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Trade, Development and Poverty: The Role of Air Freight Horticultrual Products

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1 Introduction

The purpose of this paper is to investigate the extent to which trade via air freight offers an important catalyst for sustainable economic development and poverty reduction in poor countries. As we will see, the literature on trade and development is vast and offers a variety of viewpoints concerning the importance of trade liberalisation and openness in promoting economic growth and development, and reducing poverty. By and large trade is seen to have a positive effect on aggregate economic growth, although the empirical work is by no means conclusive, while the precise mechanism by which trade affects economic and development indicators is frequently obscure (eg. Winters 2004, Bhagwati and Srinivasan 2003, Rodriguez and Rodrik 1999). In addition to this, fears remain as to the adverse distributional effects of trade liberalisation, particularly with regard to agricultural smallholders (Bhagwati and Srinivasan 2003). Nonetheless, since the 1980s, after the failings of the protectionist developmental strategies emerging from the seminal work of Prebisch and Singer (1950), trade liberalisation and openness are frequently seen as one of the cornerstones of developmental policy: one need only look at the ‘trade not aid’ slogan of DFID for a manifestation of this view.

Among the dissenting voices in the trade argument are those, it can be argued, more concerned with *inter*-generational rather than *intra*-generational equity. That is, with the rise of climate change up the political and economic agenda, concerns have been raised regarding the greenhouse gas emissions attributable to global transport. Emissions from this sector have been rising faster than in any other sector in recent years, largely as a result of global trade (Stern 2006) and nowhere are these concerns more vocalised than in relation to air transport and air freight.

Given that a consensus has not been reached on the precise mechanism by which trade fosters growth and development, the idea that air freight has a particular and important role to play in this process seems far-fetched. It is certainly an idea juxtaposed against current concerns about climate change. However, recent evidence from a number of developing countries suggests that air freight may have had an important role to play in driving the development of high value horticultural production. Kenya and Ethiopia for instance rely on air freight for the transport of cut flowers and green beans to European markets. While air-freighted horticulture is a relatively small market at present, there are lessons to be learned from the experience of developing countries engaged in such trade, lessons which are important from a wider developmental perspective.

There is a widely held view that suggests that trade in agricultural products has a greater impact on poverty than trade in non-agricultural commodities. Not only are horticultural products generally high-value, trade in these commodities tends to generate a direct flow of wealth to farmers (Minot and Ngigi 2003, World Bank 2004, IIED 2006). It is this view that has engendered a shift in the focus of development policy in the UK towards agriculture in general. Furthermore, transport by air is particularly suited to high value, low weight/bulk perishable or time sensitive products, making it an important element of the supply chain for horticultural goods between developed and developing countries alike.

In this paper we begin our discussion by summarising the salient literature on the impact of trade on growth and poverty, highlighting in the process the mechanisms by which trade is thought to impact on development and growth. We then go on to discuss the drivers of trade

and discuss distance between trading partners before focussing upon the importance of transport and time costs in determining trade links and flows. The costs of trade are phenomenal, and even with the general reduction of tariffs on trade they remain equivalent to a 170% ad valorem tariff of trade, half of which are due to transport. Equally important are transactions costs, such as opportunism, insurance, legal costs, search cost, and information searching.

Clearly, trade links and flows can be promoted by reducing these costs. Co-ethnic and business networks represent one solution to overcoming the costs of search and opportunism. The existence and structure of global value chains (GVC) reflects another attempt to organise and facilitate trade efficiently. Air freight also has certain advantages in reducing the costs of trade, particularly time costs, and this in turn has affected the structure of vertical industries including horticulture. Fragmentation to low cost economies and the use of just in time (JIT) inventories are all features of GVCs today. Such systems require coordination and governance, often in the form of quality and performance standards, and as such logistics and air freight have become core competencies in the GVC for horticulture. All of this has implications for the gains from trade and the implications of the GVC structure in horticulture for developing countries and for smallholders.

In the final sections we discuss the important features of the aviation industry as they pertain to air freight and trade, particularly in horticultural commodities. The importance of liberalisation of the aviation industry, open skies agreements and other bilateral agreements are also highlighted. In sum, this reveals the extent to which air freight may act as a catalyst for trade and growth. We then provide two brief case studies: Kenya and Ethiopia, which highlight succinctly the importance of each of the aforementioned facets and determinants of trade; trade costs; informal and formal networks; institutional and industry structure and air freight, in the development of trade in horticultural products.

In conclusion, air freight is an important determinant of trade links and trade flows as a consequence of its ability to reduce the costs of time in transit and reduce the costs of distance. Horticultural goods benefit tremendously from timeliness of delivery, and the structure of the GVC is also influenced by the mode of transport. By making trade in high value crop viable, air freight broadens land-use options in developing countries. This affords developmental benefits by broadening the structure of opportunities facing the private sector and frequently reduces poverty. Ultimately, some way needs to be found to consider these developmental benefits in the light of concerns surrounding climate change. The extent to which the transport of horticultural goods would withstand a global economy in which prices reflected environmental costs, e.g. the social cost of carbon, and the developmental impact that this would have, is an area for future research.

2 Trade, growth and poverty alleviation

Trade and growth: theory and empirical evidence

Contemporary economic theory provides several channels through which trade liberalisation, openness and economic growth can affect economic growth and income levels. Beyond the traditional theories of comparative advantage and the exploitation of economies of scale, more recently focus has fallen upon concepts such as learning by doing, technology diffusion or spillovers, Research and Development (R&D) investment and dynamic comparative advantage (e.g. Krugman 1979, Grossman and Helpman 1991, Young 1991). Most of these concepts are embodied in the endogenous growth literature. Naturally, the burgeoning theoretical literature has spawned an equally varied empirical literature which has strived to establish the validity of the general theoretical proposition that trade liberalisation and/or openness have a positive impact on growth and income levels.

Theory

The impact of trade on growth and development has been the subject of debate for decades, and the view of development economists has oscillated over the years. During the 50's and 60's protectionism was the preferred developmental approach, following on largely from the seminal work of Prebisch (1950) and Singer (1950) which predicted worsening terms of trade for primary products and hence, in the absence of industrialisation in developing countries, an increasing gap between rich and poor countries (Edwards 1998). However, history has largely refuted the wisdom of promoting growth through import-substitution and, to some extent, protection of infant industries. In the aftermath of the Latin American debt crisis of the early 80's, trade liberalisation became almost a pre-requisite for development assistance despite remaining unpopular among development economists (ibid.).

More broadly, growth theorists are largely agreed of the positive effect of trade on aggregate income *levels*, however the discussion still rumbles on as to the importance of trade as a determinant of *long-run growth*. The theoretical literature points to several mechanisms through which trade can promote higher aggregate incomes and/or growth in the short-run. In addition to comparative advantage, access to cheaper imports can reduce inflationary pressures while economies of scale offered by larger international markets can improve productive efficiency. The impact in the long-term is more complicated however.

Within the Harrod-Domar framework, in which productive capital exhibits constant returns when labour is in surplus, growth is permanently increased as a result of trade that improves the efficiency of resource use and hence the capital-output ratio.¹ In the Neoclassical growth framework (e.g. Solow 1957), in which technological change is taken as given and capital exhibits decreasing returns to scale, trade increases per capita income levels via increased investment, but long-term growth rates are unaffected². Increased income levels increase growth rates in the short-run, and the welfare importance of this depends upon the magnitude

¹ Provided there is excess labour supply.

² In the Solow model the fundamental parameters determining long-run growth are population growth, the savings rate, and technological change). None of these parameters are generally assumed to be affected by trade

of the increase in income and the speed of convergence to long-run growth rates (Winters 2004, Srinivasan and Bhagwati, 2004). More generally, Romer (1994) suggests that protectionism can have infra-marginal effects on production via the restriction of intermediate goods. Similarly, liberalisation may induce additional one-off boosts to productivity via competition stimulating adoption of new technology or the elimination of x-inefficiency. X-inefficiency is the difference between efficient behaviour of firms assumed or implied by economic theory and their observed behaviour in practice. Each represents a transitory impact on growth which may extend to the medium term and which translates into higher income levels.

Ultimately, this rather general view of neoclassical growth theory: trade increases income levels but not long-run growth, is somewhat dependent upon the assumptions underpinning the model. In particular, once market imperfections are introduced into the neoclassical framework the impact of trade liberalisation and openness on income levels, transitory growth and long-run growth is no longer certain. Rodrik and Rodriguez (2001), for example, provide a model in which openness pushes countries into less dynamic sectors, such as primary extraction, which ultimately harms income levels and growth.³ Bhagwati and Srinivasan (2001) provide further examples.

More recent theory has looked at how trade can affect long-term *growth* via increased competition or via the impact of trade on technological progress. The latter mechanism is the mainstay of the endogenous growth literature. For instance, if growth is determined via endogenous technological change, this provides a channel through which trade can positively affect economic growth. Exposure via trade to higher quality or greater varieties of products, particularly intermediate products, so the argument goes, can generate increased growth through direct imitation of new technologies or organisational strategies, via induced innovation and the pursuit of associated rents, or simply through the increased productivity associated with access to a greater variety of intermediate goods (e.g. Romer 1990, Aghion and Howitt 1992, Young 1991). The extent of knowledge spillovers arising from trade is the subject of large empirical literature.

Empirics

The conclusions of the empirical literature in this regard are, generally, less varied than the underlying body of theory. For instance, although cross-country regression analyses are fraught with methodological and conceptual problems, taken as a whole they cast a favourable, albeit uncertain light on trade liberalisation and openness in relation to growth⁴. Furthermore, case studies of particular countries and programmes also tend to show a positive link, but there again, caution is required in generalising these results. Certainly, few studies find a negative relationship (Winters 2004).⁵ That is, countries that are more 'open' in the sense that tariffs, quotas and other limitations on trade are lower tend to exhibit higher growth rates. Similarly, programmes of trade liberalisation tend to induce higher growth rates at least

³ Bhagwati and Srinivasan (2001) argue that the critique offered by Rodriguez and Rodrik (1999) merely reiterates the well-known fears of growth economists back in the 1960s. The implication is that the current and historical focus upon the conventional neoclassical model (e.g. of Solow) has been argued empirically and yet with the caveats that R&R highlight.

⁴ See Winters (2004), Bhagwati and Srinivasan (2003) for a review of the economic literature to date.

⁵ One exception here is Rodriguez and Rodrik (2001) who find a negative relationship in one of their econometric models.

in the medium term.⁶ Beyond this, there is empirical evidence in favour of a positive effect of trade, trade liberalisation and openness on income *levels* (e.g. Winters 2004).

The main problems facing economists are threefold: i) the measurement of openness ii) establishing causation and; iii) disentangling the effects of trade liberalisation and openness from factors with which they are highly correlated and which are also highly correlated with growth.

Problems of measurement beset most of the early and highly cited empirical work of Sachs and Warner (1995) and Dollar (1992). Both studies found a positive link between trade policy (rather than trade volumes) and income growth. The former used a dummy dependent variable reflecting elements of trade policy, such as the extent of tariff rates, as a measure of openness. The latter used exchange rate distortions and volatility. Dissenting voices start with Rodriguez and Rodrik (1999) who argue that the empirical measures of openness used by many researchers, such as trade ratios or indices of price distortions or average tariff level, are flawed.⁷ Furthermore, in many cases, the results of cross-country analysis are driven by specific outliers. Ultimately, once correcting for the apparent failures of previous analyses of the impact of trade policy on income growth, they find the effect is zero to negative. Rodriguez and Rodrik's critique extends to underlying theory, but this is rejected by Srinivasan and Bhagwati (2004, 2001), who proceed to argue that the cross-country approach itself is somewhat flawed and focus ought to be shifted towards case studies and industry analysis.

Even if measurement problems are overcome, the problem of establishing causation remains. The difficulty is disentangling the causal effect of trade on growth from that of growth on trade. Using cross-country regressions, Frankel and Romer (1999) find strong evidence of a positive impact of trade on growth using the exogenous variation found in geographical determinants of trade such as coastline. They find that a one per cent increase in the share of trade to GDP increases per capita income by between 0.5 and two per cent. Despite further criticism from Rodriguez and Rodrik (2001), Frankel and Rose (2002) establish the validity of geographical variables as instruments and appear to establish causation.⁸

Lastly, in practice trade liberalisation is undertaken alongside other macroeconomic reforms. This generates two problems. Firstly, disentangling the effects of reforms made in parallel is difficult. Secondly, establishing the extent to which parallel reforms are complementary, or indeed necessary for growth is empirically difficult (Winters *et al.* 2004). Evidence thus far suggests that institutions and investment are important parallel attributes. In short the arguments rumble on, with Dollar and Kraay (2002) finding in favour of trade when comparing 'globalisers' with 'non-globalisers', and yet numerous micro-econometric studies at the level of the firm indicate some reverse causality via a process of self-selection into the export market by technologically advanced firms.

⁶ Much is made of the distinction between trade liberalisation and openness in the economic literature, and indeed many of the empirical problems centre on the difficulty with which these concepts can ultimately be measured (e.g. Rodriguez and Rodrik 2001). Generally, openness is effectively a stock variable reflecting the history of trade liberalisation policies (Winters 2004, Bhagwati and Srinivasan 2003)

⁷ Mainly because the measures of openness are numerous are far from perfectly correlated, and yet must be aggregated into an index for econometric purposes.

⁸ Rodriguez and Rodrik (2001) show that geographical variables are correlated to other factors affecting growth, e.g. health, which renders these instrumental variables for openness invalid.

Another line of research has focussed on estimating the extent of trade related knowledge spillovers, Coe *et al.* (1997) construct an index of total knowledge capital: accumulated investment in R&D. They assume that the extent of knowledge transfer depends upon the trade in capital goods. They find strong evidence to the effect that knowledge capital is increased by trade, and hence trade induces spillovers. Subsequent papers have developed the idea further and find that trade with one country in the capital goods of another is also an important determinant of knowledge spillovers. That is, knowledge spillovers occur indirectly as well as directly (See Winters *et al.* 2004). Xu and Wang (1999) find similar results for OECD countries, and also find that half the return on investment in R&D spills over to other OECD countries. Lumenga Neso *et al.* (2004) find that indirect spillovers are at least as large as the direct spillovers, while Keller (2000) finds that these differences in the flow of technology explain up to 20 per cent of total variation on productivity.

Trade and poverty: theory and empirical evidence

While on balance the evidence suggests that trade liberalisation and openness increase the size of the pie, a considerably more polarised and, some would say, acrimonious debate is taking place in relation to the distributional effects of trade. Although economic theory offers no hard and fast predictions in relation to the impact of trade on inequality, it is far from silent on the subject. The latter is true of the associated empirical literature.

Theory

Interest in this area has focussed upon two aspects of poverty: relative and absolute poverty. In an analysis of the impact of trade on absolute poverty Winters *et al.* (2004) identify four separate channels through which trade liberalisation operates (See Box 1).⁹ Firstly, trade affects the poor to the extent that it can stimulate growth. The theoretical arguments in this regard are outlined in the previous section. Important here is the extent to which trade related productivity increases can *sustain* economic growth. In addition to this, trade may affect the poverty through its effects on macroeconomic stability. For example, Bhagwati and Srinivasan (2004) argue that macro economic stability accompanies trade related policies such as export promotion. This leads to lower, more predictable inflation levels which are generally of disproportionate benefit to the poor. On the other hand, an open economy is subject to a greater array of macro economic shocks, and often greater uncertainty in relation to commodity prices.

Trade may affect the poor in more direct ways via changing access to markets, commodity prices, employment opportunities and wages. The extent to which trade liberalisation and openness affects *employees* depends upon its impact on wages and employment in specific industries. Standard trade theory shows that if the price of a commodity increase as a result of trade the wage paid to the abundant factor will increase.¹⁰ In developing countries this would appear to predict an increase in wages for unskilled labour. An important distinction to make in this regard is between short-run (static) and long-run (dynamic) effects (Bhagwati and Srinivasan 2004). Another channel by which poverty can be reduced is via increased employment of surplus labour as a trading country specialises in labour intensive production.

⁹ Winters et al (2004) focus on poverty alleviation and are not concerned with the unequalising effects of trade.

¹⁰ This is the so-called Stolper-Samuelson effect. It implies that the return to the scarce factor simultaneously declines. Assumptions for this effect include constant returns to scale production and perfect competition.

Naturally, if the comparative advantage lies elsewhere, and the trade sector excludes low skilled labour, trade may have the opposite effect if commodity prices deteriorate for agricultural producers (Winters *et al* 2004). Indeed, where markets fail or are imperfect many outcomes are theoretically possible.

The impact on producer-consumer households depends upon the extent to which they participate in markets affected by price changes and the composition of their income and consumption.¹¹ *Inter alia*, the impact here will depend upon sources of income, distribution costs from border to rural areas, the extent to which markets are created or destroyed (e.g. for off-farm labour or grain) and the extent to which households can respond to the adverse impacts (e.g. risk) or positive opportunities (e.g. employment) presented to them.

The impact of changing commodity prices will depend upon whether a household is a net consumer or net producer of the affected commodity.¹² In the longer-run, the welfare effect depends upon household coping strategies and responses, e.g. crop choice. A large body of literature shows that such responses are dependent upon the extent to which households are subject to market and institutional failures, e.g. in relation to credit and land tenure (Winters *et al.* 2004). Furthermore, Janvry *et al.* (1991) show that in theory market failures and transactions costs can limit household responses to price changes in one fully functioning market due to failures in other related markets. For instance, subsistence households may be prevented from increasing cash crop production if there are significant transactions costs in the grain market. The same analysis is relevant to price changes and market creation generated by trade liberalisation.¹³

Another channel through which trade can affect poverty is through the impact on productivity arising from the availability of inputs, improved capital goods and the general transfer of technology. Lastly, changes in government revenue and spending are another important channel via which trade affects poverty. In general trade liberalisation involves the reduction of tariffs which could negatively affect revenues and expenditure. The impact on poverty depends on whether trade responds sufficiently to make up any shortfall, the impact of other taxes levied in the place of tariffs and whether any drop in expenditure adversely affects the poor. In considering this channel, as in each of the previous channels, economic theory provides only ambiguous predictions. The impact of trade liberalisation on trade is therefore an empirical question.

Before turning to the empirics, it is important to note that, while Winters *et al.* (2004) were concerned largely with absolute poverty levels, there is a great deal of research into the ‘unequalising’ effects of trade. Much of this has focussed on the detailed analysis of industry structure and supply chains. While economists have taken a broad look at the nature of different industries and branches thereof, the analysis of Global Value (or Commodity)

¹¹ Singh, Squire and Strauss (1986), and recent literature on the producer-consumer household, suggest that market failures/missing markets, transactions costs and institutional failures are defining features of the rural household. To the extent that this is the case rural households will be insulated from the impact of trade liberalisation and openness.

¹² Deaton (1997) shows that an approximate welfare impact of price changes can be measured by

$$\sum_i (q_i - c_i) \Delta p_i, \text{ where } q_i \text{ is the quantity produced, } c_i \text{ is the quantity consumed and } \Delta p_i \text{ is the price change}$$

for good i . He provides an empirical example of the impact of domestic price support policy for rice in Thailand.

¹³ See e.g. Key *et al.* (2000) for an illustration of the impact of transactions costs in grain markets on household behaviour. See Groom *et al.* (2007) for a discussion of the importance of institutional failures such as tenure insecurity, while Taylor and Adelman (2005) provide an overview of producer-consumer household modelling.

Chains (GVCs) and their ‘governance’ has become the preoccupation of some development economists (See Box 1).¹⁴ The fragmentation of industries as a consequence and feature of globalisation makes the analysis of GVCs and governance all the more pertinent. On the one hand, detailed understanding of the location of value adding activities in a supply chain reveals the point at which rents accrue and value is added in the production process and, hence, how the gains from trade are distributed throughout the supply chain. Analysis of GVCs also brings to light where the incentives for innovation lie as well as location and ownership of the most innovative portions of the chain. This reveals the dynamic potential of trade in the particular commodity or industry in question for developing countries. That is, the structure of ‘governance’ (e.g. ownership, production patterns, performance standards) is a determinant of the extent to which certain channels of growth, such as technology transfer and other informational spillovers, will determine the outcome of trade.

Not just the structure of governance, but also the structure of government policies, will be important. Given that market imperfections and market structure in general will be important for determining the outcome, government policies that address market imperfections can conceivably improve the outcome. Similarly, government policies that affect market structure will also affect the outcome of trade (for better or worse).

Box 1: Global value chains and governance

A value chain essentially describes the full range of activities that are required to bring a product or a service from conception via production to the consumer and to final disposal (Kaplinsky 2000). **GVCs** extend this concept to supply chains that cross international borders and attempt to characterise the structures underpinning global trade. While effectively descriptive, Gereffi (1994, 1999) couched GVCs in the economic theory of the firm and firm boundary: **transactions costs** (e.g. Coase 1937, Williamson 1985, 1975) and **property rights** (e.g. Grossman and Hart 1986, Hart 1995). Interpreted in this way the structure of ownership in GVCs reflects the underlying transactions costs, the costs of incomplete contracts, and the incentives for investment at each stage of the chain. Issues of **governance** in GVCs refer to the institutions which govern production patterns and transactions: e.g. whether a firm should undertake a function internally, quasi-internalise via contracts and standards or let the market govern the transaction. Ultimately, the nature of the institutions governing transactions in GVCs between, for instance, producers in developing countries and retailers in developed countries, reflects a **systemic efficiency** rather than ‘point’ efficiency (Kaplinsky 2000). That is, the observed institutions and governance structures minimise transactions costs and promote essential investment. Concomitantly, management of GVCs is widely seen as a potential source of competitive advantage.

GVC analysis has become more important as the composition of trade has moved from the import and export of finished goods, which was largely governed by arm’s-length relationships for which the boundaries of ownership and production largely coincided with national boundaries, towards the fragmentation of production into the manufacture of sub-components and services. In addition to this, competition is more frequently based on product differentiation and quality (Dolan and Humphrey, 2004). More complicated governance structures are required in order to facilitate the greater coordination and logistical complexity inherent in this economic environment. Several common features of GVC governance have arisen (Kaplinsky 2000): i) **legislative governance**: strict rules, e.g. performance standards on production, which determine participation in the chain; ii) **judicial governance**: the need for monitoring and auditing of compliance, and; iii) **executive governance**: the assistance required, e.g. training and technology transfer, in order for participants to meet performance standards. Elements of these governance structures can be seen in relation to horticulture: standards on pesticides, labour, and overall quality.

¹⁴ Kaplinsky (2001), Dolan and Humphrey (2004) Gereffi et al (2003) all build upon the work of Gereffi (1994) in identifying and analysing GVCs for various commodities: e.g. horticulture, shoes, automobile components etc. All have some connection with the Institute of Development Studies at Sussex University.

GVCs have also been classified as either **buyer driven**, in which retailers or brand names exercise the key governance functions, or **producer driven**, in which chain governance is exercised by those who control the key technologies and or production facilities (e.g. biotech or IT, or capital intensive industries) (Dolan and Humphrey, 2004). Furthermore, recent work on GVCs has focussed on the extent to which observed GVC structures promote or stifle innovation, or **upgrading**, in developing countries (Gereffi 1999). Most economists agree that innovation is key to development, and the nature of GVCs and their governance is an important determinant of the incentives and capabilities for R&D.

Ultimately, the outcomes for producers depend not solely upon participation in GVCs but the terms upon which participation founded. The terms of trade, in this sense, are determined largely by the governance structure.

Empirics

The empirical literature on the link between trade/openness, growth and poverty is burgeoning with each of the theoretical channels described above receiving attention (See Box 2). The empirical results are as varied as the theoretical predictions.

Box 2: Trade, growth and poverty: analytical framework (Winters *et al.* (2004))

1) Economic Growth and Stability:

- Does trade liberalisation stimulate growth and relieve poverty?
- Does trade liberalisation boost productivity?
- Are open economies less stable?

2) Households and Markets:

- Do border price shocks get transmitted to poor households?
- Are markets created or destroyed?
- How well do households respond?
- Do spillovers benefit the poor?
- Does trade liberalisation increase vulnerability?

3) Wages and Employment:

- Does trade liberalisation raise wages?
- In transitional unemployment concentrated on the poor?

4) Government and Spending

- Does liberalisation actually cut government expenditure?
- Do Falling revenues from trade taxation hurt the poor?

Bhagwati and Srinivasan (2004) provide a general answer to the question of the impact of growth on poverty by noting that China and India represent the main sources of evidence for the link between poverty reduction and growth: since 1980 absolute poverty has declined significantly in both countries, falling from 28 per cent to nine per cent for the former and

from 51 per cent to 27 per cent respectively.¹⁵ Together with the finding that growth is generally enhanced by openness, the finding that the impact of growth on income distribution is limited suggests improvements in absolute poverty and no decline in relative poverty (e.g. Bruno *et al.* 1998, Dollar and Kraay 2002). Establishing causality is problematic here also, since theory and empirical evidence tell us that income distribution is a determinant of growth, e.g. through savings propensities and aspirations (e.g. Ray 2000). However, Ravallion (2001) suggests that the elasticity of the poverty headcount with respect to mean incomes is roughly proportional to 1 – index of inequality. So, the higher is inequality, the lower the impact on poverty.

The evidence with regard to productivity, is more compelling, although again it remains mixed. Coe *et al.* (1997) provide evidence of the positive impact of trade on technological spillovers, as discussed in Section 2.1. In general, countries with lower trade barriers exhibit higher productivity (Winters *et al.* 2004), although causation is frequently difficult to disentangle. As for stability, the evidence is also mixed. In general where trade is not diversified volatility in terms of trade is likely. Lutz and Singer (1994) find no evidence for one implication of the Prebisch-Singer hypothesis: countries specialising in the export primary products are subject to greater volatility in terms of trade. There is strong evidence to suggest that African countries growth is adversely affected by volatility in terms of trade and exchange rates, from whatever cause (terms of trade shocks, structural instabilities). Easterly *et al.* (2000) provide evidence for the role of protectionism in stifling the growth of financial institutions, which then adversely affects long-run growth.

The analysis of transitional unemployment as a consequence of trade liberalisation suggests it is somewhat infrequent and limited in duration (Winters *et al.* 2004). The analysis of the response of wages provides a varied picture depending upon the sectors affected. Dollar and Kaay (2002) show that the mean income of the poor increases with overall mean income, suggesting a pro-poor impact of trade.

More interesting, perhaps, are the household level studies. The results are very much contextual and are dependent upon factors such as: the extent to which process shocks resulting from trade reach poor households; whether a household is a net purchaser or net producer of commodities; ability to exploit employment opportunities because of poor infrastructure; whether markets are created or destroyed. Barrett and Dorosh (1996) show that one third of poor rice farmers in Vietnam could lose from the higher and less stable prices resulting from trade liberalisation.

In relation to the impact of trade via the price and availability of consumption goods and inputs, Gisselquist and Grether (2000) reveal significant direct benefits to farmers in Bangladesh as trade liberalisation provided greater access to diverse inputs. Booth (1993) finds similar evidence for consumers in Tanzania at all levels of the income as a result of the availability of commodities, despite a rise in some prices. On the other hand, there is evidence to suggest that liberalisation has destroyed some markets upon which isolated rural communities were dependent. For instance, as marketing boards are abolished and the distribution of inputs dries up, or as cross subsidisation via national pricing policies is withdrawn, as was the case in Zambia post liberalisation (Winters *et al.* 2004). This was not

¹⁵ In 1980 the ‘Household Responsibility System’ was introduced which made land tenure more secure for farmers. Some argue that it is this innovation that reduced poverty rather than growth induced by trade alone. Indeed, the leases introduced under the HRS on formerly collectively owned land seem to have increased investment and productivity in rural areas and reduced significantly the numbers of rural poor.

trade liberalisation, though (at least not liberalisation in external trade): what happened was that government institutions had been set up to address various market failures, these institutions became increasingly dysfunctional and were therefore abolished, but when this was done the market failures remained. This is an important illustration of how a well designed government intervention can be preferable to a *laissez faire* approach if market failures are sufficiently important. It is also interesting to note that trade may affect households close to the poverty line in different ways to the those further below such that reductions in poverty can be measured at the same time as a deepening of poverty for others (Ravallion 2001).

On balance the empirical evidence, over and above that summarised here, tends to favour a positive impact of trade on growth and poverty. At the same time it raises issues concerning the complementary interventions and policies that can enable poor households to adapt to and benefit from the changing economic climate, such as infrastructure, distribution and credit. With increasing quantities of traded goods being transported by air freight as years go by it seems that air freight may not only have important implications for establishing trade and growth, but given the agricultural nature of the goods exported from Sub Saharan Africa, this mode of transport may have important implications for these objectives also. In the following section we discuss some of the theory surrounding the establishment of trade and trade flows. This forms the background for a discussion about the role of air transport.

3 Determinants of trade: trade costs, institutions and industry structure

Introduction

In order to determine the developmental potential of air freight we look at the important determinants of trade links and flows. Firstly, we discuss the nature and composition of trade costs particularly as they relate to developing countries. Here we initially draw from the field of economic geography and look at the importance of distance (see e.g. Venables 2006, 2001). The basic ‘gravity’ model (See Box 3) of trade flows provides an oft used empirical approach to determine the importance of distance and other geographical characteristics, such as infrastructure quality or sharing a common border, as determinants of trade (Venables 2001). We report some of the findings of this approach including recent work which has disentangled the particular costs associated with distance into their component parts: transport, administrative, infrastructure and the like (Limao and Venables 2004, Anderson and van Wincoop 2004). Importantly, the theory of economic geography and distance which largely motivates the gravity model points towards the clustering of activities, partly to reduce costs and partly to exploit positive externalities associated with proximity. We review some of the theoretical and empirical evidence surrounding this claim. This leads, in Section 4, to an analysis of the importance of air freight, airport hubs and associated infrastructure in reducing these costs and fostering trade.

Secondly, we consider the importance of formal and informal institutions, such as networks, and industry structure and ownership as determinants of trade. We discuss industry structure generally from the perspective of Global Value Chains (GVCs) (e.g. Humphrey 2004, Gereffi 2001). Since logistics and air freight have become a core competence in the supply chain of many industries engaged in global trade, GVCs provide a useful perspective from which to assess both the importance of air freight in horticulture as well as the likely developmental impact of horticulture in particular.

Trade costs, distance and clustering

Taken together the costs of trade are equivalent to a 170 per cent *ad valorem* tax on production, half of which are due entirely to the costs of transport (Anderson and van Wincoop 2004). Geographical factors are perceived as being important determinants of the costs of trade and participation in global production networks: country size, distance from trading partners, borders with other countries, access to the sea are frequently discussed. (e.g. Krugman 1991, Venables 2006). Poor transport and communications infrastructure are also widely viewed as important in this regard (e.g. Limao and Venables 2001). As an example of the impact of these features it is interesting to note that land-locked countries had an import share of 11 per cent of GDP compared to 28 per cent for coastal economies, while eight of the top 15 non-primary export performers for 1965-1990 are island countries, and none is landlocked.¹⁶ There are many factors at work here and we now briefly review some of them.

¹⁶ These are extreme examples taken from a WB report. I don't find this particularly compelling. NOTE TO SELF: SEARCH FOR MORE EXAMPLES....

Distance

Of the numerous geographical factors that determine the costs of trade, distance is one of the most important. In addition to transport costs, the costs of time in transit and other transactions costs (such as information costs) are strongly positively related to distance (Rausch 2000, Venables 2001, Anderson and van Wincoop 2004). The relative importance of these transport costs has risen as other trade barriers, such as tariffs and quantity restrictions, have diminished (Hummel 1999). So, despite claims that ‘distance is dead’ in the aftermath of the information communication technology (ICT) revolution (Cairncross 1999), distance from trading partners remains an important restriction on trade (See Box 4).

The most common approach to understanding the determinants of trade flows is the gravity model. The basic version models bilateral trade flows (usually imports plus exports as a percentage of GDP) as a function of the ‘mass’, e.g. GDP, of each trading partner, and some measure of distance. In this model, distance operates as a proxy for the costs of trade since data on the components of these costs is typically sparse. Refinements have included richer geographical variables such as shared borders, access to the coast, as well as sociological/cultural and historical variables such as shared language or colonial history. Like many economic approaches the gravity model started off life as an empirical approach, the theoretical justification for which has been retrospective and varied.¹⁷ (See Box 3).

Box 3: The gravity model: a brief history

In 1687 Newton posited that the attractive force F_{ij} between two objects of mass M_i and M_j is given by the following relationship:

$$F_{ij} = G \frac{M_i M_j}{D_{ij}^2}$$

Where G is the gravitational constant and D_{ij} is the distance between object i and object j . In 1962 Jan Tinbergen posited that a similar relationship held with regard to trade flows (F_{ij}) between two countries of ‘mass’ M_i and M_j a distance D_{ij} apart:

$$F_{ij} = G \frac{M_i^\alpha M_j^\beta}{D_{ij}^2}$$

While this seems like a rather heuristic approach to the analysis of trade flows, there have been several, sometimes unsuccessful, attempts to show that this specification accords with economic theories of trade, such as comparative advantage, or has some other micro-economic foundation (See e.g. Anderson 1979, Bergstrand 1985). One natural interpretation is that M_i and M_j represent demand and supply of imports and exports respectively, while D_i is a measure of the transport and other trade costs associated with distance. The model generates a logarithmic equation for empirical work. See Anderson and van Wincoop (2000) for a critique of the gravity model.

While the basic gravity model provides little detail with regard to the determinants of the costs of distance, it is illustrative of the importance of the costs of distance. The estimated elasticities of trade with respect to distance from the simple gravity model are typically in the

¹⁷ Another example of this type of approach, it can be argued, is the Kuznets curve as it pertains both to inequality and environment.

order of -1 to -1.5 (Venables 2001). This indicates a significant tapering off of trade volumes between ever more distant countries. The same relationship has been found for other economic quantities such as equity holdings, foreign direct investment and technology transfer. See Table 1. Distance is a rather noisy proxy for the costs of trade, and so while these elasticities are interesting they do not indicate the precisely which trade costs are important. Indeed, the tapering off of economic activity reflects a number of factors associated with distance. Fortunately, numerous studies have started to delve deeper into these questions.

Table 1: Economic interactions and distance: flows relative to 1,000 km¹⁸

Distance	Trade	Equity Flows	FDI	Technology
1000km	1	1	1	1
2000km	0.42	0.55	0.75	0.65
4000km	0.18	0.31	0.56	0.28
8000km	0.07	0.17	0.41	0.05

In an empirical analysis Limao and Venables (2001) begin by disentangling the various determinants of transport costs into several categories, such as whether countries share a common border, whether they are land-locked and quality of infrastructure.¹⁹ The rationale for the former is that, even when distance is controlled for, countries sharing a common border are more likely to have integrated transport networks and customs unions, both of which reduce transit times. Similarly, with integration comes the possibility of backhauling, that is, the movement of commodities in both directions. This allows fixed costs to be shared over both legs of the journey. Using detailed data on freight costs from the U.S. Limao and Venables (2001) are also able to separate land and sea transport costs and estimate the importance of each of these determinants econometrically. Overall, Limao and Venables find that the cost of transporting a 40ft container from Baltimore (in 1990 prices) increases by US\$ 3,450 if a country is land-locked, almost 80 per cent more than average. An additional 1,000 km by sea adds US\$ 190 whereas by land it adds US\$ 1,380. Their measure of infrastructure quality is also highly significant and indicates that a movement from the 75th percentile to the median is the equivalent of a reduction of 3,466 km of distance by sea or 419 km by land.

By including these detailed determinants of transport costs in a gravity model Limao and Venables are also able to obtain estimates of the elasticity of trade flows with respect to each factor. In particular they find that distance and infrastructure are the most important determinants. The estimates vary widely with an elasticity of -6.47 for distance and -1.67 for infrastructure quality. These are highly elastic relationships and imply that moving from the median to the top 25th percentile of the infrastructure quality distribution increased trade flows by up to 68 per cent, or equivalent to countries approximately 2,000 km closer. They find similar costs associated with being land-locked.

Importantly, Hummels (2001) undertakes an analysis of the impact of transport costs on the selection of trading partners. He finds overwhelming evidence to the effect that high air freight tariffs and shipping times reduce the likelihood of engaging in trade with another country.

¹⁸ This is taken from Venables (2001).

¹⁹ Infrastructure quality is measured using an index reflecting the extent/density of rail, road and telecommunications networks in both the importing and exporting countries.

Time costs and other transactions costs

In addition to transport costs, there are numerous other trade costs associated with distance from markets. Hummels (1999, 2001) shows that the costs of time in transit are extremely important determinants of trade. Using data on freight and mode of transport, Hummels finds that the costs of time are equivalent to an *ad valorem* tariff of approximately 16 per cent for the average shipment by sea as compared to air freight. Naturally, these costs vary across industries but are found to be particularly pervasive in manufacturing: that is, in industries which generate time-sensitive goods. Hummels (2001) also finds that time costs reduce the probability of engaging in trade. Savings in time represent a major advantage offered by air freight, and we discuss this in some detail in the following Sections.

There are numerous other transactions costs associated with distance that make trade less likely. Rauch (1999) looks at the costs of information transfer and opportunism. As Venables (2001) notes, we know less about potential trades in far off places than with our neighbours, and for this reason are less inclined to engage in trade, other things being equal. Krugman (1991a) has looked at the importance of language and culture. While language appears to an important determinant of trade it still remains unclear as to why this might be. For instance, is this because of the similarity of preferences or the ease with which searches can be undertaken? (Hummels 2001).

Clustering

The empirical evidence points towards the importance of proximity in determining trade links and flows as a means of reducing costs associated with transport. Indeed, theories of development stemming from economic geography predict ‘lumpy’ and divergent development patterns resulting from clustering of activities around transport and communication hubs. One implication of this is that spatial disparities in income for instance are likely to persist rather than decline not only because proximity reduces transport and trade costs, but also because clustering generates a number of important positive externalities.

Venables (2006) describes the positive externalities arising from clustering of activity as being fourfold. Firstly, there are production side benefits resulting from economies of scale associated with being in the midst of dense economic activity and close to labour, consumers and other firms. In smaller markets, the existence of scale efficiencies gives rise to the spectre of monopolistic behaviour. Larger markets tend to be more competitive, generate a greater variety of outputs and along with them a wide range of specialised input suppliers with which firms can easily and efficiently match. Secondly, similar gains can be made from large scale labour markets. Firms faced with a large and diverse labour force are more likely to find an appropriate employee match. Furthermore, large labour markets can insulate workers from idiosyncratic risk and increase incentives for training. Greater competition and diminished opportunistic behaviour ensure the latter.

Thirdly, communication is also important. While distance has been pronounced dead by some in this regard, due to the ICT revolution (See Box 3), proximity remains important where face-to-face meetings are important: e.g. for exchanging ideas rapidly, for developing trust, generating networks and promoting partnerships. Finally, proximity facilitates ‘knowledge spillovers’. This is a rather general category of benefits around which a large literature has developed exploring several mechanisms related to proximity of activities. Venables (2006) suggests that labour mobility, face-to-face contact between workers, or ability to observe the practices of other workers or firms are important channels for knowledge spillovers. Audretsch and Feldman (2005) point to the particular importance of these channels in

innovation intensive industries. Evidence for this proposition is to be found in the dense concentration of such industries; consider Silicon Valley for example. Rodrik and Hausman (2003) discuss the extent to which information about location quickly spills over to local firms. In general such effects are likely to be nothing less than herding effects whereby firms locate near other successful firms.

These different classes of benefits of proximity attenuate at different rates with distance. The benefits of large markets may cover large distances (e.g. the east coast of the US benefits from large markets on the west coast), however the benefits associated with labour markets and technology spillovers tend to attenuate rapidly (Rice, Venables and Patachini 2006). While Table 1 provides some evidence for this in terms of international trade, Jaffe, Henderson and Trajtenberg (1993) point to rapid attenuation of patent application citations outside of the metropolitan area in which they originated. As Box 3 indicates, the benefits of proximity depend upon the nature of the activity. Venables (2006, 2001) uses the financial sector as an example in which some activities can easily be codified and digitised and hence with the development of ICT benefit little from proximity. However, some highly skilled elements of the financial sector benefit tremendously from proximity: they require face to face contact, firms offering complementary services etc., and are generally subject to strong clustering forces.

Clearly, clustering forces will have a major effect upon immobile factors, such as land, many of which can attenuate the clustering forces. For instance, in concentrated areas the price of land eventually rises, while firms in the cluster may be subject to other increased resource costs such as congestion. The clustering effect is therefore a careful balance between the two. This is important when we consider horticulture.

There is much evidence to support this theory of economic geography: doubling city size increases productivity by three to eight per cent, firm level data shows significant increases in productivity as a result of clustering, particularly in the technology sector (Venables 2006).

Box 4: Distance is dead, long live distance!

The rapid advances in information and communications technology (ICT) have lead some analysts to cry 'distance is dead' (Cairncross 2001). Technological change such as this reduces the cost of communications and market access and facilitates the diffusion of information. This is naturally of considerable importance for developing countries. However, Venables (2001, 2006) argues that the impact of ICT on the costs of distance will be both mixed and complex. In short, 'distance still matters'.

As an empirical starting point, Venables points out that the major technological advances in transport in the 19th century induced the concentration not diffusion of economic activity. Furthermore, empirical applications of the **gravity model** show that economics activity tails off considerably with distance with **elasticities of trade flows with respect to distance** remain stubbornly high: in the order of -1.5 . That is, an additional 1,000 km of distance reduces trade flows by around 80 per cent. Consequently, it is not immediate that the ICT revolution will diffuse economic activity.

Clustering and concentration of economic activity occurs for the following four reasons: 1) **Dense local networks** of suppliers of specialised goods and services; 2) **Specialised local labour markets**; 3) **R&D and spillovers**: firms benefit from being near centres of innovation; 4) **Monitoring and management**: more easily undertaken in an established location via local benchmarking.

Consequently, distance and hence choice of location is important for a firm for the following four reasons: 1) **search and matching**: trade involves finding a partner; 2) **supply chain management**: investment, for instance, must be managed; 3) **transport costs**: inputs and outputs have to be transported, and; 4) **time in transit**: time costs as well as the attendant risks of transport increase with time. Transactions reduce with

distance for each of these reasons and ICT will only reverse this to the extent that it reduce these costs.

Venables argues that ICT will only reduce the importance of distance to the extent that economic interactions are **codifiable** and can be digitised, such as airline ticketing. Where this is not the case, the benefits of proximity will remain and in many cases will be increased as a consequence of the ICT revolution. For instance, although 40% of automobile buyers in the US used the internet to obtain information, only 3% made purchases in this way. Ultimately, **information is not sufficient for trade to occur**. Similarly, improvements in technology may increase the clustering forces. For instance, improved ICT can save time in monitoring changes in consumer demand. In order to meet the changing demands more rapidly it is even more important that the production is close at hand. Hence, in this case **ICT generates an additional clustering force**. The same would be true of improved monitoring of quality standards: proximity of production would reduce the number of faulty goods already in transit. Ultimately, Venables is sceptical of the claim that distance is dead. Perhaps it is more apposite to cry 'Distance is dead, long live distance!'

We saw in Section 2.1 that knowledge spillovers via technology transfer were positively related to international trade, both via direct trade and indirect trade. We have also seen evidence from the gravity model approach to the effect that distance is an important determinant of trade flows. Consequently it seems likely that proximity also induces technology transfer via market access and trade.

The theory and evidence on trade costs and distance tell us something about the nature of the firm level decision concerning where to locate and with whom to trade. That is, they speak to industry structure and trade links. Proximity is important for all sorts of reasons which can be broadly summarised by transport costs, costs of time in transit transactions costs and clustering effects. Cultural features, such as language are also reported to be important on occasion.²⁰ These are some of the main determinants of location of business and trading partner.

Box 5: Positive externalities from proximity and clustering

Network Effects: networks develop more easily in densely populated business environments. Networks can be useful for reducing transactions costs and facilitating complementary production, reducing costs and inducing innovation.

Complementarities: firms locating at a transport or business hub are more likely to benefit from complementary businesses, which can improve one another's productivity.

Coordination Externalities: more complicated operations can be coordinated when the component firms or parts of the firm are located close together.

Technology transfer: technology, ideas, efficient business practices etc. can be easily transferred at dense transport and business hubs.

²⁰ The notion of natural trading blocs also arises naturally from theories of distance and transactions costs: countries trade establish trade blocs on the basis of proximity and cultural similarity: e.g. shared borders and common languages (Frankel et al 1995). The idea was popularised by Kruger (1990) and Wonnacott and Lutz (1989), the former providing evidence for welfare gains arising from the formation of Free Trade Agreements (FTA) between neighbours rather more distant trading partners.

Institutions and industry structure

In this section we begin to focus on the non-geographical determinants of trade and its impact on developing countries. Clearly, cultural ties, overcoming transactions costs, and the structure of ownership and production are important in this regard. We first consider the importance of cultural and business networks and then discuss the importance of industry structure, from retailer to producer, from the perspective of Global Value Chains (GVCs).

Networks

Traditionally business and cultural networks have been important determinants of trade and economic activity. Recent work suggests that this remains important not only within countries but also, increasingly, between countries. Former colonial ties and religious networks represent one dimension of this, while more recently, product related networks have become important Rauch (1999). Networks are an important informal institution for overcoming the transactions costs associated with trade. Information, uncertainty, opportunism and collective action problems can be readily solved by repeated interactions. Reputation building, punishment strategies (such as blacklisting) and enforcement are some of the mechanisms that can be employed by members within a network in a manner similar to those found in common property resources. Transactions that take place within a network are subject to less uncertainty, while matching with an appropriate business partner in another country can also be facilitated. Networks have also been important for transmitting information, e.g. about market characteristics and overcoming asymmetries.²¹

Rauch (1999) makes a distinction between Coethnic Networks and Business Networks. Business Networks are generally based upon a common business interest. Japan's Keiretsu networks provide an oft-cited example. Coethnic Networks are built upon a shared ethnicity and frequently these are domestic networks that have become international through migration or foreign direct investment. Rauch and Trindade (2002) discuss how ethnic Chinese located in different parts of the world facilitate trade by providing information about foreign markets. In effect such networks can overcome the costs of search involved in trade that represent one of the benefits of clustering (see Box 4). With the costs of search reduced and opportunism minimised, efficiency wages within a network can be lower. It is thought that this is one way in which the Yoruba and the Hausa of Nigeria out-competed the Europeans.

Networks are also seen as important conduits through which technology is transferred, as discussed in Section 2.1. Similarly, Rauch raises the spectre of networks generating protectionism and inefficiency. The fact that networks are more prevalent in developing countries suggests that they are a second best solution to market failures, rather than an efficient institution per se. Nonetheless, networks have been important historically and remain important in the current climate of globalisation. In sum, networks have a role to play in generating trade where none would have existed otherwise. As we will see in Section 5, Coethnic Networks were important in establishing horticulture in Kenya.

²¹ Rauch uses the example of how wig manufacturers in Korea kept pace with fashions in the US via business networks.

Global Value Chains

In addition to this a wide literature on transactions costs stemming from the seminal work of Coase (1937) and Williamson (1975, 1985), is also seen as important in determining trade links and flows. The structure of transport and transactions costs is also important in determining the ownership and production structure of the GVCs in which developing countries participate (e.g. Gereffi *et al.* 2003). Along with the concomitant standards and regulations these structures determine the initial impact of trade on developing countries, as well as the long-term prospects for progress in developing countries: via technological change, spillovers and so-called ‘upgrading’ of GVCs (Humphrey 2004).

While the economic geography literature emphasises the role of transport costs and clustering in determining trade links and flows, the literature on Global Value Chains (GVCs) focuses more upon the structure of the vertical industry and the nature of governance within industries. Since Gereffi (1994), and his description of governance, the literature is entrenched in the new institutional economics literature, particularly the transactions costs literature, and looks at the nature of vertically integrated industries at one end of the scale, compared to spot market arm’s length relationships between purchaser and supplier countries. An offshoot of this literature speaks to the implications of different industry governance structures for supplier (developing) country innovation and diversification. This relates naturally to a discussion of agriculture and horticulture in developing countries.

Whereas the economic geography literature emphasises the importance of proximity and the formation of clusters as being important for development and competitiveness in a global market, the GVC approach is concerned more with the role of global buyers in organising production, potentially to the detriment of developing country partners. Gereffi (1999) distinguishes between several governance structures in GVCs, one taxonomy of which is: 1) vertically integrated; 2) quasi-hierarchical; 3) networks; 4) arms length relationships.

Institutional economics theory suggests that the structure of the vertical industry will be determined by features such as: asset specificity, the extent of product specialisation or differentiation, the need for quality assurance, coordination and the nature and extent of informational asymmetries. For highly specialised production, where quality or time of delivery is important, then vertical integration would be the most likely outcome. For minor informational asymmetries and more homogeneous goods, some kind of quasi-hierarchy (e.g. production technology and standards set by purchasing country) or network relationship is most likely, whereas for standard/homogeneous goods, arms length production is the likely institutional structure. The trade off is obvious: integration confers production benefits via incentives for asset specific investments and close relationships with purchasing countries, while the incentives for innovation are stifled/restricted and flexibility reduced. This is an interesting discussion, which will pertain to the agriculture/horticulture discussion and air freight.

Governance, innovation and ‘upgrading’

In short, governance structure impacts upon the ability and incentives for innovation in the supplier (poor) country. Upgrading is a general term for product or production innovations and hence higher value activities. Humphrey and Schmitz (2002) note that the incentives for upgrading are heavily dependent upon industry structure and cite the example of Brazilian

participation in the GVC for high fashion shoes. This is an industry for which governance in the form of strict standards and adherence to (mainly Italian) designs has transferred know-how on the one hand and yet stifled innovation and upgrading in this industry towards Brazilian based design.

3 Air-freighted horticulture: catalyst for development?

Introduction

The previous sections have highlighted the importance of distance, transport costs, time in transit and other transactions costs as determinants of trade. In addition, the importance of clustering in influencing the location of firms and activities in a vertical industry has also been highlighted. Clustering effects will also be important in determining trade as transport and communications hubs develop. In this section we turn to aviation and discuss the importance of these features in establishing air transport links and the advantages that air freight has in overcoming the costs of trade. In essence, air transport can reduce the importance of distance in determining trade flows mainly by virtue of reducing time in transit and other supply side transactions costs. Air freight has also become important with respect to the demand side in industries producing ‘time-sensitive’ goods. Consequently, logistics and air freight have become core competencies in Global Value Chains in general and horticulture is no exception. As will be explained, the recent restructuring the GVC for horticultural products around air freight has implications for the location of suppliers with respect to retailers, the location of activities within GVCs and the structure of ownership and governance. This has important implications for the distribution of the gains from trade.

The economics of air freight

There numerous advantages to transporting goods by air. On the supply side, air freight has the potential to reduce trade costs associated with distance: time in transit and other transactions costs, compared to transport by land or sea. These savings alone have reduced the costs of distance and enabled trade flows between more distant countries and the vertical specialisation of activities in lower cost economies (Hummels 1999). It is also pivotal in the development of Just In Time production techniques. On the demand side, air freight is synonymous with industries that compete not only on cost but also in product differentiation and speed/timeliness of delivery (Kaplinsky 2000, Doganis 2002). Horticulture and electronics provide good examples of goods that benefit in this regard. In each case, any advantages are traded off against the higher transport costs.

Cost savings

On average, transport costs for goods shipped by air represent around 25-30 per cent of the good’s value. This is up to three times more than for sea freight (Hummels 2001). For this reason, air freight must offer particular advantages in order to remain competitive. The most obvious cost saving offered by air freight is reduced time in transit. These savings come partly in the form of reduced risk of damage and theft, which will be reflected in insurance premiums. Partly for this reason, high value and fragile goods, such as works of art and electronic goods, are generally transported by air freight. In addition, long shipping times induce inventory and depreciation costs. Inventory costs include the capital costs of goods in transit as well as the need to hold large buffer stocks close to the market in order to satisfy upswings in demand or uncertainty of delivery (Hummels 2001). Depreciation costs reflect ‘any reason that a newly produced good may be preferred to an older good’ (Hummels 2001). Agricultural and horticultural goods are a good example of goods that spoil, as are certain

informational goods (newspapers are no good a day late). Goods for which demand is difficult to predict, for which preferences change in unforeseen ways or for which competition is based upon novelty value: examples include high fashion clothes or technologies (e.g. mobile phones), also depreciate in this sense.

Where goods can be rapidly accessed from further away, firms in the recipient country (e.g. importers, retailers, manufacturers) become able to exploit costs savings from reduced inventories and lower capitalisation in warehouses for instance. On the one hand this can induce the vertical specialisation/fragmentation of an industry on the basis of costs. In many industries a shift of storage functions to countries with low wages and overheads has been witnessed, with an associated shift of the attendant risks of holding inventories. This type of restructuring has been one of the main features of supermarkets and horticulture importers strategy in recent years and reflects the changing structure and governance of the GVC in this area (Dolan and Humphrey 2004). One important example is the use of Just In Time (JIT) inventories for which coordination and timely delivery is imperative. Looked at another way, the costs of time are multiplied in fragmented or JIT industries in which each fragment is a complementary part of the production process and coordination failures cause hold-ups.

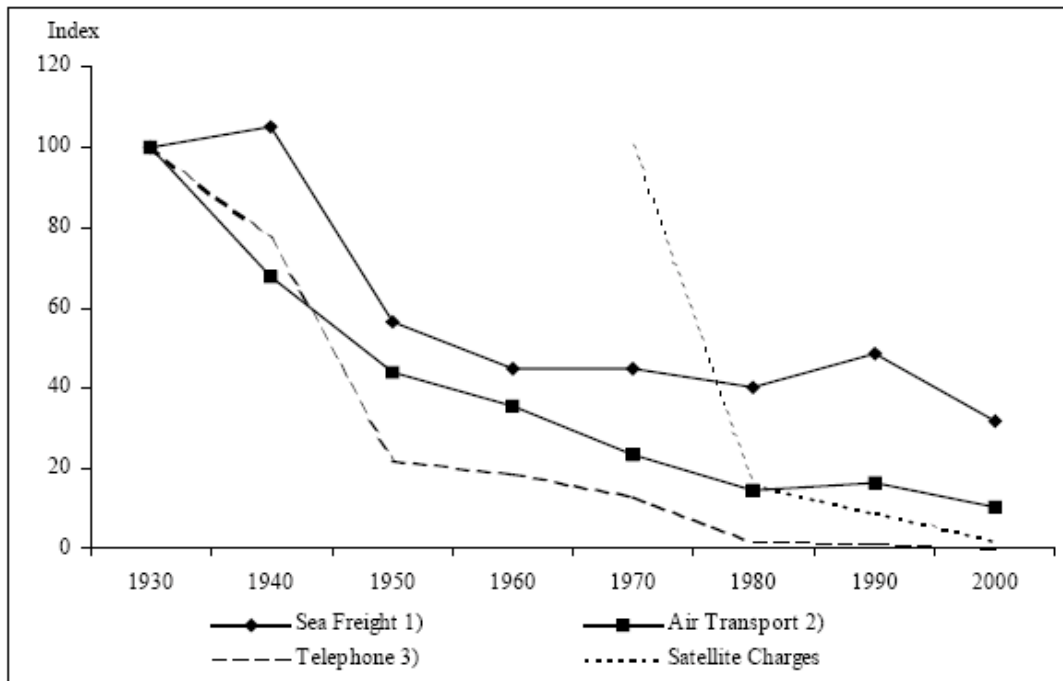
Several other trade and transport related costs that are frequently reduced when goods are transported by air. For instance, Doganis (2002) reports that goods transported by air freight are subject to fewer demands on documentation, less packaging requirements, lower costs of collection on the ground and lower delivery and handling costs.²²

The down side is that the transport costs of air freight are much higher than those associated with sea and land transport. The fixed costs are high for each flight, and, depending on the pricing policy in relation to cargo, these must be shared over limited space and payload. Furthermore, since the oil shocks of the 70s and 80s, as well as more recent rises in fuel costs, air freight is not economical over short distances. Essentially, it does not compete with transport by land given the large quantity of fuel required at take-off and other fixed costs. This does not mean that air freight becomes uniformly more competitive as distances increase however. In fact distances such as that from Western Europe to the East coast of the USA are the most efficient and competitive distances.²³ Within the EU for instance, most cargo is taken by road or train precisely for this reason.

²² Air freight will be deposited at transport hubs, thereby bypassing the additional transportation from the port for instance (Doganis 2002).

²³ For longer journeys, e.g. from Australia, the additional fuel required for a non-stop flight reduces efficiency considerably, as would an additional stop for refuelling.

Figure 1: Transport Costs²⁴



However, it is savings in time costs that are the most important advantage of air freight. These are particularly noticeable for transport over long distances. Whereas transport by sea from Europe to the US Midwest would take two to three weeks, air shipping takes no more than two days to most destinations in the world (Hummels 2001). In a series of detailed studies of freight costs, Hummels (1999, 2001, 2006) estimates the time costs implied by the changing pattern of trade links and flows over the years. The first thing to note is that the costs of air freight have declined spectacularly over the past 50 years in absolute terms, but also relative to alternative modes. As Figure 1 shows, air freight costs fell dramatically in the latter part of the last century both in absolute terms and relative to seafreight. One consequence of the changing relative costs is that a greater proportion of traded goods are currently transported by air: 50 per cent in 1998 compared to virtually nothing in 1950.

Hummels (2001) analyses several aspects of these changes in a model of firm choice of export location and transport mode. The choice of mode of transport represents the trade off between rapid yet expensive air freight against cheaper slower shipment by sea. Using a random utility approach the cost of time is calculated as implied by observed mode, export location choices and the associated transport costs. For manufactured goods each extra day of travel is worth 0.8 per cent of the value of the good per day. Since an average shipment by sea takes approximately 20 days, this translates into the equivalent of a 16 per cent tariff.²⁵

²⁴ Taken from Hufbauer (1991), US Department of Commerce (2001), World Bank (2002a), Busse (2002).

Notes: 1) Average ocean freight and port charges per short ton of import and export cargo; 2) average air transport revenue per passenger mile; 3) cost of a three-minute telephone call from New York to London.

²⁵ Hummels (2001) corrected for selectivity effects. That is, selection of trading partner. This reflects that fact that choice of trade, choice of product and choice of mode are made simultaneously. For instance, countries which have high shipping costs to the US are less likely to trade with the US. So, the sample over which the relationship between costs and modes is estimated is likely to be unrepresentative.

Naturally, some industries are more time sensitive than others. For instance, costs of time for the office machinery sector are estimated to be in the order of 2.2 per cent of the value of the good per day in transit.²⁶

The cost of trade, including transport, are important determinants of both trade links and trade flows. While the gravity model has provided some, albeit, general insight into determinants of trade flows, it says nothing about the initial choice which underpins trade flows: whether to trade or not. Hummels (2001) provides some analysis of this issue in relation to the relative costs of transport by sea and air, while still controlling for distance. He finds that, on average, increasing transit days by one day reduces the probability of trade taking place between two countries by one per cent. Once more this effect varies across industries reaching 1.5 per cent in the machinery and manufacturing sectors (SITC codes 7 and 8). Distance remains important in Hummels' analysis also, reflecting the costs associated with borders and other informational costs no doubt.

Time clearly represents an important barrier to trade and any reductions in time in transit not only tend to increase the volumes of trade but also tend to induce new trade links. Hummels (2001) provides some rudimentary calculations of the impact on trade of the relative reduction of air freight prices compared to shipping by sea. Hummels (2001) calculates that the estimated six per cent annual drop in relative air freight charges in the post-war period translates into a saving of 29.5 shipping days for the average shipment. This is a reduction from 40 days in 1950, to 10.5 days on average in 1998, at an average cost of 0.5 per cent of the value of goods.²⁷ This is equivalent to a reduction in tariffs from 20 per cent to 5.2 per cent. Once more, these savings are not uniform across sectors. In time-sensitive sectors such as manufactures and machinery this represents a fall in tariffs from 32 per cent to nine per cent, with the *ad valorem* saving in the order of 0.8 per cent. Lastly, Hummels (2001) shows that the importance of these time savings increases with the fragmentation/vertical specialisation of the industry in question and the time savings accumulate throughout the vertical industry. In sum, these multiple savings appear to explain the rapid rise in JIT techniques in recent years.

It should be clear from this section that via reduction of time costs, air freight is likely to have a positive effect on trade links and trade flows. It is equally important to understand the impact that these changes in time costs and other transactions costs have had on the composition of trade, the location of industry and the extent of vertical specialisation and fragmentation that it affords. This leads to discussion of the demands for air freight.

The demand for air freight

Given these cost advantages and disadvantages, and given that cargo pricing is predominantly based on weight and/or bulk, the comparative advantage of air freight appears to be in small, lightweight or dense objects of high economic value, often requiring higher security. Furthermore, given the issues surrounding fuel efficiency, one would expect these goods to be sourced from countries neither too close to nor too distant from their market. While this intuition captures much of the essence of air freight, as it turns out, the story is complicated by, among other things, demands from 'time sensitive' goods.

²⁶ Hummels (2001) fails to find a significant estimate for vegetables and fruit, mainly because the vast majority of world trade in these commodities is via sea, and the data offered insufficient variation.

²⁷ Holding composition of trade constant.

Box 5: The demand for air freight

Air freight will be demanded as follows (Hummels 2006):

- It will be used by commodities that develop rapidly over time such as computing equipment, or where the costs of delay have broader consequences for the production process, as with intermediate components
- Where time lags from sea shipping are especially large, as with very distant shippers.
- When the price differential between sea and air freight is small. This is particularly likely with very low weight-value ratios, like computer chips.
- When the *ad-valorem* freight costs are small, i.e. freight costs are a minor proportion of the value of the good. Where this is true, choice of mode is not a major determinant of the overall price, and hence consumer demand for the good.

The demand for air freight can be divided into two broad types: non-routine or emergency freight and routine freight (Doganis 2002). Emergency freight is generally high value and low weight such that the higher costs of air freight represent a smaller proportion of the value of the product. Examples of such goods include medicines, legal, financial and business documents, or crucial spare parts for machinery. Globalisation of trade has maintained the demand for the air freight of such non-routine commodities, e.g. express delivery of documents, despite the ICT revolution. Air freight is also important at times of natural disaster or failure of communications networks. Non-routine commodities are naturally difficult to plan for, result in inefficient use of cargo space but can command high tariffs due to price insensitivity (Doganis 2002). However, the services usually required for high-value and emergency commodities (e.g. preferential handling, guarantee of timely arrival etc) mean that such commodities are frequently more costly to handle. Ultimately, given their price insensitivity, emergency commodities need not accord with the basic intuition given in the previous section with regard to the goods for which air freight has a comparative advantage.

Routine freight makes up the bulk of air freight and represents those goods for which a genuine cost advantage or additional value is to be obtained from air freight. Routine freight falls into two categories: perishable (depreciable) and non-perishable. As described above perishable goods by definition have a short economic life and need to be transported quickly to the market: they are time sensitive. Horticultural commodities are good examples, as are high-fashion goods and fish. Yet each necessarily must command a price premium in the marketplace in order to cover the considerably higher transport costs. Horticultural goods have only a limited price premium since their demand is generally quite elastic with respect to price, consequently the costs of transport make up a large percentage of the price received. Yet, differentiation by supermarkets has created an increasing number of higher-value niches – such as fresh produce from Africa, small packets for smaller families, and various cosmetic grades. However, as explained above, the additional costs of air freight can be offset by savings made in other parts of the supply chain such as reduced inventories and storage, and cheaper distribution.

Hummels (2006) summarises the nature of the demand for air freight rather succinctly (see Box 5). The overall lesson here is that where the overall costs of freight has little impact on

the price of the product, the speed of delivery and other advantages of air freight will determine the mode of shipping.

Other important features of air freight demand include its competitiveness, heterogeneity, seasonality and uni-directionality. Air freight is more competitive and heterogeneous than passengers since the route taken by cargo is unimportant. Furthermore, whereas passengers tend to make return journeys, trade is frequently unidirectional, that is, there is often no backhauling. Of course, the demand for air freight is dependent upon the pricing policy employed by the airline with regard to cargo. As explained below, this can be crucial to the establishment of trade links in the first place, and is likely to be important for horticultural industry.

Pricing of air freight

Air freight is carried in one of three ways: i) as ‘bellyhold’ in passenger planes; ii) as freight in combi planes which can be converted to take passengers and/or freight; and iii) as freight in a designated cargo plane. The pricing policy for air freight depends upon the accounting model that an airline uses, the interpretation of the opportunity cost of cargo space, as well as a certain amount of discretion reflecting the nature of demand. It is well documented that air freight tariffs are rather heterogeneous and changeable. From the perspective of the exporter, bellyhold cargo is less preferred since it is more uncertain both in terms of availability and price compared with dedicated cargo flights.

Air freight began as a means of increasing revenues via exploitation of bellyhold space on passenger airlines (Doganis 2002). In this sense it was seen, from an accounting perspective, as a bi-product of the passenger flight and subsequently the price for air freight generally excluded fixed costs. More recently, this type of pricing approach is reserved for situations in which an airline wishes to encourage backhaul where trade is unidirectional, or where airlines have a pure passenger focus to their operations and see bellyhold as a means of increasing revenue. However, where an airline has discretion over its pricing policy, preferential rates are often charged for marginal products, such as in horticulture: e.g. for early season grape exports from Cyprus to the UK.

Where freight is transported in combi or designated cargo planes the pricing policy must consider the opportunity costs of space. With combi planes, where it is possible to substitute passengers for cargo the opportunity cost of cargo at the margin is the expected revenue from a displaced passenger. That is, passengers and freight must be considered as joint products of the flight and must pay a share of the fixed costs. Tariffs in designated cargo planes must also cover fixed costs. More recently, many airlines are ceasing to see bellyhold as a simple bi-product of the passenger business and are apportioning fixed costs jointly between each operation. This has important implications for the profitability of air freight, which by and large is rather low (Doganis 2002).

Open skies agreements

Up to this point we have said nothing about the nature of ownership within the aviation industry, nor have we discussed the regulation of the industry as a whole. Historically the skies have been governed by somewhat restrictive bilateral agreements known as Air Service Agreements (ASAs). Such agreements govern which airlines are allowed to operate between

particular city pairs and the number and frequency of flights. By and large these have represented policy-induced barriers to trade.

More recently there is a movement towards liberalisation and this has been one of the main driving forces in reducing air freight costs.²⁸ ASAs now place fewer restrictions on air freight and are becoming more liberalised, perhaps only specifying the airlines. At the extreme are ‘open skies’ policies that allow all airlines to operate on any route without any *ex ante* controls on capacity.

Prior to this, air routes were the sole domain of a few companies or highly inefficient national airlines.²⁹ In many developing countries national airlines are still being propped up by the government resulting in uncompetitive air freight tariffs or highly inefficient air freight operations (Doganis 2002). The benefits of open skies policies are to reduce air freight tariffs and stimulate competition. In addition to this, deregulation in the aviation industry can also generate wider benefits from the coordination of infrastructure developments and network design. For instance, increases in efficiency at transport hubs generate important efficiency spillovers to attached ‘spoke’ airports which can only be realised with coordination, possibly between countries (Cohen and Paul 2003).³⁰ As explained in Section 5, the fact that Kenya represents a transport hub in Eastern Africa has been important in developing trade in horticultural goods. Open skies agreements have also been important (Minot and Ngigi 2003).

Air freight, vertical specialisation and GVC governance in horticulture

In a study of the implications of transport and specialisation for China and Latin American and Caribbean regions, Hummels (2006) describes how Latin America’s current advantage over China in terms of shipping costs will erode as air freight costs decline. Although there is some dispute as to the likely consequence for these regions, it seems likely that the pattern of trade will follow those of the past in this regard. That is, there will be a general shift towards air freight from seafreight and that these trends will be most pronounced in goods with the qualities described in Box 5 above.

Indeed, past trends show that 30 per cent of freight was shipped by air in the US in 1998 compared with seven per cent in 1965. Outside of the NAFTA countries,³¹ 50 per cent of US exports are now shipped by air. Globally, however, the US share of global air freight has declined largely because of the rapid increases in air freight from the export oriented countries of Asia and the Pacific: global share increased from 12 per cent to 37 per cent between 1972 and 1999 (Doganis 2002). As for the composition of trade, the largest increases have been in time-sensitive, low weight, high value goods, such as electronics (Doganis 2002). Air freight has been critical to the export-led development of South and Eastern Asia. Trade in horticultural products has also increased over the past two decades. Not only has this been of considerable benefit to many sub-Saharan African countries (SSA), it has been fostered by the changing costs of air freight.

²⁸ The rise of the low costs passenger carrier in Europe resulted from the EU open skies agreement.

²⁹ This remains the case, for instance in the EU with routes from within the EU to the US restricted to a few airlines.

³⁰ There is some rather poor empirical evidence knocking around claiming that liberalisation of the skies has induced growth. However the evidence presented shows a positive correlation between the two while not controlling for the inevitable endogeneity of this policy variable.

³¹ North American Free Trade Agreement: the US, Canada and Mexico.

In addition to changing modes and composition of trade, Hummels *et al.* (2001) posit that the changing costs of air freight will have consequences for vertical specialisation/ fragmentation of many industries. They show that between 1970 and 1990 vertical specialisation has increased by 30 per cent as companies exploit lower wage economies without compromising the benefits of timeliness or coordination formerly offered by proximity. In parallel with these changes has been a rise in the use of Just In Time (JIT) inventories in vertical industries, which are made possible either via proximity to suppliers or by air freight. Falling freight costs have changed the nature of comparative advantage for many countries. In a similar vein, it is not unheard of for air freight to be used by firms trying to break into new markets so as to avoid the initial investment costs associated with storage and distribution (Doganis 2002).

Without doubt, for the reasons outlined in this section, the decline in air freight costs has had an important impact on the horticultural industry, the location of its suppliers and the structure of its GVC. In some industries however, although air freight costs have been pivotal in enabling trade between developed and developing countries, the advent of JIT, time sensitive and coordination sensitive goods can be something of a double edged sword. On the one hand a country can participate in global market as a consequence of air freight, but on the other hand clustering forces may prevail which take activities away from the country in question to a location closer to the marketplace. For instance, production of car components in Tunisia was recently moved to Romania, not because of transport costs but because of the greater certainty and coordination provided for the JIT system (GEP 2004). It is difficult to envisage something similar happening in horticulture since much of what determines the comparative advantage for e.g. Kenya and Ethiopia are immobile: climate and soils. Yet, competition increasingly abounds between countries with similar climates which compete over logistical efficiencies – for instance, Kenya and Thailand compete in many fresh vegetable markets. Another source of competitive spirit in the supply chain are the new cold storage facilities developed in the United Arab Emirates.

The structure of horticultural GVCs

The importance of horticultural products for supermarkets cannot be understated. Fruit, vegetables and cut flowers have become ‘destination’ products in that they are a major determinant of consumers choice of shopping location (Dolan and Humphrey 2002). In line with this, sales of speciality vegetables have increased by 21 per cent in the mid 90s, while ready to eat salads increased by 34 per cent, albeit from a small base. Sub-Saharan Africa has found a niche in this market initially based on the comparative advantage in terms of climate and soil, as well in terms of labour cost.

The increase in the trade in horticultural products has been driven by a number of factors. Dolan and Humphrey (2004) point to the changing demands and dietary habits as a result of increasing health consciousness and the demand for convenience foods. There has also been a thriving trade in cut flowers. Horticultural goods have many of the characteristics that make them economical to transport by air. They are time sensitive products in that they are perishable, and they are generally high value products compared to their weight. In addition, competition among retailers is based upon increasing use of product differentiation in developed country markets. Competition is based not only on price but also on reliability, product variety, product quality and speed of innovation (Dolan and Humphrey 2004). One outcome of this is that demand for particular varieties of horticultural goods is somewhat difficult to predict, and retailers are generally uncertain as to which, if any, of the new

horticultural products that they offer are likely to become popular.³² The end result of this is that 93 per cent of Kenya's horticultural exports are transported by air (Dolan and Humphrey 2004).

Many African countries have been able to benefit from this trade over the years. Kenya, Ethiopia, Côte d'Ivoire, Ghana and, formerly, Zimbabwe have all developed horticultural industries. As a result, between 1989 and 1997 the value of exports of fresh vegetables from SSA to the EU increased by 150 per cent (Dolan and Humphrey 2004). Horticultural products are non-traditional and high value crops. They represent an important component of the export diversification strategy of the aforementioned African countries. Not only this, but horticultural production is somewhat specialised compared to traditional crops, not least because of the stringent performance targets placed upon the final products, and this raises the possibility of the transfer of technology and human capital (IIED 2006).

The extent of the gains to developing countries, in terms of income generation and innovation, depends in large part on the structure of opportunities, ownership and governance within the GVC for horticultural products. The same is true with regard to the distribution of these gains and hence the ability to alleviate poverty. The governance structure also determines which producers can be inserted into the horticultural GVC and to some extent, which countries are chosen as suppliers. Yet, as the following statement indicates, the gains from international trade can be considerable for industry participants in developing countries.

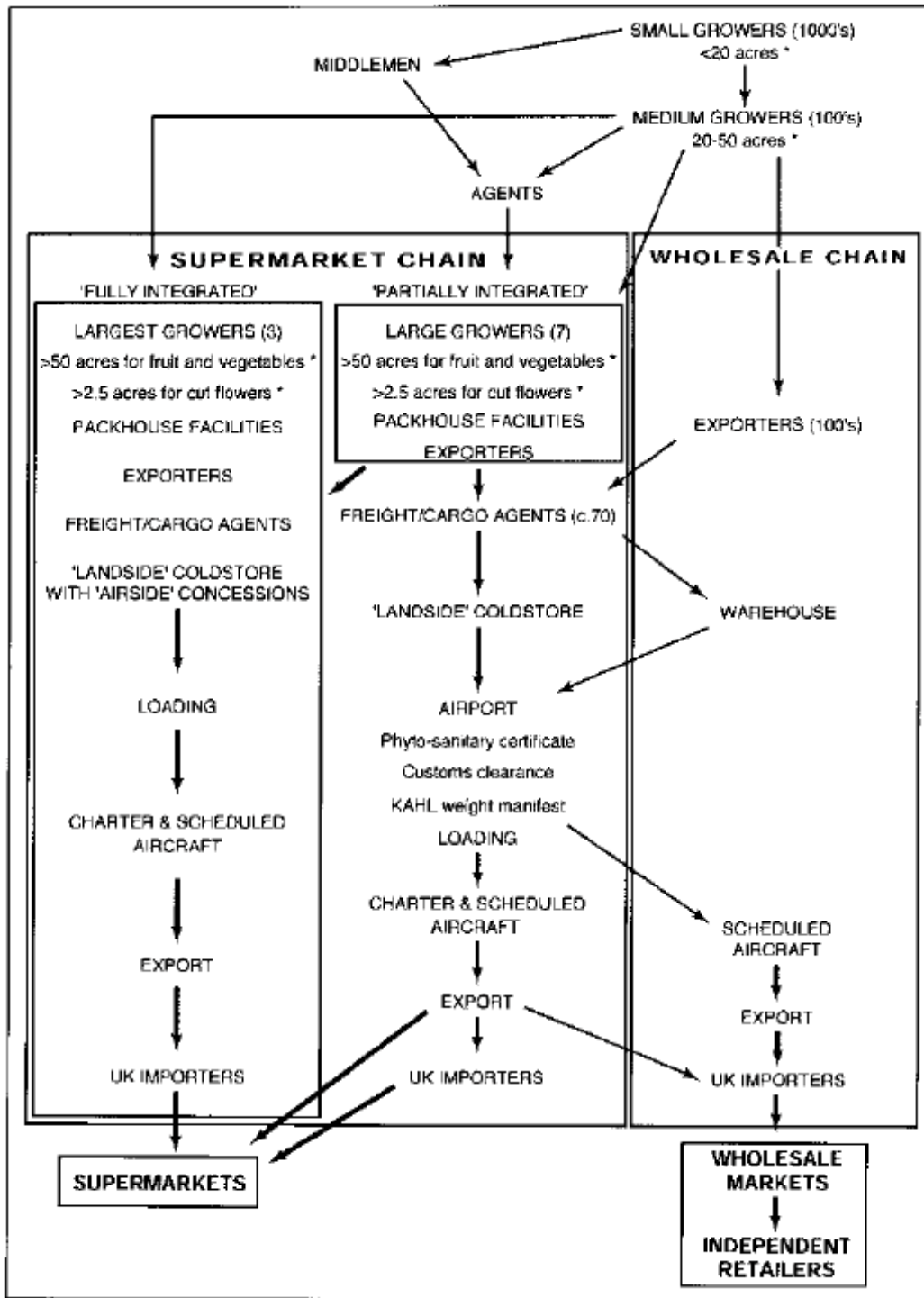
“More than 94 per cent of vegetables produced in Kenya are consumed here locally. But the value of the five per cent which we export is almost equivalent to the 94 per cent. So the foreign earnings that we get from the export of these beans go very far to promote and to get the Kenyan economy growing.”

Timothy Mwangi, Kenya Horticultural Development Programme KHDP.

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³² It is worth considering the Buzz Lightyear effect here. Preferences for toys, and the movement of demands driven by fashions in general, are difficult to predict.

Figure 2: Schematic representation of horticulture GVC: UK- Kenya



Source: (Barrett *et al* 1997).

The main actors in the horticulture GVC in recent years have been the supermarkets. African producers have been trading with highly concentrated European retailers: the top five supermarket chains controlling 50 per cent of the market in all but three EU countries.³³ In this sense at least, the horticultural GVC is 'buyer driven' and driven by a few powerful

³³ In the UK in 1997 the top six retailers had a 76 per cent market share (Dolan and Humphrey 2004).

players (See Box 1 for a definition). Furthermore, due to the specialised nature of horticultural products and the specific features of demand, the GVC no longer consists of arm's length relationships between buyer and producer, but more integrated and governed structures. Figure 2 describes the GVC for horticulture between Kenya and the UK (source Barrett *et al.* 1999). Two distinct structures are identified, those driven by supermarkets and those driven by wholesalers, and it is the former that is most important for air freight (Barrett *et al.* 1999).

Firstly, with retailer competition based on quality, variety, speed of innovation etc., retailers prefer greater control of the supply chain over the flexibility of purchasing commodities in the spot market.³⁴ Secondly, where products are sourced from developing countries for EU markets they must satisfy a number of additional and stringent performance standards compared to those required for domestic markets. These include standards on fertilizers, pesticides, labour and quality. These standards, e.g. EurepGAP, must be audited and the required know-how to achieve these standards must be transferred to the producers. Respectively these elements make up the legislative, judicial, and executive governance components of the GVC discussed by Kaplinsky (2000) (see Box 2).

One common response to the need for strict management and coordination of the supply chain is vertical integration: the extension of ownership to the various functions of the vertical supply chain. This is one prediction of the transactions cost theory underpinning the governance ideas of Gereffi (1999). While not completely integrated, the horticultural supply chain has moved away from market governance towards specific relationships between retailers, importers, exporters and suppliers.

Retailers in the UK have developed exclusive arrangements with UK importers who source products from a sole exporter at a particular time of year. A more common situation is that UK importers deal exclusively with one exporter in the source (African) country, rather than dealing with a variety of different suppliers. This kind of arrangement need not represent a secure one for African producers since importers are frequently looking for lower cost, more reliable producers. Governance strategies are perhaps most apparent in the GVC for horticulture as a consequence of performance standards. Monitoring and auditing is now frequently undertaken by the retailers e.g. supermarkets, or this is undertaken by a third party at the expense of the supermarkets or, increasingly, the importers and exporters. The information exchange and coordination required between importers, exporters and produces in this regard has led to integration between importers and exporters in occasion (Dolan and Humphrey 2004).

The characteristics of demand and competition in the retail of horticultural commodities have wider implications for the export sector. As we have mentioned above, adherence to performance standards requires significant investment in training for monitoring and auditing. Investment is also needed in post harvest facilities such as storage, packaging and labelling of products. This is one aspect of the GVC that has been driven at least in part by the availability of air freight. Not only are these labour intensive activities less costly in developing countries, the value-added in the process yields a product with a high value to weight ratio predisposed to transport by air. In short, in order to be included in the horticultural GVC exporters need make large highly asset specific investments, often up to US\$ 500,000, in processing and packaging capabilities (Dolan and Humphrey 2002). Such asset specific investments will only

³⁴ More homogenous agricultural commodities could be handled at arm's length (e.g. purchased on the spot market or from wholesalers) because of the reduced need to manage product characteristics, less product specialisation/differentiation etc.

take place where the prospect of opportunistic behaviour (quasi-rent appropriation) has been eliminated. This has most likely motivated the close relations between importers and exporters in the GVC.³⁵

Lastly, innovation is also a key feature of the horticultural industry. Competition among retailers is driven by product differentiation and a competitive advantage can be obtained via innovation. An innovative supplier is of more value to the retailer and yet investment in product development will not occur without information concerning consumer demand. In this context the relationship between importer and exporter acts as a conduit for information and long-term relationships have developed.³⁶ Naturally, investment in R&D and innovation is costly and risky, and generally falls on the exporter.

The role of air freight establishing horticultural trade and in generating the structure of the GVC is difficult to assess since the counterfactual is difficult to pinpoint: what would have happened in the absence of air freight? However, a partial answer is as follows. In the same way that information and communications technology has allowed the movement of certain business functions to low cost economies, the falling costs of air freight have enabled the production of high-value, time-sensitive goods, a movement of aspects of the supply chain to developing countries (e.g. storage and innovation) and a more diverse use of agricultural land. The high costs of air freight also have a tendency to shift value adding activities, such as packaging and R&D, to producer countries.

But what has been the impact on the producers themselves? Horticulture is frequently seen as an important element of trade since it generates wealth among smallholders. But where do the smallholders fit in to the GVC? We turn to this question in the following sections.

Horticulture and poverty reduction.

The characteristics of the horticultural goods and the resulting structure of the GVC from retailer to exporter are suggestive of particular outcomes for smallholders. Above it was argued that each of the features of the horticultural GVC benefit from economies of scale and concentration. Furthermore, the presence of market failures in developing countries also tends to favour large firms. For instance, credit constraints generally preclude small firms from undertaking the investments in post-harvest processing required to compete with other firms and countries. Similarly, innovation is necessary but not sufficient to build a long-term relationship with an importer or retailer. Small firms are less able to take such risks.³⁷ Large firms also have an advantage in logistics, particularly in securing air cargo space. When exporters are small, it is not economic to charter dedicated cargo planes. Similarly, organising several small exporters incurs transactions costs. This leaves bellyhold, which is unreliable and uncertain in comparison, qualities which are not desirable in horticulture. Large exporters suffer neither of these problems and are better placed to negotiate with airlines. The result here is obvious, the top five exporters in Kenya and Zimbabwe control up to 75 per cent of the fruit and vegetable export market.

³⁵ Incomplete contracts between elements of a vertical industry yields the spectre of opportunistic behaviour (e.g. hold-ups). Again, one common solution to this is to ensure ownership of both stages of the vertical industry: vertical integration (Williamson 1975).

³⁶ African exporters have import offices in Europe, including the UK. This is a form of integration to ensure the flow of, inter alia, information.

³⁷ Small firms are less able to finance promotional offers by retailers either (Dolan and Humphrey 2002).

The fact that scale is so important higher up the GVC has implications lower down. For instance, monitoring, auditing and training in relation to performance standards is more easily and cheaply undertaken where producers are few and transactions costs are low. In general smallholders find it difficult to adhere to almost every dimension of the performance standards required by European retailers. For instance, when products are supplied by many producers it remains difficult to maintain consistency and quality. Although there are exceptions, supermarkets are wary of sourcing from smallholders.³⁸ Evidence from Kenya and Zimbabwe suggests that smallholders have been edged out of the horticultural market (Dolan and Humphrey 2002).

Performance standards have a positive role to play in some respects. The transfer of knowledge, technology and resources to developing countries in order that they adhere to such standards has improved productivity for smallholders and large farms alike, where credit constraints or simply limited information may have prevented these investments from taking place (IIED 2006). However, the fact that retailers impose such strict governance on African suppliers may cast doubt on the extent to which this knowledge transfer can alleviate poverty. Indeed, that the standards imposed upon African farmers are often far in excess of those placed upon suppliers in Europe (e.g. Spain) may reflect the limited market power of African producers compared to their European counterparts. This could indicate a smaller share of the gains from trade (Dolan and Humphreys 2002).

It is not clear that there is sufficient market power in the producer countries for significant gains to be made at the level of the smallholder. Some evidence of this can be seen in the fact that the number of smallholders contributing to supply in Kenya has fallen dramatically in recent years. Five main exporters obtain all their produce from similarly small numbers of producers. The trend is towards the large exporters owning large farms. Whereas early entrants to the industry were smallholders in SSA, entrants today have well-established capabilities and market linkages.

The story is mixed however, and in Kenya smallholders are the main producers of green beans, while in Zambia it is suggested that the imposition of the EurepGAP performance standards has actually improved efficiency among the participating smallholders as well as transferring technology (IIED 2006). Again though, the main gains appear to be accruing to large farmers, while questions remain as to the extent to which the fixed costs of compliance can be covered in the absence of development assistance or targeted government policies by the host country. Nevertheless, it should not be overlooked that agricultural productivity is an important determinant of poverty and inequality in developing countries, not least because of significant multiplier effects (e.g. Bourguignon and Morrisson 1998, Hazel and Hjjati 1995). In Zambia it is estimated that every £1 of agricultural income generates another £1.5 for other businesses (Stern 2006). In Kenya, the agricultural multiplier is 1.64 compared to a non-agricultural multiplier of 1.23 (Block and Timer, 1994). This suggests that even though the benefits of horticulture do not always accrue to smallholders, the development of high value agriculture in general is likely to improve outcomes for rural communities.

³⁸ The exception to this rule here appears to be French Beans. Its labour intensive nature introduces incentive problems with wage labour and associated supervision costs. These are partially overcome in smallholder farms via the use of family labour. It is worth mentioning that large farms are not without supervision costs.

Innovation and 'upgrading'

Ordinary agricultural products: tea, coffee etc. tend not to offer significant opportunities for innovation in the producer countries. Indeed this is largely true of homogeneous goods. Gereffi (1999) suggests that the use of stringent performance or production standards also standards may also stifle innovation by generating incentives only for compliance rather than upgrading.

In relation to horticulture competition between retailers rests not so much in cost reduction but more in innovation and product differentiation. Just as the high cost of air freight has shifted post-harvest production to the producer countries, e.g. packaging, there is a similar tendency in relation to innovative activity underpinning product differentiation. Both entail a shift of value adding activities towards the producer (Dolan and Humphreys 2002). Indeed, there is considerable competition between countries and suppliers on the basis of product differentiation, and hence innovation, in the horticultural industry.

5 Air-freighted horticulture: case studies

In this section we provide two brief case studies of Kenya and Ethiopia in order to highlight the reasons underpinning the establishment of the horticultural industry in these countries and the outcomes. The reasons are numerous speak of a complicated mixture of trade costs, air freight, the establishment of coethnic networks, as well as preferential trade agreements and government policy.

Kenya's horticulture industry

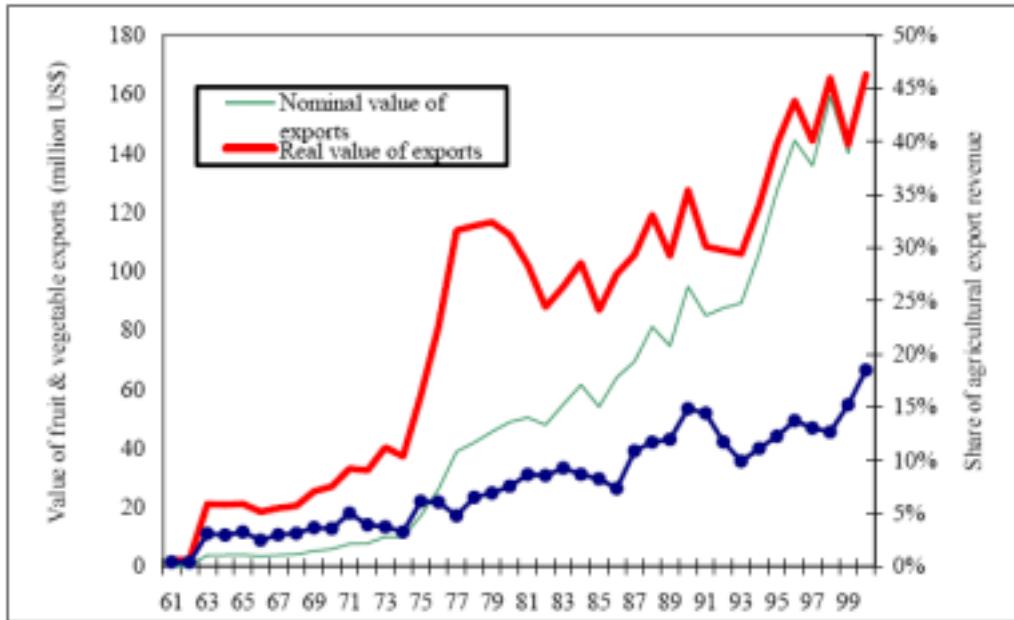
Horticulture in Kenya has been something of a success, but the origins of and catalysts for this industry are as numerous as they are fortuitous. Minot and Ngigi (2004) provide a concise history of Kenya's evolving horticulture industry and suggest that there are many lessons to be drawn from Kenya's experience. It is true that Kenya's exports of fruit and vegetable exports have increased four-fold in real terms since 1974, reaching US\$ 167 million in 2000. In so doing, horticulture has become the third largest source of foreign exchange after tourism and tea. Another important feature is that, in recent years, Kenyan horticulture has seen increased participation from smallholders to the point at which it is estimated that half of all Kenyan horticultural exports are produced by smallholders. But how did this come about?

The industry started in the early twentieth century with the production of 'Asian' vegetables (e.g. okra, aubergines, chillies etc.). During the colonial period, fruit and vegetables were produced in large scale for dehydration in order to satisfy the demand of the colonial army, and in parallel investment was placed in R&D and plant-breeding. In the fifties pineapples became the main fruit export and a canning factory was constructed and smallholders were the main suppliers (75 per cent by 1960). With independence came the redistribution of land via compulsory purchase towards smallholders. Following on from this was the development of the Horticultural Crop Development Agency (HCDC) and the growth of foreign investment, with numerous joint ventures.

It was really in the seventies that exports began to increase dramatically (eight per cent per year from 1974-90), for several distinct reasons. Firstly, rising prices drove diversification into fruit and vegetables, pineapples remaining key. Simultaneously, exports increased because of the expulsion of Asians from Uganda under Idi Amin, many of whom settled in the UK and drove demand for 'Asian' vegetables (Minot and Ngigi 2002). Crucially, Asian diaspora formed a *de facto* coethnic network through which the trade in fruit and vegetables could be facilitated more easily by reducing information asymmetries, risk and other transactions costs. In addition to this tourism began to take-off in Kenya. The regular flow of passenger planes to and from the UK provided bellyhold cargo space for these initially small quantities of high value fruit and vegetables. As export grew, dedicated cargo planes were eventually chartered. That is, passenger flights acted as a type of anchor product allowing the export of fruit and vegetables, probably at reduced cargo rates (see Section 4 on pricing of bellyhold).

The horticultural industry has benefited from the clustering effects which have made Nairobi a regional transport hub, as expertise has been accumulated in the production of high quality produce for hotels and restaurants. That is, tourism has generated spillovers for horticulture in the domestic market.

Figure 3: Kenyan horticultural exports (US\$)



Minot and Ngigi (2002) point to the rise of smallholder production during the seventies and eighties as an important contributing factor to rising exports. Dolan and Humphrey (2004) find the reverse trend during the nineties as a consequence of the cost and governance issues associated with the GVC. At their peak, one export company sourced its produce from 24,000 smallholders before the issues of governance made larger scale producers more attractive.

During the nineties growth in the value of horticultural exports has dwindled, although growth in volume remained strong. Declining revenues has reflected the competition that Kenya has faced in this sector, particularly from Egypt with regard to French Beans. Also during the nineties, supermarkets have become the key players in the industry, with the consequences on industry structure described above.

In the background there have been some highly significant trading agreements signed between the EU and the Kenya. For instance the Lomé Agreement was renewed for the period 2000-2005. This offers preferential access to EU markets.

As is easily seen from this discussion, there have been several factors that have contributed to the success of horticulture in Kenya. These range from the almost random development of coethnic networks, to the development of tourism and reduction in associated air freight costs, to PTAs. Each component has had its part to play.

Ethiopia's horticultural industry

Ethiopia's involvement in horticulture is less striking than that of Kenya. Development of this industry is in its early stages compared to Kenya and its success is far from guaranteed in the long-run. Between 1993 and 2003 the growth of fresh vegetable exports has been a modest 3.4 per cent per annum on average, mostly as a result of recent increases in the export of

green beans and peas which contributed over 20 per cent of the entire export value. In 2002, exports of fresh fruit and vegetables reached upwards of 14,000 tonnes, compared to approximately 150,000 tonnes from Kenya. The average growth hides some rather large fluctuations year on year. For instance, green beans exports vary from 34 tonnes in 1999 to over 3,000 tonnes in 2001, to 600 tonnes the following year. Cut flowers have emerged as an important export over the past five years, although they remain a minor contributor to export value to date.

These fluctuations are thought to reflect the relatively recent entry of Ethiopia into these markets, the limited development of the supply chain and the consequent difficulties in maintaining the quality and quantity for the European markets (World Bank 2004). **The difficulties associated with Ethiopia** Furthermore, there are questions as to the appropriate portfolio of products to enable Ethiopia to enter the global market.

The success of horticulture in Ethiopia will be partly dependent upon establishing a functioning and efficient supply chain and encouraging investment (World Bank 2004). Production, logistics and marketing represent important features of the supply chain which need to be addressed. While there has been some success in production, there are some important bottlenecks in logistics which may have thwarted the growth in exports of time-sensitive, perishable horticultural products in Ethiopia. For instance, in relation to floriculture, there is substantial difficulty in establishing air-cargo space on outgoing flights from Addis Ababa via Ethiopian Airways (World Bank 2004). While competition from Lufthansa has alleviated this bottleneck somewhat, coordination between exporters, in order to maximise the utilisation of space, is problematic in the absence of a handling company. In the presence of transport bottlenecks, storage of perishables become more important, and yet limited refrigeration facilities in Addis airport, and the absence of a rental market for such services, presents a further bottleneck for horticultural products in general. Despite labour costs almost 60 per cent lower than those in neighbouring Kenya, more favourable conditions for floriculture and 30 per cent lower freight costs, Ethiopia finds it difficult to compete with Kenya in horticulture for logistical reasons such as these. Lack of FDI and, it is argued, limited commitment from the government are also important here.

Smallholder involvement in horticulture varies depending upon the product. Floriculture lends itself well to large scale production techniques and therefore involves little smallholder activity. In fact in Ethiopia there are four main farms supplying all the cut flowers for export. Fruit and vegetable production tends to involve smallholders more. However, as discussed above, the need for compliance strict standards on foods has driven the need for vertical integration or quasi-integration in the supply chain as a means of governing production. There are significant economies of scale in certain dimensions of these GVCs and so the only way in which smallholders can engage the industry is via organising themselves into producer groups that can enter into contract farming arrangements with private commercial farms. There is some evidence to suggest, however, that there are considerable gains to be made in terms of quality from production by smallholders (World Bank 2004).³⁹ While this tends to be true for green beans, it need not always be true however (Kaplinksy 2000, Dolan and Humphreys 2002).

³⁹ Consider the case of green beans, in which quality can be increased since monitoring costs for the household unit are reduced via the use of family labour.

Lessons from case studies

A general consensus is emerging from the study of the country experiences over time as to the important determinants of the success of trade in horticulture. Drawing together the views of various papers provides the following list of factors (Dolan and Humphrey 2002, World Bank 2004):

- Geography and Climate
- Limited government participation
- Positive investment climate
- Macro economic stability
- Vertical integration
- International links and networks
- Agricultural extension and technology transfer
- Preferential Trade Agreements
- Transport and logistics
- Competition in transport: e.g. open skies agreements
- Contractual enforcement

There are numerous factors, which determine the existence of and the volumes of trade. Air freight and transport is an important complementary part of this complicated picture.

6 Post script: climate change

A discussion of air freight would be incomplete without a reference to climate change. There are numerous reasons to be concerned about air freight from this perspective. Firstly there is the observation that of all modes of transport, air freight is the most carbon intensive. Secondly, air freight is one of the fastest growing sectors many economies. This is certainly true of the UK. Lastly, in relation to horticulture, it is often said that air freight is the most carbon intensive link of the supply chain. These environmentally damaging features of air freight, and hence, the horticultural commodities that are transported in this way, make worrying reading for those concerned with climate change.

There has been much said and written about these issues. In a paper addressing each of these issues in turn, Wangler (2006) finds that, unsurprisingly, transport by air freight from Cape Town to London generates approximately 14.9kg of carbon equivalents per kg of product compared to 0.1kg by sea (to Southampton). To get an idea of the scale, fruit and vegetable imports as a whole contribute 0.2 per cent to total carbon emissions in the UK, half of which is generated by the 1.5 per cent that are air freighted.

In relation to the second point, air freight is by no means the most carbon intensive link of the horticultural supply chain for all commodities. On the one hand, air freighted fruit and vegetables are up to four times more carbon intensive than those produced in greenhouses in Northern Europe (let alone imported from Spain or from Morocco, by road). On the other, some studies have found that the production of cut flowers in the Netherlands is more energy intensive than those produced in Kenya. The former use 9.5MegaJoules per rose stem, the latter only 2-3MJ.

Lastly, Wangler (2006) notes that air freight is the fastest growing emitter in the UK, reflecting the growing use of air cargo in trade described in the previous sections. Currently, transport as a whole makes up almost two per cent of the global GHG emissions, of which 12 per cent is attributable to aviation (Stern 2006). It is expected that aviation will contribute five per cent of the global warming effect by 2050.⁴⁰

While each of these points tend to confirm the three commonly held views concerning air freight and climate change, some important economic questions are not answered by the papers research reviewed by Wangler (2006). These include:

- How can we trade-off the positive effect of trade on development against the environmental impact associated with air freight?
- If all modes of transport involved in trade used fuel priced to include the social cost of carbon, either through carbon taxes or emissions trading schemes, how would the pattern of trade change?

The answer to these questions is not straightforward and point to a useful direction for research. One thing is for sure, the relative prices of sea and air freight would change dramatically in favour of the former if the cost of fuel reflected the social cost of carbon. The question then remains, to what extent would the benefits of air freight in reducing other dimensions of transport costs (e.g. time), enabling restructure of the industry and allowing

⁴⁰ This includes the effect of radiative forcing associated with aviation emissions, but does not single out air freight.

some of the benefits of clustering, compensate for such cost increases? Ultimately the answer to this question will turn not upon the quantity of carbon per kg of product, but the value per kg.

7 Conclusion

The empirical evidence on trade suggests, by and large, that trade liberalisation and openness are good for growth and poverty reduction. *While there are exceptions to this general rule, there is no systematic evidence in favour of the reverse proposition.* Yet, how trade and openness achieve the growth and poverty reduction is a mixed bag. Determinants are numerous and complicated, ranging from the existence of coethnic and business networks, to distance and its associated costs.

Air freight is important in overcoming some of the costs to trade, most of which are related to distance or time from the trading partner. A key advantage of air freight is the reduction of time in transit and its associated costs: risk of damage, capital/depreciation costs and costs of storage. In addition air freight is often subject to fewer administrative and border-related costs.

The higher unit costs of air freight mean that only goods with high value to weight/bulk tend to be transported in this way. Furthermore, goods that are perishable or become dated in some other way benefit from the time-savings afforded by air freight.

Horticultural goods are good examples of high value, perishable goods that benefit from rapid transportation to the market. These are also goods for which demand is often uncertain, and can dramatically change owing to prevailing weather conditions, and hence for which rapid supply responses are often important. The existence of efficient air freight capabilities has been an important contributing factor to the development of horticulture in SSA, Kenya being a good example. Rapid transport of horticultural goods has widened the land-use options and enables the production of higher value export crops for European markets. Plus, air freight assists land-locked countries, such as Ethiopia and Zambia, to participate in high-value global horticultural markets.

While the impact on poverty of increased horticultural production is not well understood, it seems likely that where smallholders are participants in the horticultural supply chain they will benefit hugely from the production of high value products. The only questions that remain here concern the extent of participation and the extent to which technology transfer and innovations are stimulated. Participation varies from crop to crop, with high participation of smallholders in the production of green beans in Kenya, and low participation in floriculture in Ethiopia. Some parties argue that the high performance standards associated with exported horticultural goods have enabled technology transfer and generated increased efficiency in production. However, the enforcement and monitoring of such standards tends to be subject to economies of scale so that the efficient structure of the GVC can exclude smallholders given the current lack of policies, by government or otherwise, to alleviate the problem. Furthermore, some authors suggest that the ability to impose standards which are stricter than those applied to European counterparts is a reflection of limited bargaining power of African farmers, raising questions concerning the extent of the benefits.

One way in which it appears that developing countries have benefited from participation in the horticultural supply chain is as a consequence of the restructuring of the supply chain. The fact that the efficiency of air freight depends upon the value to weight/bulk ratio has tended to move value-adding activities to the producer countries. Packaging, product differentiation and innovation are now important components of the horticultural industry in developing

countries these days. While the benefits of this to the host country depend largely upon ownership, the presence of such industries generates jobs, skills and associated learning spillovers. Much of this restructuring has been enabled by falling costs in air freight, and the rising costs of time in transit for perishable goods.

In light of the increasing concerns surrounding climate change, it is worth noting that there appear to be some important developmental benefits, which are made available by the ability of African countries to transport horticultural goods by air. While air freight is not a catalyst for development, it certainly appears to be an important enabling factor for such goods. To maximise the potential of air freight's sustainable development credentials, an economist would suggest three linked components. First, all goods should be priced in order to reflect the social cost of carbon. Second, consumer awareness should be raised of the ethical/developmental content of certain purchases so that the price reflects these preferences. If air freighted horticulture could survive such a change in relative prices remains to be seen, but in principle such an approach is preferable to an outright ban. Last, in order to maximise benefits from trade in developing producer countries, supportive policies need to be put in place to ensure sustainable pro-poor impacts of air freight-led development. Such policies might include greater access to training for smaller and rural farmers, to credit for the cash-constrained and to market information for all.

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