Institute of World Economics
Duesternbrooker Weg 120
24105 Kiel (Germany)

Kiel Working Papers No. 969

Globalization of the World Economy: What Happened in 1985?

by

Jörn Kleinert

March 2000

Globalization of the World Economy: What Happened in 1985?

Abstract:

This paper brings forward a three-country model to analyze the internationalization process in the age of globalization. It is shown that investment of one company increases not only the incentive to invest in another country for every national competitor but for third country's companies as well. That results from the adjustment of the host country's companies which react to their shrinking market share by reducing output and raising the price of their goods. Some host country's companies exit the market. The results are used to explain the surge of foreign direct investment since the mid-1980s.

Keyword: F12, F21, F23

JEL classification: general equilibrium, globalization, multinational enterprises

Jörn Kleinert
Kiel Institute of World Economics
24100 Kiel, Germany
Telephone: ++49 431 8814 325
Fax: ++49 431 85853
E-mail: j.kleinert@ifw.uni-kiel.de

Contents

Introduction

Globalization is certainly one of the words of the nineteen nineties. The discussion on this process included various aspects, and one, the increasing internationalization of production, made obvious by the strong rise of Foreign direct investment (FDI), attracted special attention. This paper deals with the start of this increase in FDI. What happened in 1985, the year when FDI took off to grow so much stronger than exports and output. And why did the rapid growth of outward FDI occur in so many countries at the same time? This paper argues that the sudden change in internationalization strategies of Canadian, European and Japanese companies from exports to production abroad results from the change in conditions of international competition and a “contagion effect“.

A general equilibrium model is set up to explore the change in internationalization strategies of companies from exports to internationalization of production. Companies can choose between these two alternatives. Over time conditions of competition change through an exogenous fall in distance cost between the markets. Up to a certain threshold companies prefer exports, then production abroad. Since the FDI of one company has a positive impact on the profitability of FDI of every national competitor, FDI occurs in waves. This results from the change in the degree of competition in the host country. This change affects companies from a third country as well, so that an FDI wave can also have contagion effects on these companies. The incentive of their FDI in the host country is increased by FDI of first countries companies.

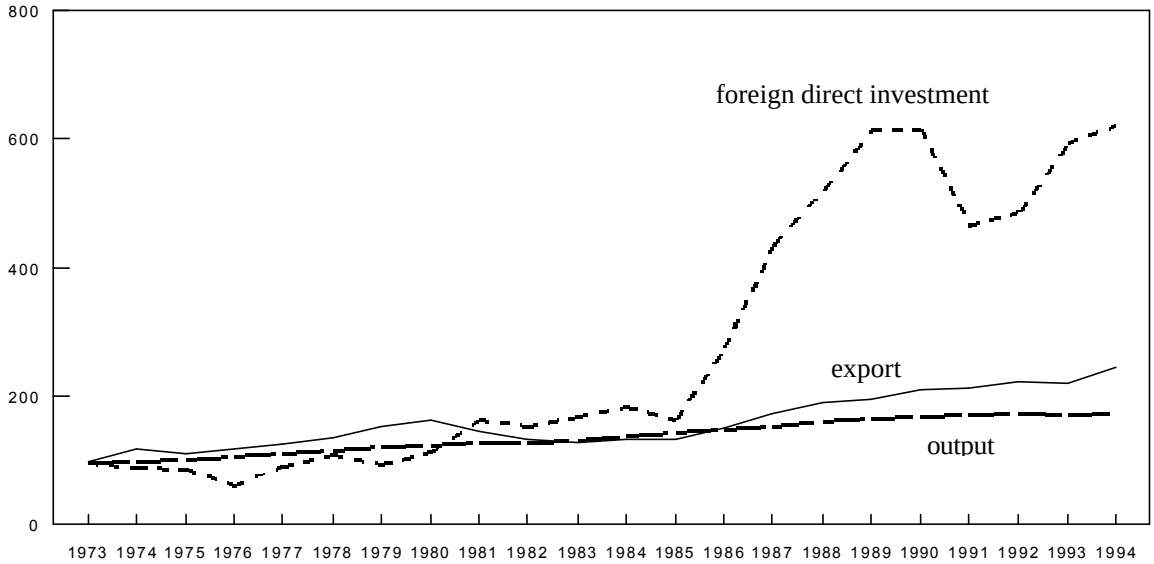
The first part presents some figures for motivation. An intuitive story is given in the second part. The third brings forward a three country model with national and multinatioanl companies, with three being the smallest possible number to model international “contagion“. The model is solved using simulation techniques. The results are given in the forth part. The fifth part concludes.

1. Globalization and the Role of Multinational Enterprises

Since the end of World War Two the world has been characterized by growing world trade. Political trade barriers which had been built since the beginning of World War One were lowered, technical change in transportation and communication technologies did their part to decrease distance costs especially among industrial countries. World trade grew at much higher rates than world output; trade was the main channel of international integration.

Only companies from the United States started to internationalize their activities. U.S. based multinational enterprises (MNE) emerged in the 1950s and 60s, whereas the companies from all other countries almost exclusively relied on exports to serve a foreign market. This pattern changed in the mid 1980s. FDI by European and Japanese MNEs took off. MNEs from these countries invested heavily in other industrialized countries, especially in the U.S. (Graham 1996). Figure 1 illustrates the increase of FDI relative to trade and world output.

Figure 1: World Output, Exports, and FDI (1973 = 100)



Source: Siebert (1997, p. 15).

The strong growth of FDI is due to a change in the internationalization strategy of companies from industrialized countries other than the U.S. as Table 1 shows.

Table 1: Regional Distribution of FDI Outflows

	1971–1976 (millions of dollars)	1985–1990 (millions of dollars)	Change (85–90)/(71–76)	Share of World FDI Outflows (Percent)	
				71–76	85–90
Canada	3 805	29 661	7.8	3.0	3.2
France	5 914	72 793	12.3	4.7	7.9
Germany	10 726	85 004	7.9	8.5	9.3
Japan	8 610	166 870	19.4	6.8	18.2
United Kingdom	17 721	150 337	8.5	14.0	16.4
United States	71 573	142 470	2.0	56.7	15.5

Source: IMF (various issues), own calculations.

Although FDI flows by U.S. companies increased too, the lower dynamic compared to other countries' companies' FDI results in the decreasing U.S. share of worldwide FDI outflows. United States' share of inward FDI flows, on the other hand, increased from 18.2% in the first half of the seventies to 35.9% in the second half of the eighties (IMF various issues).

2. MNE and Globalization in an Evolutionary Model

2.1 The Emergence of MNEs

The existence of MNE is bound to market imperfections (Dunning 1977, 1988). These govern different sectors to a different degree. They are more dominant in some industries, here called manufacturing, and less in others, here called agriculture, which is, therefore, modeled as a perfect competitive sector in this paper.

Market imperfections result from distance costs and the usage of fixed inputs in the production process. Distance costs favor the production as close as possible to consumers and intermediate good producers (proximity), fixed inputs in production the concentration of all production activities. There are two parts of fixed inputs, some have public good character within the company as R&D, marketing or a brand name, others can not be used non-rivalry such as buildings or equipment. The first group, called headquarter services, can be produced anywhere, their production is not necessarily connected to the physical production of the actual good. The second group, on the other hand, includes the fixed inputs

which are locally connected to the actual production process. They have to be employed at the plant.

Since fixed inputs generate internal economies of scale for companies the size of a company matters. Companies set prices above marginal costs to cover the fixed costs. Hence, they engage in imperfect competition, modeled in theories of MNE either as oligopolistic (Markusen and Venables 1998; Koop 1997) or monopolistic competition (Brainard 1993; Kleinert 1998). In monopolistic competition models fixed costs are specific for the production of one variety out of a bundle of many possible varieties the economy could produce. Every company produces one variety, it behaves as monopolist who competes with many other monopolists of different varieties. Consumers split the share of their income, which they devote to products of the monopolistic good sector, to each variety according to their preferences, which assumes a love of variety. Therefore, many varieties are produced in the manufacturing sector.

To make the production process in the model more realistic, a bundle of intermediate goods is used in the production of the consumer good in the manufacturing sector. It is assumed to be specific to the product or the production process in such a way that it is not substitutable (at least not in the short run). That is not realistic for all intermediate goods, but some (and only these are thought of) since the others can be modeled as the other factors of production, unskilled and skilled labor. Feenstra (1998) and Campa and Goldberg (1997) pointed to an increase in the trade in intermediate goods in the last two decades which is especially pronounced in industries with high levels of MNE activities.

The other market imperfection derives from the existence of distance costs. These tend to be an incentive for production to spread in order to be as close to consumers as possible to save on distance costs. Distance costs will be understood in this paper to include pure costs of transport and communication, political barriers to trade, information asymmetries between domestic and foreign producers, cultural differences, in short everything which contributes to a home bias. Distance costs have fallen over the last five decades, but they remain to be an important factor in the international geography of trade and production. McCallum (1995) calculated the border effect between the United States and Canada to decrease the trade to five percent of within country trade level. Nitsch (1998) inferred somewhat lower levels of border effects for Europe which lower trade to only ten percent of the amount which would be traded without border. The border effect is the appropriate measure of distance cost in this model, since distance costs within countries are assumed to be zero, but they incur at higher levels when goods are exported.

With production abroad a second way of serving the foreign markets is possible. Headquarter services can be used non rivalry, but there are additional fixed costs on the plant level which are related to the operation of the second plant. Hence, production abroad is not free of additional costs. But neither are exports. Given this setting, the companies choose between exports, which save on the additional fixed costs on the plant level and production abroad which saves on distance costs. Obviously, this decision is influenced by the level of distance costs, which is exogenous for the company. Since export of consumer goods and intermediate goods are subject to distance costs the profitability of production abroad is changed by

a change of distance costs because the costs of intermediate goods vary with the distance costs.

To capture the main features of the globalization process the evolutionary approach, which was introduced in economic geography models (Fujita and Mori 1997; Fujita, Krugman and Mori 1999; Fujita, Krugman and Venables 1999), is applied to the process of internationalization of company activities. Evolution is understood as a permanent adjustment process to changing conditions. As long as improvements in the utility level or profits are possible individuals or companies will use these opportunities. This changes the conditions for other individuals or companies which will adjust, too. The process continues until no further improvement can be achieved by anyone. The economy reaches a (general) equilibrium. A general equilibrium implies, that all goods and factor markets are cleared, companies earn zero profits, since free entry and exit is assumed, the current account is balanced and no improvements in the utility of any one is possible. But there are external (with respect to the model) influences on individuals and companies which change over time as well. These changes alter the conditions, improvements through adjustment are possible. Adjustment is assumed to take place immediately, hence, by continuous adjustment the economy “moves“ from equilibrium to equilibrium.

The driving forces behind globalization are decreasing transport and communication costs, advances in information technologies and the widespread tendency of liberalization in many countries (Siebert and Klodt 1999). All these tend to reduce the distance costs between countries. To reflect this, distance costs in the model are exogenously reduced over time. Starting with high distance cost levels resembling the situation after World

War Two, distance costs are reduced gradually. The level of distance costs defines the time point in development since equilibria at higher distance costs are seen as earlier in time than equilibria characterized by lower distance costs.

Earlier work using this framework (Kleinert 1998, 1999) showed that FDI occurs in sectoral and temporal clusters and that there are differences which result from country size. Companies from larger countries internationalizes their production activities earlier. The theory can, therefore, explain the pattern of MNE's activities up to the era of globalization, which started in 1985.

2.2 1985: Globalization Takes off

The new phenomenon since the mid 1980s has been the involvement of many industrialized countries in the internationalization process of production. The model is, therefore, extended to three countries, the United States, Germany and France. The countries differ in size: Germany is modeled three quarters of the size of the largest country U.S., France being the smallest country is little smaller than Germany. To reflect the situation in the mid 1980s companies from the U.S. are assumed to be MNEs which have set up affiliates in Germany and France. German and French companies are national companies which serve foreign markets by exports. The three country model is set up to analyze the effect of German companies' FDI in the U.S. on French companies, which are seemingly unaffected, but influenced through the change in the condition of competition in all three markets.

Each German company is assumed to internationalize production by investing in the U.S. if it is profitable to do so. With falling distance costs the profitability of production abroad relative to exports increases. When FDI has become profitable for one company, it decides to set up an affiliate. Production in the U.S. decreases the German company's good's price in the U.S. and increases sales and market share. U.S. companies suffer the losses, their reaction includes raising their price and decreasing output. Some have to give up. U.S. companies' reaction increases the incentive to invest in the U.S. for every other German company. But FDI of one German company increases not only the incentive of a national competitor but also that of a French competitor to invest in the U.S. French companies would not have yet invested in the U.S. at this distance costs level but later if there would not have been the change in the degree of competition in the U.S. market which occured because of the internationalization of production of German companies. FDI by French companies occurs, therefore, earlier than without German companies' investment. A clustering of FDI emerges in the U.S. market by companies from both foreign countries.

An investment brings about changes in the degree of competition with companies in the United States forced to give up. The degree of competition decreases therefore. This alters the profitability of exports relative to production abroad of every company operating in this market. FDI occurs not only in sectoral and temporal national waves, as shown in Kleinert (1999) but can affect other country's companies' decisions to FDI. A global wave of internationalization of production occurs, as happened in the second half of the 1980s with Canadian, European and Japanese companies. Globalization is, therefore, brought about by the interdependence of

companies from different countries through competition in the same markets.

3. A Model of an Economy with National and Multinational Enterprises

Consider three countries, the United States (US), Germany (G) and France (F), each with two sectors of production. One sector, agriculture, produces an homogenous product Q_A with constant returns to scale under perfect competition. The other sector, manufacturing, produces a variety of consumer goods and a variety of intermediate goods under imperfect competition. The aggregate amount of output of the final goods in the manufacturing sector is Q_M. An individual company's output is denoted q_i. The consumer goods producer, which can serve the foreign market through exports or production abroad, uses intermediate goods, which are also produced in the manufacturing sector. The aggregate output of the intermediate goods, Z, is used as input exclusively by the final goods producer headquartered in the same country. An individual intermediate firm's output is denoted z_i.

It is assumed that every individual is endowed with one unit of either unskilled labor (L) or skilled labor (H). The individual is free to choose any job in his country, but there is no cross-border mobility of labor. The labor market equilibrium in country j gives wage levels for unskilled and skilled labor (w_j, v_j). Full employment is assumed.

3.1 Consumption

Individuals in each country have identical preferences. Their utility function is increasing in the agricultural product and the aggregate manufacturing product.

$$U_j = Q_{A,j}^{1-m} Q_{M,j}^{m} \qquad m \in (0,1);\ \text{j=F,G,US} \qquad (1)$$

μ gives the income share spent on manufacturing goods. The aggregate Q_M is a CES-function with λ different products.

$$Q_{M,j} = \left[\sum_{i=1}^{l} q_{i,j}^{\,r} \right]^{1/r} \qquad r \in (0,1);\ \text{j=F,G,US} \qquad (2)$$

r defines the degree of differentiation among the manufacturing goods. The products are poor substitutes for each other if r is small, leaving the companies with more market power. If r increases, it is easier for consumers to substitute one good for the other, and, therefore, market power decreases.

Equation (2) implies that consumers love variety. If they are indifferent to two products, they prefer a mix of half a unit of each good. The CES-function (2) implies a constant elasticity of substitution s, with $s=1/(1-r)$, between any two varieties of the manufacturing products. Individuals maximize their utility (1) subject to budget constraints

$$Y_j = p_{A,j} Q_{A,j} + \sum_{i=1}^{l} q_{i,j}\, p_{i,j}\,. \qquad \text{j=F,G,US} \qquad (3)$$

to obtain the optimum quantities of agricultural and manufacturing goods

$$Q_{A,j} = (1-m)Y_j \,/\, p_{A,j} \qquad \text{j=F,G,US} \qquad (4)$$

$$Q_{M,j} = mY_j \,/\, p_{M,j} \qquad \text{j=F,G,US} \qquad (5)$$

$p_{A,j}$ is the price of agricultural goods, which equals the marginal costs since agriculture is perfectly competitive. It is assumed that it can be traded without incurring costs. The price of the agricultural product will be the same in both economies and set to one. The agricultural good Q_A will, therefore, be used as numeraire throughout this paper. $p_{M,j}$ is the price-index of the varieties of manufacturing goods. The price index, $p_{M,j}$, depends on the price, $p_{i,j}$, of each individual product sold in j.

3.2 Production

3.2.1 The Agricultural Good Producer

The agricultural good is assumed to be produced under constant returns to scale. Production costs are given by

$$C_{A,j} = \left(\frac{w_j}{q_1}\right)^{q_1}\left(\frac{v_j}{1-q_1}\right)^{1-q_1} Q_{A,j}. \qquad \text{j=F,G,US;}\ \ q_1 \in (0,1) \qquad (6)$$

Since agriculture is a perfect competition sector, wages, w_j, and salaries, v_j, are paid according to the marginal products of the production factors, unskilled and skilled labor, respectively. Perfect mobility of workers across sectors assures that wages and salaries are identical in every sector of the economy.

$$\frac{\P Q_{A,j}}{\P L_{A,j}} = w_j \qquad \frac{\P Q_{A,j}}{\P H_{A,j}} = v_j \qquad (7)$$

3.2.2 The Manufacturing Goods Producer

In the manufacturing sector, companies are engaged in monopolistic competition. Consumers view the differentiated products as imperfect substitutes for each other. Each company produces a single variety. Hence, the number of differentiated goods equals the number of firms in the two countries.

There are two groups of firms in the manufacturing sector, intermediate goods producers and consumer goods producers. The consumer goods producer uses a bundle of intermediate goods as input in the consumer good's production. Since intermediate goods are often very specific to a production process or final good, the production of this consumer good in a foreign market depends on the supply of intermediate goods from the home country. For the sake of simplicity, it is assumed that MNEs exclusively use intermediate goods produced in their home country, irrespective of whether production of the consumer good takes place in the home or in the foreign country.

Intermediate Goods Producers

Intermediates are not perfect substitutes for each other. The bundle of intermediate goods used by any consumer good producer contains all varieties of intermediate goods.

$$Z_j = \left[\sum_{i=1}^{s_j} z_i^{\,e} \right]^{-\frac{1}{e}} \qquad \text{j=F,G,US;} \quad e \in (0,1) \qquad (8)$$

The intermediate goods' degree of differentiation depends on e. s_j is the number of intermediate goods produced in country j. The price-index for intermediate goods pz_j

$$pz_j = \left[s_j p_{Z,i,j}^{\,-f} \right]^{-\frac{1}{f}} \qquad \text{j=F,G,US} \qquad (9)$$

can be calculated from (8) with $f=e/(1-e)$. s_j is the number of varieties of intermediate goods in the bundle Z_j, $p_{Z,i,j}$ is the price of any of these varieties.

The costs of production of one intermediate good variety follows the cost function

$$C_{i,j}^{Z} = \left(\frac{w_j}{q_2} \right)^{q_2} \left(\frac{v_j}{1-q_2} \right)^{1-q_2} f_{Z,j} + \left(\frac{w_j}{q_3} \right)^{q_3} \left(\frac{v_j}{1-q_3} \right)^{1-q_3} z_{i,j}$$

$$\text{j} = \text{F,G,US} \quad \text{and } q_2, q_3 \in (0,1) \qquad (10)$$

The first term on the right hand side shows the fixed costs. $f_{Z,j}$ is the level of fixed costs given the technology. The second term describes the marginal costs $c_{Z,j}$ multiplied by the output $z_{i,j}$. Because all producers of intermediates face the same factor costs and use the same technology, their marginal costs and their fixed costs are identical.

The amount spent on intermediate goods from country j by the final goods producer is denoted I_j. From the composition of the aggregate intermediate good (8), the demand for any of the varieties can be derived.

$$z_{i,j} = \frac{p_{Z,i,j}^{-(1+f)}}{pz_j^{-f}} I_j \qquad \text{j=F,G,US} \qquad (11)$$

In an equilibrium, demand for the intermediate good equals its production. Therefore, the output of an intermediate goods producer decreases in its own price $p_{Z,i,j}$, and increases in the price-index of intermediate goods pz_j as well as in the demand for intermediate goods from the final goods producer I_j. Maximizing the profit function of an intermediate goods producer yields the optimal price for his intermediate good

$$p_{Z,i,j} = c_{Z,j} / e\,. \qquad \text{j=F,G,US} \qquad (12)$$

The producers of intermediate goods set their prices *1/e* over their marginal costs $c_{Z,j}$. These prices are identical among all intermediate goods, because their marginal costs are identical, as are their outputs z_j.

The number of intermediate goods companies s_j in the country j is determined by the zero-profit-condition.

$$\Pi_j^Z = (1-e) p_{Z,j} z_j - C_{ZF,j} = 0 \qquad (13)$$

Since there is free market entry and exit in all three countries, new companies will enter profitable markets until profits fall to zero. New entrants influence the profit of existing firms by increasing competition: the price index (9) decreases as a result.

Equation (9) gives the price-index faced by an home-based plant of a consumer goods producer. The price-index of affiliates in the foreign country pz_j^M must take distance costs $(t_M D)$ into account.

$$pz_j^M = \left[s_j \left(p_{Z,j} e^{t_M D} \right)^{-f} \right]^{-\frac{1}{f}} \qquad \text{j=F, G, US} \qquad (14)$$

Distance costs are modeled in Samuelson's 'iceberg' form: a part of the value of every product must be paid for transportation. This value increases with the distance D between any two markets (D is set to one for the remainder of this paper). To buy one unit of an imported intermediate good, $e^{t_M} (>1)$ units have to be paid by the producer of the consumer good in the foreign country, $\left(e^{t_M} - 1 \right)$ units being distance costs.

Final Goods Producer

There are two possible types of consumer goods producers in each country: (i) national firms producing in their home market and serving the foreign country through exports and (ii) MNE producing domestically and abroad. For the sake of simplicy, exports of the MNEs' affiliates to the home country are excluded in this paper. The consumer goods producers manufacture their products in a multi-stage process. In the first stage, headquarter services, such as R&D or marketing, which have the character of public goods within the company are produced in each company. In the second stage, actual production takes place at the plant. Therefore, headquarter services and intermediates are used as inputs. The cost function of any national producer is given by

$$C_{i,j}^{N} = \left(\frac{w_j}{q_4}\right)^{q_4}\left(\frac{v_j}{1-q_4}\right)^{1-q_4} r_j + \left(\frac{w_j}{q_2}\right)^{q_2}\left(\frac{v_j}{1-q_2}\right)^{1-q_2} f_j + \left(\frac{w_j}{q_5}\right)^{q_5}\left(\frac{v_j}{q_6}\right)^{q_6}\left(\frac{pz_j}{1-q_5-q_6}\right)^{1-q_5-q_6} q_{i,j}^{N}$$

with j=F, G, US; $q_2, q_4, q_5, q_6 \in (0,1)$ (15)

The first term represents fixed costs on the company level, the second term on the plant level. The fixed costs increase in the factor prices of unskilled and skilled labor w_j, v_j and in r_j and f_j. r_j is the level of headquarter-services produced by the companies in country j. f_j is the level of fixed input necessary at the plant level for production. r_j and f_j are given by the production technology and exogenous to the company.

Variable costs, the third term in equation (15), increase in the factor prices w_j, v_j in country j, the price-index of intermediate goods pz_j in country j and the output level $q_{i,j}^{N}$.

A multinational company's production costs in its home-country j, $C_{i,j,j}^{M}$, are

$$C_{i,j,j}^{M} = \left(\frac{w_j}{q_4}\right)^{q_4}\left(\frac{v_j}{1-q_4}\right)^{1-q_4} r_j + \left(\frac{w_j}{q_2}\right)^{q_2}\left(\frac{v_j}{1-q_2}\right)^{1-q_2} f_j + \left(\frac{w_j}{q_5}\right)^{q_5}\left(\frac{v_j}{q_6}\right)^{q_6}\left(\frac{pz_j}{1-q_5-q_6}\right)^{1-q_5-q_6} q_{i,j,j}^{M}$$

with j=F, G, US; $q_2, q_4, q_5, q_6 \in (0,1)$ (16)

The costs differ from costs of a national producer only in the third term, the variable costs. Factor prices and used technology are the same, but since

MNEs do not produce for exports, the quantities produced by a *j* based national and multinational company in *j* differ $\left(q_{i,j}^{N} \neq q_{i,j,j}^{M}\right)$.

Different plants of MNEs have different variable costs in each country because of differences in wages ($w_j \neq w_h$, $v_j \neq v_h$) and differences in the prices of the intermediates ($pz_j^M \neq pz_j$) in both markets. A MNE's plant costs in the foreign country *h*, $C_{P,i,j,h}^{M}$, are

$$C_{P,i,j,h}^{M} = \left(\frac{w_h}{q_2}\right)^{q_2}\left(\frac{v_h}{1-q_2}\right)^{1-q_2} f_h + \left(\frac{w_h}{q_5}\right)^{q_5}\left(\frac{v_h}{q_6}\right)^{q_6}\left(\frac{pz_j^M}{1-q_5-q_6}\right)^{1-q_5-q_6} q_{i,j,h}^{M}$$

$$\text{with} \quad \text{j,h=F, G, US; j}\neq\text{h;} \; q_2, q_4, q_5, q_6 \in (0,1) \qquad (17)$$

The costs of production in the foreign country do not include costs at the corporate level due to the public goods character of the headquarter service. Headquarter services are produced at home and are used on a non-rivalry basis in both plants, in *j* and in *h*.

A MNE's costs abroad depend on w_h, v_h, the level of fixed costs used in production f_h, the production elasticities q_2, q_5, q_6 (technology) and the costs of the intermediates pz_j^M. The output $q_{i,j}^{k}$ (k=N, M; j=F, G, US) differs between domestic suppliers and MNEs based in the same country, as well as between MNE affiliates in its home country and in the foreign country.

In equilibrium, companies produce the amount of goods they can sell at the optimal price. Given the utility function (1) and the composition of the

aggregated manufacturing good (2), equation (18) gives the demand for a single product $q_{i,j}^{N}$ of a national firm, which serves the foreign countries through exports.

$$q_{i,j}^{N} = \frac{p_{i,j}^{-(1+g)}}{p_{M,j}^{-g}} mY_j + \frac{p_{i,j}^{-(1+g)} e^{-(1+g)t_M}}{p_{M,h}^{-g}} mY_h + \frac{p_{i,j}^{-(1+g)} e^{-(1+g)t_M}}{p_{M,l}^{-g}} mY_l$$

$$\text{with} \quad j,h,l=F, G, US;\ j\neq h;\ j\neq l;\ h\neq l;\ \gamma=\rho/(1-\rho) \qquad (18)$$

The optimal quantity of good *i* produced in *j* depends on: its price $p_{i,j}$, the price-indices $p_{M,j}$, $p_{M,h}$, $p_{M,l}$ in both final goods markets and distance costs t_M. The lower the price of good *i* relative to the price-index in both countries, the higher the optimal output of this good. High distance costs decrease the optimal output by increasing the good's price in the foreign market. Consumers in the importing country *h* must pay the distance costs and, therefore, react by partially substituting imported goods for domestic goods.

An MNE headquartered in *j* produces in at least two countries. It supplies goods which are produced in each country. The optimal output from the domestic plant

$$q_{i,j,j}^{M} = \frac{p_{i,j,j}^{M\ -(1+g)}}{p_{M,j}^{-g}} mY_j \qquad \text{j=F,G,US} \qquad (19)$$

equals the demand in the home country, since re-export is excluded. The price of a MNE's good in the foreign market *h* is lower than the price for an

imported good, since consumers do not have to pay distance costs. Its output $q_{i,j,h}^{M}$ is given by

$$q_{i,j,h}^{M} = \frac{{p_{i,j,h}^{M}}^{-(1+g)}}{{p_{M,h}}^{-g}} mY_h \qquad \text{j,h=F,G,US; j≠h} \qquad (20)$$

It is positively related to the price-index and the market size mY_h in country *h* and negatively related to its own price. In equations (18) through (20), the price index is constant and, therefore, independent of the product price $p_{i,j}$. Competitors do not react to *i*-th company's price changes. Hence, there is no oligopolistic reaction.

The quantity of the intermediate goods-bundle used by a single final goods producer can be calculated from the variable cost functions (15)–(17) by taking the partial derivative with respect to the price-index pz_j (Shephards lemma).

In equilibrium, the aggregate demand for intermediate goods $\left(\sum_{i=1}^{m_j} qz_{i,j}^{M} + \sum_{i=1}^{n_j} qz_{i,j} \right)$ equals the aggregate supply (Z_j). The total costs for intermediate goods $\left(\sum_{i=1}^{m_j} p_{Z,j} qz_{i,j}^{M} + \sum_{i=1}^{n_j} p_{Z,j} qz_{i,j} \right)$ equal the demand for intermediates I_j, since zero profits are assumed.

The consumer goods producer sets his prices to maximize his profits. The solution to this maximization-problem is always a fixed mark-up factor over marginal costs $c_{PV,i,j}^{k}$.

$$p_{i,j}^{k} = c_{PV,j}^{k} / r \qquad \text{j=F,G,US; k=N, M} \qquad (21)$$

The price of a single consumer good depends only on the good's marginal costs $c_{PV,j}^{k}$ and r, the parameter of differentiation. Marginal costs can easily be obtained from variable costs (15)–(17). Since all companies use the same technology, the marginal costs differ only if factor prices differ. But factor prices can not differ within one country, because there exists inter-sectoral mobility. In each country j there are, therefore, four different potential suppliers of consumer goods: (i) Country j's national companies producing for their home market (ii) Foreign firms (based in country h or l) serving country j through exports (iii) MNEs, with their headquarters in country j producing at their plant in j and (iv) country h or l-based MNEs producing at their affiliate in country j. Furthermore the prices of h and l-based companies' products differ.

Prices set by companies located in different countries differ as a result of different marginal costs caused by different opportunities to exploit economies of scale and differences in factor costs. Prices set by national and multinational companies also differ in the foreign market but not at home. There are, therefore, five different prices $p_{j,h}{}^{k}$ (j,h= F,G,US; j≠h and k=N,M) in each market j: price of goods produced by j based firms (nationals and multinationals), two different prices of imported goods from h or l national companies and prices of goods produced by an h- or l-headquartered multinational affiliate's plant in j. The price of a national firm's good in the foreign market $p_{j,h}{}^{N}$ equals the home-market price multiplied by the transportation costs $p_{j,h}^{N} = p_{j,j}^{N} e^{t}$.

From (1) and (2), the price index, $p_{M,j}$, for each market can be calculated.

$$p_{M,j} = \frac{mY_j}{Q_{M,j}} = \left[\sum_{i=1}^{l} p_i^{-g} \right]^{-\frac{1}{g}} \qquad \text{j=F,G,US} \qquad (22)$$

Using the different product prices of the different companies, I get

$$p_{M,j} = \frac{mY_j}{Q_{M,j}}$$

$$= \left[\begin{array}{l} \sum_{i=1}^{n_j} \left(p_{j,j}^{N} \right)^{-g} + \sum_{i=1}^{n_h} \left(p_{h,j}^{N} \right)^{-g} + \sum_{i=1}^{n_l} \left(p_{l,j}^{N} \right)^{-g} \\ + \sum_{i=1}^{m_j} \left(p_{j,j}^{M} \right)^{-g} + \sum_{i=1}^{m_h} \left(p_{h,j}^{M} \right)^{-g} + \sum_{i=1}^{m_l} \left(p_{l,j}^{M} \right)^{-g} \end{array} \right]^{-\frac{1}{g}}$$

with j,h,l=F,G,US; j≠h; j≠l; h≠l (23)

n_j is the number of national companies located in j, n_h, n_l the number of nationals located in h, and l, respectively, m_j ,m_h and m_l are the numbers of MNEs headquartered in j, h, and l, respectively. n_j, n_h, n_l, m_j, m_h and m_l, added together, equal l.

Since there is free market entry and exit, the zero-profit condition holds true in equilibrium for both national and multinational companies.

$$\Pi_j^N = (1-r) p_j^N q_j^N - C_{Hq,j} - C_{PF,j} = 0$$

j=F,G,US (24)

$$\Pi_j^M = (1-r)\left(p_{j,j}^M q_{j,j}^M + p_{j,h}^M q_{j,h}^M + p_{j,l}^M q_{j,l}^M\right) - C_{Hq,j} - C_{PF,j} - C_{PF,h} - C_{PF,l} = 0 \quad (25)$$

Equation (25) gives the zero-profit condition for a MNE which produces in both foreign countries. But it is also possible that a MNE produces only in one foreign country and supplys the market of the other foreign country by exports. Here it is assumed that this market is served from the home market. The quantity produced at home $q_j^{M,E}$ is smaller than q_j^N calculated in (18) because just one foreign market is served by exports. Let $E_{j,l}^M$ be the quantity sold in the export market l. The price in market l equals the price of the exports of a national company from country j ($p_{j,l}^N = p_{j,l}^{M,E}$). Additionally the company produces in the foreign country h. The zero-profit condition is given in equation (26).

$$\Pi_j^{M,E} = (1-r)\left(p_{j,j}^M q_{j,j}^M + p_{j,h}^M q_{j,h}^M + p_{j,l}^{M,E} E_{j,l}^M\right) - C_{Hq,j} - C_{PF,j} - C_{PF,h} = 0 \quad (26)$$

The zero-profit-conditions (24), (25), and (26) are sufficient to determine the number of national and multinational companies n_j, m_j, and m_j^E in country j in the equilibrium. In the price index (23) of a country MNEs which serve one market by exports appear as national company if they don't produce there and as MNE if they produce in this market.

3.3 Investment Decision

All consumer goods producers can decide whether to serve the foreign market through exports or to become a MNE and produce abroad. If there

are no restrictions to FDI, a company will invest in the foreign market if it is profitable to do so.

The price of the good drops in the foreign market when an exporting company becomes a MNE, since there are only distance costs on the intermediates but not on the consumer good, which increases the price. The quantity sold rises as do variable profits.

A national consumer goods producer decides to invest in a foreign country if the gains in variable profits are at least as high as the additional fixed costs at the plant level.

$$C_{PF,h} \leq (1-r)\left(p_{j,j}^{M} q_{j,j}^{M} + p_{j,h}^{M} q_{j,h}^{M} + p_{j,l}^{M,E} E_{j,l}^{M} - p_{j}^{N} q_{j}^{N}\right)$$

with j,h,l=F,G,US; j≠h; j≠l; h≠l (27)

A national consumers goods producer would invest in both foreign countries if (28) is met. (29) give the condition for a MNE which exports to serve the other foreign market to invest in this foreign market, too.

$$C_{PF,h} + C_{PF,l} \leq (1-r)\left(p_{j,j}^{M} q_{j,j}^{M} + p_{j,h}^{M} q_{j,h}^{M} + p_{j,l}^{M} q_{j,l}^{M} - p_{j}^{N} q_{j}^{N}\right) \quad (28)$$

$$C_{PF,l} \leq (1-r)\left(p_{j,l}^{M} q_{j,l}^{M} - p_{j,l}^{M,E} E_{j,l}^{M}\right) \quad (29)$$

with j,h,l=F,G,US; j≠h; j≠l; h≠l

The lower the fixed costs at the plant level $C_{PF,h}$, the more likely it is that a national company will decide to build a plant abroad. The same is true for higher distance costs. The last term on the right hand side of (28) decreases because q_j^N decreases with rising distance costs. Ambiguous is the influence

of r. The first factor on the right hand side of equation (28) will increase as product differentiation increases (falling r), which accelerates investment. But $\Delta q = q_{j,j}^{M} + q_{j,h}^{M} - q_{j}^{N}$ is influenced by r as well. A smaller r implies a smaller *Dq*, and, therefore, a smaller increase in variable profits. Therefore, the influence of r on the investment decision depends on the parameter values. One company's investment in the foreign market intensifies competition for all companies in this market. This has the same effect as the entry of a new firm: the price index, $p_{M,j}$, decreases.

3.4 Market Equilibrium

Full employment of all resources is assumed in both economies. Factor demand, which can be derived by Shephards Lemma from the cost functions (6), (10) and (15) through (17) and must equal the fixed supply of both factors in each country. Wages and salaries are set in order to clear factor markets in each country. The wage level determines the size of the agricultural sector because this is a perfectly competitive industry. It, therefore, determines the level of inter-industry trade. The costless one-way trade of the homogenous good leads to the price equality of this good in both economies. In both countries the price of agricultural goods equals marginal costs.

The income Y_j in each country is given by the sum of the income of all individuals.

$$Y_j = w_j L_j + v_j H_j \qquad \text{j=F,G,US} \qquad (30)$$

The demand functions (4) and (5), the income equation (30) and the budget constraint (3) ensure that goods markets clear. The value of the marginal products of unskilled and skilled labor (7) determines the wages in each economy.

The pricing rule (21) and the equations (18) to (20), (24), (25), and (26), determine the output of the national and multinational firms and their number in each country. The number of intermediate goods firms and their production levels are given by (13), (11) and (12).

There is always intra-industry trade of final products in this model, because the final goods are not perfect substitutes for each other. The quantities $q_{j,h}^{N}$ sold fall with rising distance costs, and can be very small at almost prohibitive distance costs.

$$Ex_j^M = n_j p_{j,h}^N q_{j,h}^N \qquad \text{j,h=F,G,US; j≠h} \qquad (31)$$

The existence of MNEs, and, therefore, the trade of services, depends on fixed costs on the company and the plant level, market size and distance costs. Trade in services equals

$$Ex_j^S = m_j C_{Hq,j} \frac{q_{j,h}^M}{q_{j,j}^M + q_{j,h}^M}. \qquad \text{j=F,G,US; j≠h} \qquad (32)$$

Since this is a static model, trade must be balanced.

$$Ex_j^A + Ex_j^M + Ex_j^S = Ex_h^M + Ex_h^S \qquad \text{j,h=F,G,US; j≠h} \qquad (33)$$

Ex^A can be positive or negative, depending on whether *j* is an exporter or an importer of the agricultural good. Ex^M must be positive for both economies except in the case of prohibitively high transport costs t_M. Ex^S can be zero or positive for any country depending on the existence of MNEs.

4. Modeling the Start of Globalization

A succession of general equilibria of a world with three countries is examined to model the internationalization process.[1] The equilibria differ due to the change of distance costs between any two economies. The starting equilibrium resembles the situation in the early 1980s. The distance costs are at a modest level, U.S. based companies in the equilibrium are MNE, French and German companies are national companies. Over time distance costs decrease further. Lower spatial differentiation between foreign and domestic firms, because of the lower distance costs, changes the optimal consumption bundle, company's output and price and the numbers of companies in the equilibrium. Consumers and producers adjust to the new conditions. They reach a new general equilibrium. It is assumed that the adjustment occurs immediately, the adjustment time approaches zero. Therefore, the evolution occurs as a sequence of general equilibria.

This model was set up to explain the FDI boom of the second half of the 1980s and the (large) share of the FDI flows in the 1990s, which is an

---

[1] The equilibria are solved numerically, using Mathematica 3.0. The exogenous parameters are given by $m=0.6$, $r=0.75$, $e=0.9$, $q_1=0.7$, $q_2=0.3$, $q_3=0.5$, $q_4=0.5$, $q_5=0.2$, $q_6=0.6$, $L_1=300$, $H_1=100$, $L_2=225$, $H_2=75$, $L_3=210$, $H_3=70$, $r_1=r_2=r_3=1.5$, $f_1=f_2=f_3=0.5$, $fz_1=fz_2=fz_3=0.3$

industrialized country phenomenon. MNE of industrialized countries invested in other industrialized countries. Often the investment is bi-directional within the same industry. Since only industrialized countries are considered, comparative advantage is ruled out as an explanation by introducing only countries with the same relative factor endowments of skilled and unskilled labor. The countries differ only in absolute size. Germany is modeled three quarters of the size of the largest country U.S., France (being the smallest country) is little smaller than Germany.

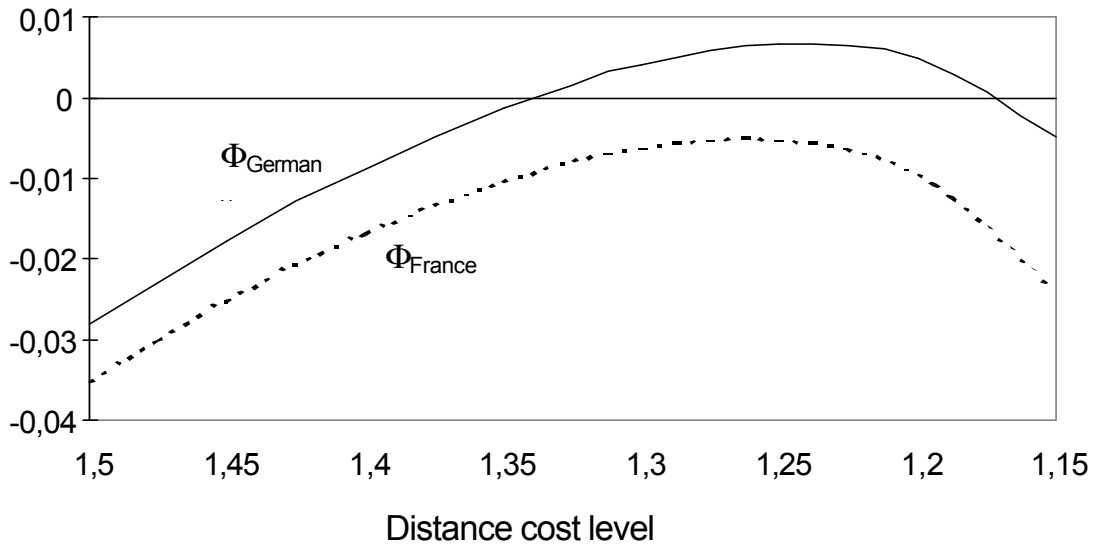
Whereas U.S. companies produce already in the foreign countries, German and French companies do not. The profitability of their exports relative to production abroad is changed by the change of the conditions of competition. To make this visible, the investment incentive equation (27) is rearranged to a trigger function F. To focus the analysis it is assumed that companies in the two small countries have only the chance to invest in the large country U.S. or stay exporters. FDI of German companies in France or French companies in Germany are not considered.

$$\Phi_j = (1-r)\left(p_{j,j}^M q_{j,j}^M + p_{j,h}^M q_{j,h}^M + p_{j,l}^{M,E} E_{j,l}^M - p_j^N q_j^N\right) - C_{PF,h}$$

with j,l=F,G; h=US (34)

The trigger function F_j indicates a higher profitability of production abroad compared to exports for values larger than zero. Here it is assumed that French and German companies with a trigger curve value exceeding zero decide to invest in the United States, since it is profitable to do so. Figure 2 shows the trigger curves of French and German companies for their decision to invest in the United States.

Figure 2: French and German Trigger Curves with Falling Distance Costs

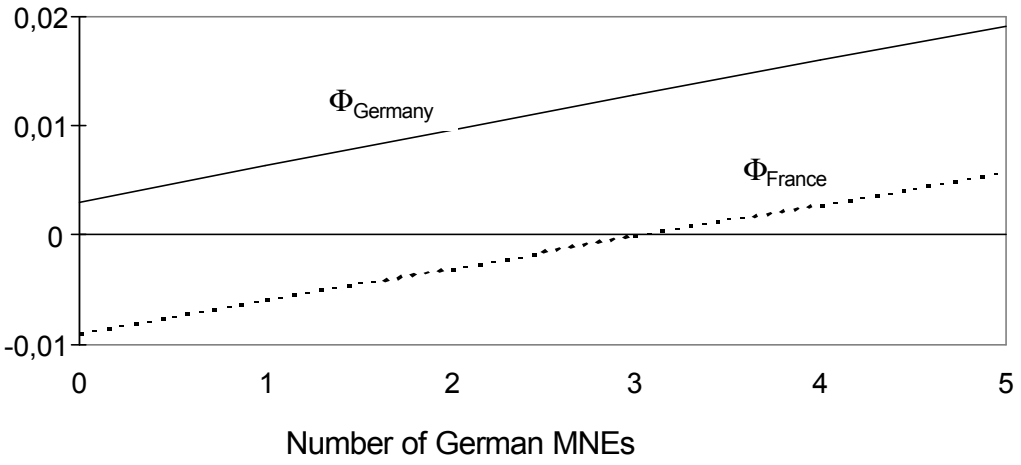


The trigger curves increase up to a certain time (distance cost level) and decrease thereafter. This derives from different influences on the investment decision. The increase results from cheaper intermediate goods, which decrease the price and increase the quantity sold of an affiliates' good and the use of scale economies at the company and at the plant level. These three effects exceed the export growth effect due to the decreasing distance costs. Hence the trigger curve which is the profitability of production abroad relative to exports increases.

As mentioned above, the incentive to invest in the foreign country and, therefore, the trigger function values depend on the size of the home market. German companies enjoy the advantage of a larger home market relative to French ones in this model. Their companies are larger and can, therefore, make more use of economies of scale at the company level. Hence, they will invest earlier in the larger U.S. market.

The trigger curves shown in figure 2 are valid only up to the time when FDI of a German company in the United States becomes profitable (t_M=1.34). At this point it is assumed that the German company invests in the U.S. market, because it is profitable to produce abroad instead of exporting. The FDI of this company increases the incentive of all other German companies to invest in the United States, too. But it also increases the incentive of French companies to invest in the U.S. as can be seen in Figure 3. Figure 3 shows the incentive to invest in the U.S. market of a German and a French company at constant distance costs (t_M=1.3). The change in the economies occurs through the successive set ups of affiliates of German companies in the United States. The number of German companies which became MNE by FDI in the U.S. is shown on the abscissa. The ordinate gives the investment incentive.

Figure 3: The Change in the Profitability of Production Abroad Relative to Export Due to the Internationalization of German Companies Production

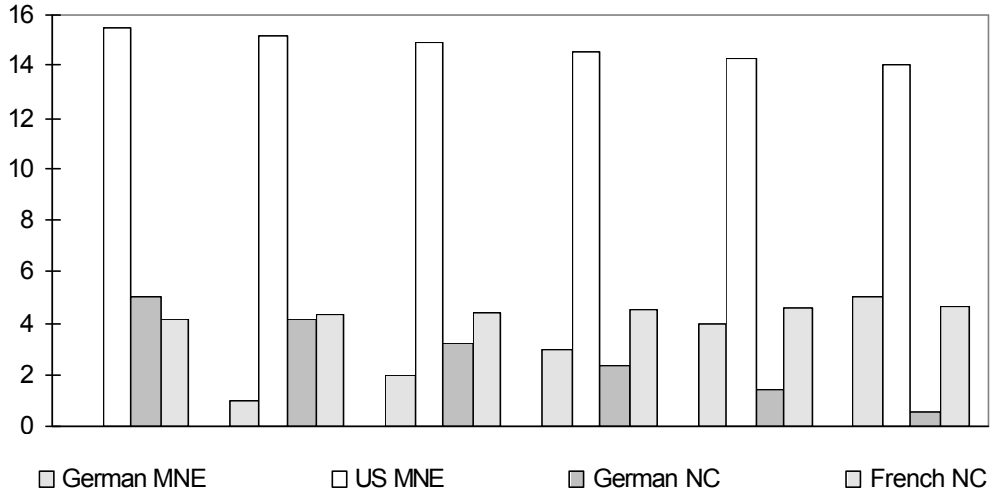


For French companies exports are still the profitable way to serve U.S. consumers in the initial situation. But for each German company production

abroad is more profitable than export as their trigger curve exceeds zero. If one German company decides to invest in the U.S. the competition is changed in such a way that both trigger curves are lifted. Having even a larger incentive to invest, the second German company establishes an affiliate in the U.S. which lifts the trigger curves even more, and so on. With the fourth German company producing in the U.S. it becomes profitable for French companies, as well, to set up affiliates in the United States. French companies are “contagioned“ by German companies’ FDI in the United States.

This “contagion“ results from the restructuring of the U.S. companies in the manufacturing sector which became necessary because of the entering of the U.S. market by German companies with goods produced in the U.S. instead of exported from Germany. A German good produced in the United States is cheaper than imports of the same good from Germany because consumers don’t have to pay distance costs any more. The lower price translates into higher quantities which are sold. Sales increase and, therefore, the market share of a German product when production for the U.S. consumers is shifted from Germany to the U.S. That gives pressure to U.S. companies which sales decrease. But since zero profits are assumed, falling sales result in negative profits. U.S. companies can not pay their fixed costs. Some have to exit (Figure 4), the other raise the price of their goods to increase sales. The overall price level increases, what gives German companies a larger incentive to invest in the U.S. (Figure 5).

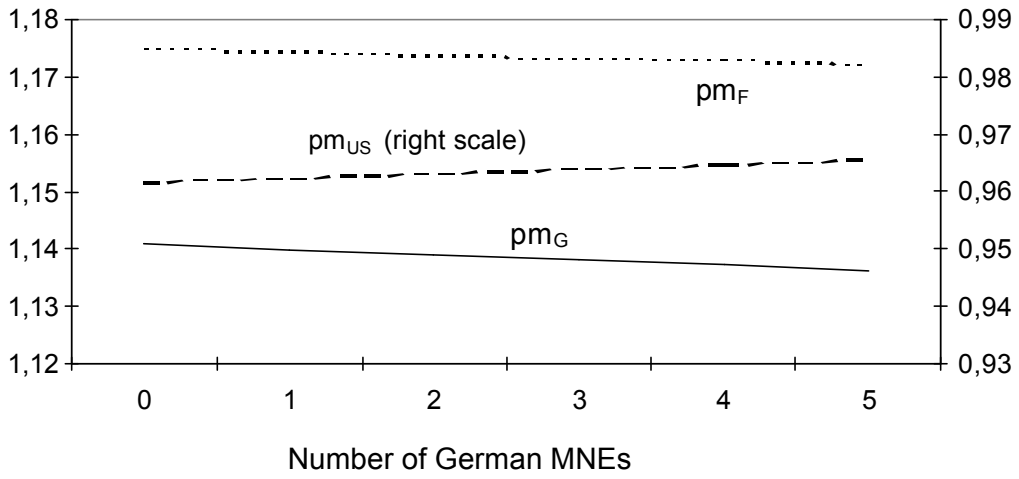
Figure 4: The Change of the Numbers of Companies Due to the Internationalization of German Companies Production



The most drastic change is experienced by the German companies. They change from national companies (NC) which serve the U.S. market through exports to MNEs which produce in the U.S. The sum of German companies (MNE+NC) increases during the internationalization process, as does the number of French companies which are still national companies. But since Figure 3 shows an incentive for French companies for FDI in the U.S., too, French companies would start the same internationalization process. The number of U.S. companies on the other hand falls during the adjustment to a new MNEs based equilibrium.

The adjustment of the U.S. companies is twofold. There is the declining number of U.S. companies on the one hand, which is an adjustment of the overall goods offered. On the other hand there is a change in prices. U.S. producers raise their prices. That reflects the decreasing efficiency which results from the smaller gains from economies of scale at company and plant level with lower output.

Figure 5: Change in the Overall Price Level of Manufacturing Goods



The overall price level of manufacturing goods increases in the United States (right scale) and decreases in Germany and France (both left scale). That results from an increase of the share of goods offered by domestic companies relative to foreign companies. U.S. companies reduce their sales a bit in the German market, the importance of German suppliers is increased by the new companies entering. The new French exporters which are active in the German market have little weight in the price index relative to the new German companies because their quantities sold in Germany are rather low. Hence, the overall German price level drops. The same hold for the French market. In the U.S. market, on the other hand, there is more foreign supply of goods with the internationalization of German companies and a growing number of French exporters, and less domestic supply. The price level raises, therefore. But Figure 5 also shows that the overall price level of manufacturing goods after the adjustment is still lower in the larger country U.S. than in the smaller countries.

For analytical reasons it was assumed that adjustment is very fast. That was done to separate the effects of decreasing distance costs from the effects resulting from adjustment. When the adjustment is completed, time goes on with falling distance costs. From now on only MNEs are in equilibrium, since French companies go through the same internationalization process when it becomes profitable. With many German companies becoming MNEs internationalization of production is profitable for French companies as well. The internationalization process increases the importance of home-based companies in the foreign markets. With further falling distance cost „globalized“ economies integrate more and more, since the market shares of foreign affiliates in a market increase with falling distance costs.

5. Conclusion

In this paper a three-country model is brought forward to analyze the internationalization process in the age of globalization. It is shown that investment of one company from one country increases not only the incentive to invest in a second country for every national competitor but for third country’s companies, as well. That results from the adjustment of the FDI host country’s companies which react to their shrinking market share by reducing output and raising the price of their goods. Some host country’s companies exit the market.

This paper gives an explanation for the FDI boom starting in the 1980s, when companies from many countries have started to internationalize their production. The United States became the single most important host country of FDI after decades of being the most important home country.

Anecdotal evidence of the pain of the adjustment of the U.S. economy with fears of the general loss of competitiveness relative to European and Japanese companies points to an adjustment process similar to the one described in the model. The „global“ FDI wave of companies from many countries in the United States result from the influence the companies have upon each other through competition in the same markets. French and German companies’ FDI would not have occurred at the same time without this interdependence. The surge of FDI in the mid 1980s has been explained without any political factors or changes in comparative advantages. It simply follows from the internationalization strategies of companies in a world with falling distance costs. Whereas U.S. companies took the lead in the 1950s and 60s, Canadian, European and Japanese companies followed in the second half of the 1980s. The interdependence of open markets led to an international clustering of FDI.

Reference List

Brainard, S.L. (1993). A Simple Theory of Multinational Corporations and Trade with a Trade-off between Proximity and Concentration. NBER Working Paper Series 4269. National Bureau of Economic Research, Cambridge, Mass.

Campa, J., and L.S. Goldberg (1997). Evolving External Orientation of Manufacturing Industries: Evidence from Four Countries. NBER Working Paper 5919. National Bureau of Economic Research, Cambridge, Mass.

Dunning, J.H. (1977). Trade, Location of Economic Activity and the MNE: A Search for an Eclectic Approach. In B. Ohlin, P.O. Hesselborn, and P.M. Wijkman (ed.), *The International Allocation of Economic Activity.* London: The Macmillan Press LTD.

— (1988). *Explaining International Production*. London: Unwin Hyman.

Feenstra, R.C. (1998). Integration of Trade and Disintegration of Production in the Global Economy. *The Journal of Economic Perspectives* 12 (4): 31–50.

Fujita, M., P.R. Krugman, and T. Mori (1999). On the Evolution of Hierachical Urban Systems. *European Economic Review* 43 (2): 209–251.

Fujita, M., P.R. Krugman, and A.J. Venables (1999). *The Spatial Economy.* Cambridge, Mass.: The MIT Press.

Fujita, M., and T. Mori (1997). Structural Stability and Evolution of Urban Systems. *Regional Science & Urban Economics* 27 (4/5): 399–442.

Graham, E.M. (1996). The (not Wholly Satisfactory) State of the Theory of Foreign Direct Investment and the Multinational Enterprise. *Economic Systems* 20 (2/3): 183–206.

IMF (International Monetary Fund) (various issues). *Balance of Payments Statistics Yearbook.* Washington, D.C.

Kleinert, J. (1998). The Emergence of Multinational Enterprises: Simulation Results. Kiel Working Papers 900. The Kiel Institute of World Economics, Kiel.

— (1999). Temporal Clusters in Foreign Direct Investment. Kiel Working Papers 930. The Kiel Institute of World Economics, Kiel.

Koop, M.J. (1997). Trade, Foreign Direct Investment, and Multinational Enterprises in a General Equilibrium Model. Kiel Working Papers 833. The Kiel Institute of World Economics, Kiel.

Markusen, J.R., and A.J. Venables (1998). Multinational Firms and the New Trade Theory. *Journal of International Economics* 46 (2): 183–203.

McCallum, J. (1995). National Borders Matter: Canada-US Regional Trade Patterns. *The American Economic Review* 85 (3): 615–623.

Nitsch, V. (1998). National Borders and International Trade: Evidenz from the European Union. Paper presented at the Conference *European Economic Association*. Berlin.

Siebert, H. (1997). *Weltwirtschaft.* Stuttgart: Lucius & Lucius.

Siebert, H., and H. Klodt (1999). Towards Global Competition: Catalyst and Constraints. In OECD (ed.), *The Future of the Global Economy: Towards a Long Boom?* Paris.