport in economic development. The global value chain analysis was developed in the early 1990s by Gereffi (Gereffi 1994; Gibbon and Ponte 2005). Gereffi focused his analysis on three aspects of the chain: first, the *input-output structure* which was used to describe the geographical coverage of the chain and the flow of trade and transformation of a good from production of the raw material to the production and distribution of the final product. Secondly, the *governance structure* which describes the forms of control and coordination used by "lead firms" in the value chain to control the terms of operation (prices, amount to be produced and quality and standards of the products) for subordinate firms in the chain. Originally Gereffi distinguished between producer-driven chains, dominated by large, technology and capital intensive "lead" firms which obtain lead firm status by controlling production know-how and large capital, and buyer-driven chains found in more labour intensive sectors where market information, product design and

marketing/advertising cost set the entry barriers for lead firms. Thirdly, *the institutional framework* within which the value chain operates, where the focus was on the inter-firm relations permitting lead firms to control subordinate firms by determining barriers of entry to the chain for sub-ordinate firms and setting conditions for their operations and up-grading within the chain.

The central theme of global value chain analyses has been the study of outsourcing by lead firms and their strategies to control sub-contractors and other suppliers. The strong focus on the lead firm and its strategies to control the subordinate firms has until recently tended to make the analyses blind to the possible counter-strategies by subordinate firms. Thus there has most often been assumed to be only one lead firm in a chain, but recent studies show that there may be more than one, with what Gibbon has called subaltern lead firms, controlling part of the chain.

Surprisingly global value chain studies generally have had very little to say about transport which in almost all the studies has been ignored. Still, global value chain analysis is useful for our analysis of the interaction between transport and economic development because for any value chain for a physical product there must necessarily be a multi-modal transport chain allowing the product and its components to be transported along the value chain. By focusing on the interaction between the transport chain and the value chain it is possible to study the way the two chains interact.

The cost of transport depends on the amount of freight (weight and volume) to be transported and the distance over which it is carried. The cost function usually consists of a fixed cost element dependent only on the amount of freight and a variable element also dependent on the distance. There are generally large scale economies both in the fixed and the distance dependent costs. These scale economies accrue both to the transport vehicles and not least to ports and other transport terminals or transfer points. However, these scale economies can only be realised at transport links with large flows of freight. Up-stream in the transport chain freight therefore tends to be reloaded into larger and larger vehicles while in the downstream end of the chain freight is again split into smaller loads supplying retail outlets and individual consumers.

Attempts in modern production systems, such as "just-in-time" and "lean production", to reduce storage costs, as well as the increasing trade in perishable goods, mean that transport time and regularity are often as important as the money costs of transport. Many intermediate producers and suppliers are today required to deliver within narrow time windows of specific weeks, days or even hours, which make regularity and predictability of the transport system very important. This has contributed to the increasing technical integration between production, distribution and transport.

Container transport has grown rapidly because it has been one of the solutions to the increased integration between transport and production by reducing the cost and time of loading and unloading, protecting the freight, making it possible to mix freight from different transport chains in the same ship (or plane) and thereby making it possible to obtain enough freight to increase ship size and departure frequency at the same time.

6. Transport costs in three African agriculturally-based value chains

The detailed nature of a transport chain of course depends both on the product and the geography of the chain. In order to study the interaction between the transport and value chains we shall here look at three different agriculturally-based value chains, namely the value chains for coffee in Tanzania, cocoa in Ghana and cotton in Zimbabwe. For the African agriculturally-based value chains, the transport chain will typically consist of three parts:

- A rural link from the farm to a collection or buying point, located on a road accessible to motorised vehicles, where the produce is sold to a trader or trading agent who collects it, sometimes processes it, and occasionally himself exports it. This transport link is mostly the responsibility of the farmer who has to cover the cost of transport within the price that he receives for the produce. The produce is mostly carried by head or sometimes on a non-motorised so-called intermediate, means of transport, such as a bicycle or an ox-cart.

- One or more links between the rural buying point and the export harbour where the produce is transported on truck or sometimes by rail. If there are transhipment points on the way where the produce is stored or processed, the trucks used tend to become larger the further downstream of the chain the produce comes. This transport will typically be the responsibility of the exporter or sometimes a processor, but the actual transport will often be outsourced to a specialised trucking company.

- An overseas transport link usually by ship, and now often in container, but in some cases by air. This transport may be the responsibility of either the exporter or the overseas importer, but in any case the importer often has a considerable say in the choice of shipping company and details of the mode of transport.

In addition to these three links, on which we shall focus, there will also be one or more links mostly by truck (or sometimes by rail or local shipping) from the import harbour, possibly via points of reloading, storage and processing to the final retail outlet. Here the responsibility is shared between the importer, wholesaler and the retailer although they are now often merged into one and the same role. Finally there is a link between the retail outlet and the place of consumption, which is usually the responsibility of the consumer and may be carried out via different modes from walking or bicycle to car or public transport. The power of the large retailers is reflected in their ability to outsource transport costs to the final consumer at his own cost.

In order to give an impression of the importance in the late 1990s of each of the three links in the transport chain outlined above we show in Table 1 estimates of the costs of each of the three links for the three value chains: cocoa in Ghana, coffee in Tanzania and cotton in Zimbabwe. For the sea and motorised land-links the cost estimates are based on the actual costs while the rural transport costs for cocoa and coffee are based on the assumption that the produce is carried by head (which was the dominant mode of transport at the time of the cited investigations) over the average distance from farm to buying post (for cocoa 5 km and for coffee a little more) and assuming that a person can carry 20 kg at a time and is paid a wage of 1 US$ a day. For cotton the rural transport costs shown assume that the produce is transported by oxcart at distances below 15 km and over longer distances by truck or tractor.

Table 1. Cost of transport in US$/ton in different agricultural export crop value chains

	Shipping US$/ton	Inland transport (truck/rail) US$/ton	Rural transport (head-loading) US$/ton	Total transport cost US$/ton	Total transport cost as % of export price	Rural transport cost as % of payment to farmers
Coffee(Arabica) Tanzania 1997						
southern highlands	73 (19%)	280 (71%)	38 (10%)	391 (100%)	14%	1-2%
northern highlands	73 (25%)	178 (62%)	38 (13%)	289 (100%)	10%	
Cocoa Ghana 1999	53 (53%)	17 (17%)	30 (30%)	100 (100%)	11%	5%
Cotton lint Zimbabwe (via Beira)1999/2000	174 (40%)	207 (47%)	59 (13%)	440 (100%)	34%	5%

For the detailed assumptions behind the transport cost estimates see appendix.

For both coffee in Tanzania and cotton in Zimbabwe the rural transport costs made up only 10-15% of the total transport costs, but for cocoa they are 30 % of the total transport costs. The

reason for this is that both shipping and motorised land transport is shorter for cocoa in Ghana than for coffee in Tanzania and for cotton in Zimbabwe, and Ghana's land transport also has lower transport rates.

For coffee and cocoa the total transport costs only make up a little more than 10 % of the export value of the crop, while for cotton, which is a very bulky good, transport costs are more important and make up about a third of the export value.

However, the perceived importance of the transport costs depends not only of their absolute size, but also of who pays for them. Earlier, when trade in most export crops was the responsibility of parastatals which often sold the crops fob (free on board), they were responsible for transporting the crops from the buying points to the port, while the overseas buyers were only responsible for the shipping costs. After privatisation of the export trade international traders and overseas processing-industries have increasingly gone inland and now buy produce at rural buying points. They have therefore also taken over the responsibility for all or part of the domestic motorised land transport. However, rural transport from the farm to the buying point traditionally has been and continues to be the responsibility of the farmer, who has to carry the produce him- or herself, or pay somebody to do it. Therefore neither parastatals nor private buyers have been generally concerned about rural transport costs. However, even to the average farmer transport costs correspond to only 5% of the price received for cocoa and cotton farmer and less than 2% for coffee farmers.

More recent investigations show that the cost of both motorised land transport and rural transport has gone down. Rural transport costs have gone down partly because the frequency of bicycles and oxcarts has increased, especially in rural areas with successful export cropping, and partly because rural access to motorised transport has increased due to liberalisation of the transport sector. At the same time motorised transport seems generally to have become more efficient and cheaper, partly due to increased competition. However, this has partly been counteracted by increasing gasoline prises. This has especially been the case in Zimbabwe where gasoline prices earlier were extremely low (Bryceson and Mbara 2003; Pedersen 2004).

Thus it seems that transport costs are of limited importance even in most agriculturally based global value chains (e.g. coffee and cocoa, but not cotton), where transport costs are relatively higher than in most industrial value chains. Therefore one might argue that transport costs could safely be excluded from the analysis, as most value chain studies actually do. However, there are a number of reasons why transport tends to be much more important than the crude cost figures above indicate. In the following we shall discuss in detail some of these reasons.

7. Reasons for under-estimating the role of transport in the value chain analyses

There are a number of different reasons why the role of transport has tended to be under-estimated in economic geography and development studies generally and more specifically in global value chain analyses. Firstly, transport costs are often invisible because they are under-recorded or hidden under other headings in the enterprise accounts. Secondly, in value chain analyses the attempt to classify all lead firms as either producers or buyers, has hidden the possibility that transport and logistics can be a core competence of lead firms. And thirdly, by focussing only on successful value chains the geographical limits to value chains, that is the value chains that are unrealised, have tended to disappear out of sight.

TRANSPORT AND LOGISTICS COSTS TEND TO BE UNDER-RECORDED OR HIDDEN UNDER OTHER HEADINGS IN THE ENTERPRISE ACCOUNTS

There are at least three causes of under-recording of the transport and logistics cost. Firstly, the strong focus of global value chain studies on lead firms and their strategies to outsource production to a hierarchy of subcontractors and other suppliers mean that costs, including the transport costs which are borne by subcontractors and suppliers, tend to be hidden in payments to them, so that only transport costs for which the lead firm are directly responsible are visible in their accounts. Especially it is often forgotten that an important element in the efficiency of lead firms is their ability to "outsource" at zero cost to themselves the two least efficient ends of the transport chain where the unit transport costs are highest, namely the transport from farm to buying point and from the retail outlet to the final consumer which mostly have become the responsibility of the farmer and the consumer, respectively.

Secondly, transport costs and especially the indirect costs of poor transport in the form of increased storage costs and the costs of damaged goods and reduced product quality are often invisible because they are treated as an integral part of the production system, rather than as a part of the transport chain. Thereby the transport chain tends to vanish into individual transport services and the true cause of these costs, namely poor infrastructure and bottlenecks in the transport chains, remain hidden. Thus the widespread corruption in African ports and at road check points are generally attempts to profit from real or artificially created bottlenecks in the transport system.

Thirdly, negative externalities of increasing transport in the form of congestion, traffic accidents and environmental problems are generally not paid for by the enterprises, but borne by society at large outside the market economy. While transport costs including the negative externalities altogether have usually been left out of global value chain studies focusing on the developing countries, there has recently been an increasing focus on transport chains in the industrialised countries, because increasing outsourcing combined with just-in-time strategies have resulted in still longer transport chains and growing traffic congestion and environmental problems which are not accounted for in the market economy (Millstone and Lang 2003; Whitelegg 1993, 1994). However, also in the low income countries rapidly growing motorised transport in combination with poor and poorly maintained transport infrastructure lead to increasing problems of congestion and environmental pollution.

LOGISTICS ARE NOT SEEN AS A CORE COMPETENCE FOR LEAD FIRMS

The dichotomisation of lead firms into buyers and producers has tended to blindfold us to the existence of lead firms with other core competences than the retail/marketing, advertising and product design characterising the large retailers and brand name marketers originally identified with 'buyer-drivers', and the technical production know-how and capital-intensive production system identified with 'producer-drivers'. However, recently the two groups of lead firms: buyers and producers, have become defined in value chain analysis in increasingly heterogeneous ways. Thus international traders and raw material processors have also been classified as buyers (see e.g. Fold 2002 on the cocoa chains), although the core competences of international traders, namely global presence and logistics, clearly are very different from core competences of large retailers. Similarly it is difficult to understand why raw material processors are classified as buyers and not as producers. At the same time, there seems to be a trend for some lead producers, e.g. in the car industry, to shift into buyer status because production increasingly become market driven, while global presence and logistics have become core competences of non-lead producers such as the large turn-key producers (Sturgeon 2002), and the so-called triangular producers in the clothing chains (Gibbon 2002). Therefore it seems reasonable to reclassify the lead firms according to their core competences. One such classification could be to distinguish between:

1. Retail traders (large retailers and brand marketers) with retail marketing, advertising and product design as core competences;

2. Global intermediaries, either traders or processors which also provide logistics as a core competences;

3. Final product producers (large-scale production and processing) with product technology, technical production know-how and capital-intensive production systems as core competences.

The introduction of such a new group of global intermediaries as lead firms would make the transport and logistics system more visible because their core competences are closely linked to the global transport chains and because their efficiency depends on their ability to coordinate the global production and distribution systems with the global transport system. Some of these global intermediaries operate transport and storage facilities of their own but most often they hire transport and storage capacity from dedicated transport and storage providers. These global intermediaries would be what Gibbon has called subaltern lead firms, typically controlling up-stream and middle parts of the chains. Characteristic of the logistics providers is that they often derive their strength from serving more than one chain, typically geographically differentiated chains for the same commodity but often also chains for more than one commodity. Examples of this are the US-owned Cargill, which trades globally in a large number of agricultural commodities including cocoa, coffee and cotton, and partly operates its own transport capacity and the South African Outspan which now sources fruit from many parts of the world in order to be able to supply it year round, but which relies entirely on hired transport services. By operating in more than one chain they are able to obtain a better utilisation of their own production, storage and transport system and at the same time exploit seasonal and other swings in capacity utilisation of and rates for hired transport and storage facilities, which are, especially in the rapidly growing container traffic, not value chain specific. This means that the operations of the logistics providers are difficult to understand within a narrow commodity or value chain framework.

THE GEOGRAPHICAL LIMITS TO VALUE CHAINS

Finally transport tends to be under-rated because value chain studies for empirical reasons have tended to limit themselves to the study of existing and mostly successful chains. Here transport clearly is not a major hindrance to development, because if it was, there would not be a chain. However, low-income developing countries are full of failed or unrealised value chains beyond the limits of the existing chains. To come to grips with poverty we must study the limits of value chains.

In Table 1 above we showed that the cost of transport apparently was of little importance not only to the large actors in the chains, but also to the average small-scale farmer who has to bear the costs of inefficient rural transport. However, this low importance of transport costs for the

average export crop farmer hides a large variation in rural transport costs for different farmers depending on their distance to a buying point and the value of the crop.

Table 2. Examples of payment to farmers for different crops in US$ per ton of produce

Coffee (Arabica), Tanzania 1997[a]	2743-2328
Cocoa, Ghana 1996-2001[a]	967-461
Cotton, Zimbabwe 2000[a]	471
Maize, Kenya 1996-2001[b]	212-284

[a] Pedersen 2002

[b] Republic of Kenya 2002

When produce is carried by head the transport costs increases proportionally with the distance (until the distance become so long that over-night stay become necessary). Thus the cost will triple when the distance increases from 5 to 15 km. For high-value export crops such as coffee it will still be of minor importance, but for lower value export crops such as cocoa they will rapidly be prohibitive when the distance increases. Therefore the number of cocoa farmers peters rapidly off beyond 5 km from roads accessible to motorised traffic (see e.g. Riverson and Carapetis 1991). For grains and other lower value food crops distance of course is even more important, and even if von Thünen (1826) has gone out of fashion in economic geography, von Thünen-rings are still visible in many parts of rural Africa around truck buying posts.[3]

The seemingly low rural transport costs are also a result of the very low value of rural labour found in most low income countries. Increasing costs of rural labour would rapidly reduce the distance within which the production of especially lower-value agricultural crops for the market is profitable, unless transportation is mechanised. This is put in further perspective by the results of the studies of rural transport carried out during the 1990s which show that transport of crops make up a minor part of the transport tasks of African rural households which is dominated by the transport of water and fuel (Leinbach 1995).

[3] Similarly the production of export horticulture shows von Thünen-rings around the major international airports with frequent flight opportunities because relative short travel time to the airport is prerequisite. E.g. Jacobsen (2004) shows that new pineapple plantations in Ghana are located in areas 40-50 km from Accra where distance to the airport is acceptable and land still relatively cheap.

The importance of transport costs explains why non-marketed (or locally marketed) production remains very important even to farmers who also grow export crops. And it shows that one of the limitations of value chain studies is that they focus on the export crops only and forget that the decision of small-scale farmers to engage in export cropping depends on the local conditions of growing food crops (for subsistence or for the market) as much as on the requirements of export value chain.

Transport costs can be reduced by use of motorised and non-motorised intermediate means of transport. This however, requires three things which are often not available in rural Africa. Firstly, especially motorised but also often intermediate means of transport requires infrastructure, to be possible or feasible. Secondly, it requires capital, which is generally extremely scarce in rural Africa, even in amounts necessary to buy a bicycle or pushcart. Especially earlier access to motorised transport was also limited by foreign currency restrictions and requirements for transport licences which were seldom given to trucks in the rural areas (see e.g. Pedersen (2004) on rural transport in Zimbabwe). Thirdly, capital costs result in large fixed costs which mean that motorised and certain forms of intermediate transport are only competitive with head carriage over longer distances and for larger amounts. Therefore many investigations show that even where the road infrastructure exists, a large share of the freight moved along the road is carried on the head or on bicycle (see e.g. Riverson and Carapetis 1991; Pedersen 2003).

However, there are signs that rural transport has improved in many African rural areas since the mid-1990s, especially in areas of successful export crop production. This is not primarily due to improvements in the infrastructure because since introduction of the structural adjustment policies during the 1980s and early 1990s road investments in Africa have primarily focused on rehabilitation of the main trunk roads rather than on developing rural transport. Improved transport rather has been a result, partly of liberalisation of the transport and agricultural trade sectors which has improved the access to trucks for hire in the rural areas and especially increased the access to smaller vehicles better suited to rural crop collection than the large trucks generally operated by the parastatals; and partly an increase in the number of non-motorised transport vehicles, especially bicycles and oxcarts, which have spread rapidly in areas of successful export crop production. For instance, in the rural town of Gokwe mentioned above, which is located in a cotton growing region in Zimbabwe, the one truck for hire available in the early 1990s had in 2000 increased to about 50, and at the same time local production of oxcarts had increased from 20-30 a year to about 2000, so that a large share of the farmers now own an oxcart (Pedersen 2004); and in Arusha, a centre of the coffee growing region of Northern Tanzania, a large fleet of pick-ups operated as private taxis developed during the late 1990s, which among others serve the coffee growers (Pedersen 2001b).

At the same time there are indications that truck rates went down during the 1990s as a result of the increased competition. Around 1990 Rizet and Hine (1993) found in comparative studies of truck transport in West Africa and Pakistan that African trucking rates were 5-6 times higher than Pakistani rates. However, more recent studies have indicated that African trucking rates went down during the 1990s, although they are probably still higher than the Asian rates (Ellis and Hine 1998), and since 2000 undoubtedly have increased again due to raising gasoline prices (Bryceson and Mbara 2003).

These recent improvements in rural transport may eventually expand the effective hinterland of the buying points, and probably also make African producers more competitive on the world market. This will happen not just because transport costs go down, but because improved transport opportunities make it possible for farmers to bypass rural traders and break their local monopolies. For instance, Hine et al. (1983) showed in a study of food marketing in the Ashanti region of Ghana that less than 10% of the price differences in the region could be explained by differences in transport costs. Some recent data borrowed from a study of pineapple growers in Uganda illustrate this[4]. These data show that while the average price per pineapple paid by traders at the market in a rural town was in average 560 Ugandan shilling, the price paid by traders collecting pineapples at the farm-gate was only Ush 300. Thus the mark-up from farmgate to bulking market was Ush 260 whereas the cost of collection and transport by truck was at most Ush 75. This is possible because for the pineapple growers to carry their own pineapples to the market individually would be much more costly than it is for the truck-traders.

8. Conclusion – the new role of transport and logistics in development

The new economic geography introduced since the 1970s focusing on global industrial reorganisation, large international enterprises and their global value chains, rather than on transport costs, has undoubtedly led to a much better understanding of how the global production system operates in order to exploit natural resources and first of all cheap labour. However, although post-Weberian location and development theories have clearly shown that transport in itself does not explain industrial location and economic development, poor, expensive and unreliable transport

[4] Unpublished data from Peter Gibbon.

still lead to exclusion from or unstable integration into many global markets, and therefore to slow and unstable development or stagnation. Because the local transport costs are usually the responsibility of the supplier, poor and expensive rural transport inevitably leads to lower incomes in rural areas. Even where development does take place, poor and unreliable transport has a negative impact on the production and distribution system not only in the form of higher transport costs but also in the form of higher storage costs, increased product damage or reduced product quality, and inability to exploit narrow time windows of market opportunity.

In rural areas with poor transport facilities this especially hits agricultural crops with high weight per value ratio. These tend to be food crops which therefore tend to be substituted with higher value export crops, not because there are no market for food crops, but because it is impossible or too costly to transport them to the market.

At the same time the shift from regional geography to enterprise geography, which was a consequence of the new economic geography, removed the focus from the role of government and other local actors in developing the local resource base, the local, national and regional markets and the local infrastructure and services, including transportation. Therefore there is a need to reintroduce transport into the new, post-Weberian economic geography, not as a simple distance variable as was the case in the old location theories and also in Krugman's new economic geography, but in the form of transport and logistics chains interacting dynamically with value chains.

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Appendix

Assumptions behind the transport-cost data in Table 1 for the production and marketing chains for

- cocoa in Ghana
- coffee in Tanzania and
- cotton in Zimbabwe

Transport costs in cocoa production and marketing in Ghana, 1999

Rural transport

Head-loading costs

One ton of cocoa beans are produced on about 1.1 acres. Empirical studies indicate that the average distance from field to village is about 4 km and from village to collection point about 5 km (Hine 1998; Arhin 1985). If one head loads 20 kg at a time it will require 50 trips to move one ton. If we assume that most of the movement of the cocoa from the field to the village is done in connection with work in the field, only loading from village to buying point should be counted. One person will hardly be able to walk more than two trips or 20 km a day. It will then take 25 days or about one person-month to move one ton. There is no simple way of estimating the value of one month's work in rural areas, but we have set it to US$1 a day or US$30 per ton.

Inland transport

Trucking costs

I assume an average distance of 300 km from the collection point to the port, and a transport rate of about US cents 3 per ton-km, which amounts to US$9 per ton. In addition we assume that the cocoa is reloaded at a midway depot, at a cost of US$2 per loading and unloading, in total US$8 per ton.

Shipping costs

The transport rate for a container between Tema and Rotterdam, including handling in Tema and Rotterdam, is US$878. As a container load 267 bags of 62.5 kg, this give a transport rate of US$53 per ton. Of this, US$43 represent shipping costs and US$10 the bunker adjustment factor and terminal handling costs.

Transport, packaging and storage costs in different sectors of the coffee transport chain in Tanzania. Tsh. per ton of green coffee, 1997

Sector of the chain	Farm to buying post		Buying post to mill		Mill to point of sale		Mill or other point of sale to port		Ship transport[3]		Total transport			Auction price	Total transport costs as % of auction prices	Payment to farmer 1000 Tsh	Farmers transport costs[1] as % of payment to farmers
Responsible	Farmer		Coop. Union for private buyer		Coop. Union for private buyer		Exporter		Exporter								
Mode of transport	Head load or intermediate transport		Truck		Truck		Truck or railway		Ship								
	Tsh/t	%	Tsh/t	%	Tsh/t	%	Tsh/t	%	Tsh/t	%	Tsh/t	US$/t	%	US$/t	%		%
Northern Highlands	22,000	(13%)	70,000	(42%)			33,000	(20%)	42,000	(25%)	167,000	288	(100%)	2850	(10%)	1590	1,4%
Southern (Mbozo)	22,000	(10%	57,000	(25%)			105,000	(46%)	42,000	(19%)	226,000	390	(100%)	2850	(14%)	1470	1.5%
Southern (Mbuga)	22,000	(9%)	57,000	(24%)	27,000	(12%)	85,000	(36%)	42,000	(18%9	233,000	402	(100%)	2850	(14%)	1350	1.6%
Kagera Region[2]	35,000	(15%)	55,000	(24%)	81,000	(35%)	20,000	(9%)	42,000	(18%)	233,000	402	(100%)			550	6,4%

Source: Based on Agrisystems (Overseas) Ltd., 1998, Appendix E.

[1] Computed at 5 work days at 870 Tsh. per ha of 200 kg green coffee.
[2] Farmers' transport costs in Kagera are higher than in the other areas because there go about 1800 kg magenda per 1000 kg robusta green coffee, but only 1200 kg parchment per 1000 kg arabica.
[3] Based on a freight rate of US$1200 per 20' container of 16.5 tons of coffee and an exchange rate of 580 Tsh. per US$.

Transport costs in cotton production in Zimbabwe, 2000

Rural transport

From farm to cotton depot/buying point

Transport between the farm and the cotton depot or buying point is paid by the farmer. The transport rate in rural areas is generally a rate per cotton bale regardless of distance, though the rate per bale tends to increase at longer distances, partly because rates for hire of scotch carts are lower than for the hire of tractors and lorries, and scotch carts seldom go beyond 15 km, while tractors may go up to 40–50 km and lorries are used for longer distances.

Transport rates varied in 2000 between Z$ 100 and 350 per bale or between Z$ 400 and 1400 per ton. On average this is Z$ 900 per ton seed cotton or US$23.6 per ton. As the farm price in 2000 was about Z$18 per kg, the transport rate corresponds to 5% of the price paid to farmers.

In the ginning process, the lint extracted is about 40% of the weight of seed cotton (the new ginneries extract 43–44%, while the old only extract 35–37 %.). Therefore 2.5 tons of seed cotton is needed to produce one ton of lint. This means that the rural transport needed to produce one ton of lint costs US$59.

Inland transport

Transport between depots and ginnery

This part of the transport costs is paid by the cotton-buying organisation and the transport made by truck.

On the basis of data from Cargill, I have estimated this transport cost at about Z$1000 per ton of seed cotton (US$26.2). As the farm price in 1999–2000 was about Z$18 per kg, this corresponds to about 5–6% of the farm price.

Information in Danida-ASSP (2001) shows similar figures for the transport between depot and ginnery at 5% of the farm price or Z$900 (US$24) per ton of seed cotton, corresponding to US$60 per ton of lint.

Transport from ginnery to railway

I do not have any information on this but I estimate it to be about the same as between the depot and the ginnery, or US$24 per ton of lint, corresponding to a distance of about 140 km.

Transport by railway from Harare to Beira

According to information from Maersk (June 2002), the cost of transporting one 40' container between Harare and Beira is US$2207 (rail transport: US$2092 + bill of lading release fee: US$40 + carrier merchant haulage service fee: US$75). As a 40' container contains 18 tonnes of cotton lint, this corresponds to US$123/tonne of cotton lint.

Shipping costs

Shipping costs from Beira to western Europe

According to Maersk (June 2002), the shipping costs of transporting a 40' container from Beira to western Europe is US$3123 (sea fare incl. 9.13% bunker adjustment: US$2738 + harbour handling charges in Beira: US$140 and in Europe: US$212 + bill of lading fee: US$33). As a 40' container contains 18 tons of cotton lint, this corresponds to US$174 per ton of cotton lint.