NUPI

[607] Working Paper

Patterns of Trade and Foreign Direct Investment in Africa

A simple test of the new trade theory with multinationals

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Nr. 607 December - 2000

Norwegian Institute of International Affairs
Norsk Utenrikspolitisk Institutt

Utgiver: NUPI

ISSN: 0800 - 0018

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Abstract

In this study, we present an empirical survey of the patterns of trade and FDI in Africa based on a sample of 28 countries and their transactions with the OECD countries. These patterns are used to test whether the predictions of the new trade theory with multinationals as described by Markusen and Venables (1995,1998) fit the development in Africa. The theory states that multinational production will gradually outgrow trade as countries converge in terms of income, yet our econometric study gives only week evidence supporting such a pattern. Alternative explanations are also investigated, and it is shown that trade barriers, geographical distance, income per capita and access to ocean explain much of the variation in trade and FDI in Africa.

JEL classification codes: F12, F14, F21

Keywords: Africa, trade, multinationals, income convergence, FDI

1. Introduction

The rapid growth of international investment flows over the last decades has not been distributed equally among the regions of the world. As illustrated in Table 1, foreign direct investment (FDI) inflows have mushroomed in the South East Asian region, and more recently also in Latin America. African countries, on the other hand, have not experienced this vast growth in FDI inflows. Obviously, there is a large number of possible explanations behind this trend, of which the most commonly mentioned relate to the lack of necessary infrastructure, education, political stability and market growth potential, all pointing towards weak returns on invested capital.

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In the theory of international trade and factor mobility,[1] trade in goods and trade in factors are often studied as if they are substitutes or alternatively complements (see Fontagne and Pajot (1999) for an extensive overview of theoretical and empirical findings). That is, the amount of FDI between two countries should be related to the amount of trade between them. Based on these theories, the moderate amount of FDI flowing into African countries could possibly be explained by slow growing international trade in the region over the last decades. Alternatively, the relationship between trade and FDI in African countries may differ from the relationship we observe in other regions of the world. In other words, imports may have worked as a substitute for FDI inflows in these countries, whereas FDI inflows and imports may work as complements in other regions of the world.

Up until most recently, the traditional theories as well as the new theories of international trade based on imperfect competition, have not allowed for the existence of multinational firms operating with plants in several countries.[2] Empirically, we know that large multinationals are the dominating investors on the international scene, undertaking the vast majority of foreign direct investments. In an attempt to explain the links between international trade and international investment allowing for both the more traditional arguments for international trade as well as the presence of multinational firms, Markusen and Venables (1995, 1998) develop a theory for how trade and investment flows between countries relate to income levels, factor endowments, trade costs and technology in the respective countries.

The theory is based on oligopolistic competition where firms may either chose to be purely national, serving foreign markets through trade or go multinational through the establishment of a foreign plant (seen as equivalent to FDI). As countries converge in terms of income, technology or endowments, the new theory of international trade predicts that trade volumes should rise as the amount of intra industry trade (IIT) is boosted. However, Markusen and Venables show that when firms are allowed to go multinational through foreign direct investment, such convergence is first accompanied by rising trade volumes, but thereafter, multinational production through FDI will displace trade, generating a u-shaped pattern of trade. Moreover, this theory is consistent with a pattern where trade and FDI are observed as complements or alternatively un-correlated when differences in country characteristics are large, but as substitutes when the differences become smaller. According to Markusen and Venables, the broad pattern of trade and investment between the developed and the less developed regions of the world seems to support this prediction. Yet few empirical studies

[1] Foreign direct investment is usually treated as the equivalent to the international movement of capital where the owner has some strategic interest in the firm where he invests.

have tested this theory on a more disaggregate level, and so far, there have been no studies testing these predictions for developing countries.

In this paper, we investigate whether the Markusen and Venables prediction has any empirical relevance for the patterns of trade and FDI of African countries. More specifically, we study the development of total trade, intra industry trade (IIT) and FDI between the OECD countries and 28 African countries over the period 1980 to 1992, and relate these figures to the relative GNP level between each of the African countries and the OECD area at large. In addition, we include variables that are believed to correlate strongly with trade and FDI, such as GNP per capita (which is seen as a proxy for technology, knowledge and skills), geographical distance, trade barriers, language, membership in multinational trade agreements, the amount of aid and whether the countries are landlocked or not.

The African countries in this study are almost exclusively less developed and the jump up to OECD income levels is large, hence the Markusen and Venables prediction should support a pattern where IIT (or alternatively total trade) and FDI grows fast as incomes converge. Also, the model predicts that growth in FDI shall speed up faster than trade growth when economies converge. Broadly speaking, the empirical results give only weak support to these outlined predictions. In fact, in many of our econometric specifications we observe that income convergence between African countries and the OECD area lead to larger increases in trade than FDI, both measured in terms of IIT and total trade.

Our study also shows that increased income per capita improves both FDI flows and the amount of trade. Furthermore, only English as a national language tends to promote FDI. As expected, higher tariffs are accompanied by less IIT and more FDI. Having access to the ocean, on the other hand, tends to promote trade rather than FDI. When it comes to trade neither English nor French has any significant impact. More surprisingly, membership in WTO tends to promote FDI flows more than trade.

In general, empirical modelling of FDI flows has proved to be a difficult task, and a large number of such studies have struggled with the explanatory power of the models. This study represents a crisp exception from this tendency, as we are able to explain more than 80% of the variation in FDI as well as trade. When we focus on the intensity of FDI relative to trade we are still able to capture approximately 60% of the variation.

[2] Helpman and Krugman (1985) do however, present a framework where multinationals are allowed to

The paper is organised as follows: Section 2 provides a brief overview on the present trade and investment conditions in Africa. In section 3 we introduce the model developed by Markusen and Venables with specific emphasis on the theoretical predictions. Section 4 covers our econometric model and the construction of the variables. In section 5, we present and discuss our results and conclusions are saved to section 6.

2. Trade and FDI in Africa.

As pointed out in the introduction and in Table 1, Africa has received a small and falling proportion of the world's FDI flows. In Table 2, it is shown that African countries are even less important when it comes to FDI outflows, which primarily relates to activities undertaken by South African firms. According to UNCTAD (1999) the low level of FDI inflow to African countries can be partly explained by the moderate investment activity in the region measured in terms of gross fixed capital formation. FDI inflows to Africa measured relative to this variable do not deviate significantly from the ratio of other developing countries, hence it all boils down to the fact that African countries themselves invest to little at home.

Insert Table 1 and Table 2 here

During the late 1990s however, there are emerging signs of an FDI recovery (see UNCTAD 1999) driven both by higher economic growth in many African countries and a more pronounced policy directed towards promoting and supporting FDI inflows, primarily in the SADC region.

Africa's proportion of world trade has consistently diminished over the period 1982 to 1997, falling from approximately 5% to somewhat more than 2%. For Latin America, the development is better described as flat, whereas the South East Asian miracles have guaranteed a fast growing share of the world trade over the same period (see Table 3). However, as shown in Table 4, there is nothing such as a common African story that fits all countries on the continent. Among the 28 countries we investigate, some can refer to an annual average growth in total trade between 1980 and 1992 close to 10% (Gambia, Mauritius, Angola, Morocco, Seychelles). Other countries like Nigeria, Zambia, Tanzania, Uganda and Madagascar actually experienced negative growth in total trade over the period. The same heterogeneous pattern is identified when we look at economic growth, growth in FDI inflows as well as trade and FDI intensities (i.e. measured relative to GNP).

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operate.

Insert Table 3 and Table 4 here

3. Introducing multinationals and FDI in the new theory of trade

The main aim of this paper is to test whether the predictions derived from the model in Markusen and Venables (1995, 1998) have empirical relevance for the patterns of trade and FDI in Africa. The model is an extension of the theoretical framework which is usually classified as "the new theory of international trade". Below, we provide a short and compact presentation of the model. The interested reader should consult the original papers for more extensive descriptions of the set-up. Our graphic model presentations are primarily based upon Markusen and Venables (1995). The later version of the paper applies different figures in order to outline the full general equilibrium effects, but the main message is the same. As opposed to earlier theories within this class, this model allows firms to endogenously chose whether to stay national (the label n_i refers to the number of national firms in country i) serving foreign markets through trade or build a plant abroad and become a multinational enterprise (label m_i refers to the number of multinationals with home base in country i).

The model specifies two countries (labelled h and f for home and foreign respectively) where firms compete in a Cournot oligopoly[3]. In both countries, there are two sectors producing the homogeneous goods X and Y using labour L. Sector Y also uses a specific factor R that helps to convexify the model, and Y is produced according to a Cobb-Douglas function. Since labour can move freely between the two sectors, wages (w_i) are determined by the marginal product of labour in the Y sector in each country. The production of X is accompanied by a constant variable cost c, firm specific fixed costs F and plant specific fixed costs G. If the firm goes multinational operating with 2 plants, plant specific costs equals $2G$. Trade is associated with per unit trade costs t. For a national firm that engages in trade, we then have the following cost function in the X sector that determines the use of the only factor labour:

$$L_i^n = c_i X_{ii}^n + (c_i + t) X_{ij}^n + G_i + F_i \qquad i, j = h, f, \quad i \neq j \tag{1}$$

Here, the subscript ij refers to sales in country j by a firm located in country i. For a multinational firm, its use of labour in country i becomes:

[3] Markusen and Venables (1996) approach the same problem using a monopolistic competition model with a demand structure based on love of variety. The predictions based on this model largely mirror the predictions derived from the oligopolistic model described above.

(2) $$L_i^m = c_i X_i^m + G_i + F_i \qquad i = h, f$$

if *i* represents its home country. In the foreign country, the expression for use of labour is equivalent, but the cost component F_i does not enter. There is a fixed amount of labour in each country (L_i^*) and labour market clearing demands that

(3) $$\begin{aligned} L_i^* = L_{iy} + n_i(c_i X_{ii}^n + (c_i + t)X_{ij}^n + G_i + F_i) \\ + m_i(c_i X_i^m + G_i + F_i) + m_j(c_i X_i^m + G_i) \end{aligned}$$

Free entry of firms ensures zero profits in equilibrium so that a country's income M_i is solely based on the sum of factor rewards ($w_iL_i+r_iR_i$). The representative consumer in each country receives utility according to a standard Cobb-Douglas function over the two goods *X* and *Y*, giving rise to the following demand functions

(4) $$X_{ic} = bM_i / p_i = n_i X_{ii}^n + n_j X_{ji}^n + m_i X_{ii}^m + m_j X_{ji}^m, \qquad \mathrm{Y_{ic}} = (1-b)M_i$$

where β is the budget share derived from the utility function, p_i is the price of *X* in country *i*, and the price of *Y* is normalised to 1. *C* in the subscript indicates that this is the amount consumed in country *i*. In equilibrium, firms in the Cournot oligopoly set prices according to a mark-up rule where the mark-up is determined by the firm's market share only, since the price elasticity of demand is equal to 1 from (4). Using (4), the mark-up for sales by a national firm in its home country becomes:

(5) $$e_{ii}^n \geq \frac{p_i - w_i c_i}{p_i} = \frac{X_{ii}^n}{X_{ic}} = \frac{p_i X_{ij}^n}{bM_i} \qquad \mathrm{i, j = h, f}$$

Solving for the firm's output in (5) for all cases of nationals and multinationals yields the following four expressions:

(6) $$\begin{aligned} X_{ii}^n &\geq bM_i \frac{p_i - w_i c_i}{p_i^2} \qquad X_{ij}^n \geq bM_j \frac{p_j - w_i(c_i + t)}{p_j^2} \\ X_{ii}^m &\geq bM_i \frac{p_i - w_i c_i}{p_i^2} \qquad X_{ij}^m \geq bM_j \frac{p_j - w_j c_j}{p_j^2} \end{aligned}$$

Zero profit conditions require that the firm's mark-up revenue exactly covers the firm's fixed costs in each of the four cases, thus:

(7) $$p_i e_{ii}^k X_{ii}^k + p_j e_{ij}^k X_{ij}^k \leq fixed\ costs \qquad (\mathrm{k_i}) \qquad \mathrm{i = h, f} \qquad \mathrm{k = n, m}$$

The four equations represented by (7) now determine the number of *n* and *m* firms in each of the two countries.

Partial equilibrium analysis

Now, the authors undertake some simplifications in order to enable a graphic explanation of how the model works. Assume that there only exist 3 types of firms, multinationals (*m*) without a home country base, foreign nationals (*f*) and home nationals (*h*). Combining (6) and (7) yields the zero profit conditions for the 3 types of firms:

$$(8) \qquad b\left[M_h\left(\frac{p_h - w_h c_h}{p_h}\right)^2 + M_f\left(\frac{p_f - w_h(c_h + t)}{p_f}\right)^2\right] \le w_h(G_h + F_h) \qquad (n_h)$$

$$(9) \qquad b\left[M_h\left(\frac{p_h - w_f(c_f + t)}{p_h}\right)^2 + M_f\left(\frac{p_f - w_f c_f}{p_f}\right)^2\right] \le w_f(G_f + F_f) \qquad (n_h)$$

$$(10) \qquad b\left[M_h\left(\frac{p_h - w_h c_h}{p_h}\right)^2 + M_f\left(\frac{p_f - w_f c_f}{p_f}\right)^2\right] \le w_h(G_h + F_h/2) + w_f(G_f + F_f/2) \qquad (m)$$

Assume furthermore that countries are identical and that there are constant returns to scale in the *Y* sector. Then, wages (w_i) in both countries can be set equal to 1 and income *M* is solely determined by exogenous endowments. This leaves only two endogenous variables in (8) to (10), p_h and p_f. The 3 zero profit conditions can then be illustrated graphically in Figure 1 as functions of these two endogenous variables:

Figure 1

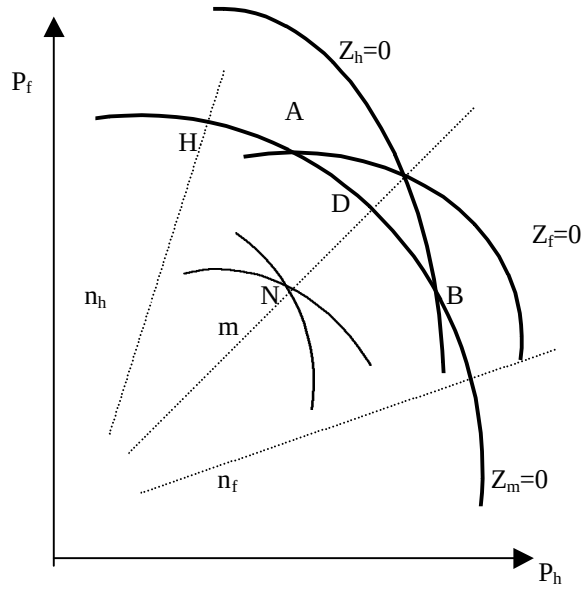
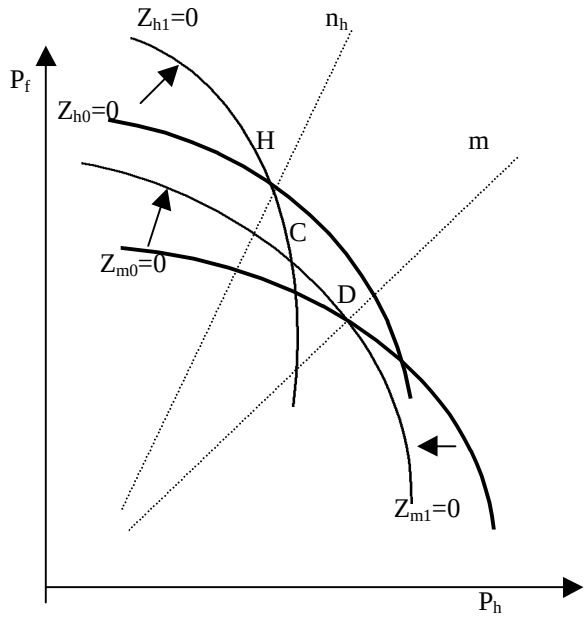


Figure 2



It is important to notice that the discussion of Figure 1 and 2 is based on partial equilibrium arguments as income and wages are not allowed to change in response to changes in prices. The locus $Z_m=0$ in Figure 1 represents all combinations of prices where the multinational firm receives zero profit. North east of the locus, profit is positive, south west of the locus, it is negative. The stapled m-line has a 45 degree slope since countries are identical. Along this line, supply and demand is equated, and an equilibrium solution must always lay on this line. [4] In (8) we see that an increase in p_h contributes more to profits for the home firm than an increase in p_f due to the existence of trade costs. Consequently, the zero profit locus for the national home firm $Z_h=0$ is steeper than the $Z_m=0$ locus. The argument is reversed for $Z_f=0$ based on the same logic in expression (9), generating a flatter locus than $Z_m=0$. The 3 zero profit loci in Figure 1 describe a situation where profits earned by the multinational exceed the profits earned by the national firms for all combination of prices along the m-line. Hence, in equilibrium, only multinationals will exist, described by the point D and we have no trade.[5] However, if the intersection of $Z_h=0$ and $Z_f=0$ loci lies inside the $Z_m=0$ locus, the equilibrium solution contains only national firms described by point N, as profits for these firms are higher along the m-line.

In the partial equilibrium model illustrated in Figure 1, multinationals and national firms cannot coexist unless all 3 zero profit loci intersect at the same point, which should be looked upon as a knife-edge situation. High trading costs (*t*) will support an equilibrium with only multinationals, whereas high plant specific costs (*G*) will support the existence of only nationals. In other words, the equilibrium is either dominated by a *high fixed cost + low variable cost technology* or a *low fixed cost + high variable cost technology*. With higher income (*M*) in both countries, the high fixed cost technology will come to dominate in equilibrium based on economies of scale effects, hence higher income will support an equilibrium containing only multinationals.

Figure 2 outlines the effects of introducing different income in the two countries. Here a given amount of income *M* is transferred from country *f* to country *h*. If all firms are

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[4] In the case with multinationals, equality between supply and demand yields:

$$mX_f^m = bM_f / p_f \quad and \quad mX_h^m = bM_h/p_h$$

Using the expression in (6) gives the following relationship between foreign and home prices:

$$p_h/(w_h c_h) = p_f/(w_f c_f)$$

Since the countries are symmetric we know that $p_h/p_f=1$, hence, the line m will have a 45 degree slope. A similar exercise can be done for national home and foreign firms, which provides us with the n_h and n_f lines.

[5] Points A and B cannot be equilibrium solutions since they are not consistent with prices clearing demand and supply in both countries.

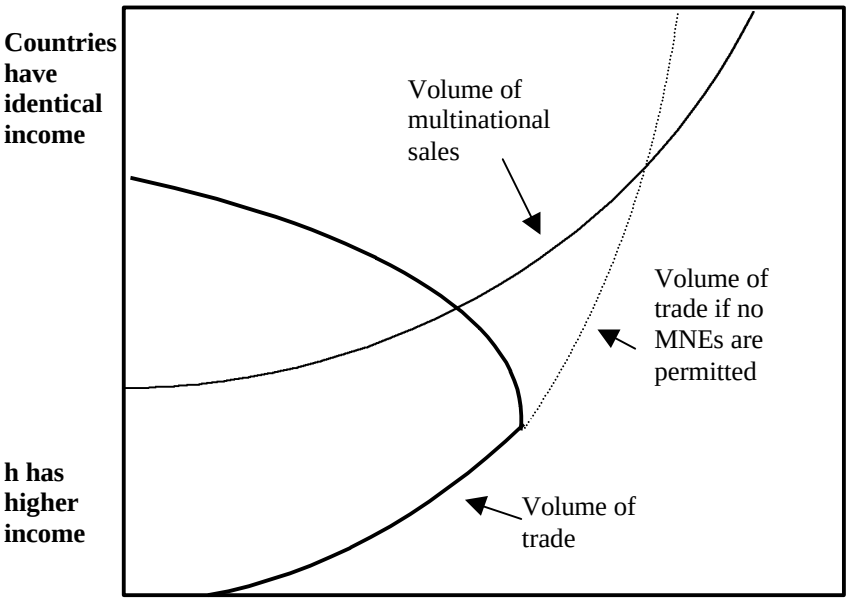
multinationals, firms will be indifferent to the distribution of income since the total income is unchanged. That is, the point where the $Z_m=0$ locus intersects with the m-line remains unchanged. By the same argument, the intersection of the $Z_h=0$ locus and the n_h-line is unaltered when only country *h* nationals are represented in the equilibrium. Along the n_h-line, we have that $p_f > p_h$, thus from equation (10) we see that the multinationals' profits is reduced as income is transferred from country *f* to country *h*. In Figure 2, this process is described by a rotation of the $Z_m=0$ locus around point D represented by the new locus $Z_{m1}=0$. Similarly, from equation (8), we see that such a transfer of income increases profits for the country *h* nationals along the m-line, as $p_h=p_f$ along this line. This effect is illustrated by the rotation of the $Z_h=0$ locus represented by the new locus $Z_{h1}=0$. As the process of income divergence is continued, the country h nationals will be increasingly more profitable, and will crowd out the multinationals, finally leaving the equilibrium solution in point *H* with only national firms, implying only trade and no FDI. Thus, the partial equilibrium exercise predicts that as countries converge in terms of income, we will see that multinational production and FDI becomes more important and that we may observe that multinational production actually crowds out trade when countries become very similar.

In order to establish general equilibrium solutions to the model where income and wages are solved endogenously, Markusen and Venables used numerical simulations. The results of these simulations are much in line with the conclusions drawn from Figure 1 and 2, and they are summed up in Figure 3. Here, the degree of income divergence is measured on the vertical axis, and the amount of trade and multinational production on the horizontal axis. As countries converge in income, trade and FDI are increased, yet trade is slowly being replaced by multinational production. The model predicts that FDI will tend to crowd out trade above a certain level of income similarity, depicted by the backwards bending trade curve.

The general equilibrium model is also designed to take account of the effect of differences in the composition of endowments in the two countries, i.e. the size of *L/R* in one country relative to the other. Markusen and Venables (1998) show that the effect of convergence in terms of income *M*, is altered when the relative composition of endowments is skewed. For instance, if the poor country has a disproportionately low share of R relative to L (which may be interpreted as a low capital labour ratio), convergence in income will lead to an even faster transition of national firms becoming multinational. In the case of African countries, this aspect is probably of large importance, since we know that capital is a scarce factor on this

continent.[6] Another model feature that is worth mentioning is the fact that the general equilibrium model also determines the home country of emerging multinationals when countries converge in income. If countries have similar relative factor endowments but are of different sizes, the model predicts that multinationals with a home base in the small country will emerge first when we observe income convergence. However, if the relative endowments are not equal, this conclusion does not necessarily hold. In the case where we compare African countries to the OECD area, as below, this prediction should imply that if we observe multinational activity between these countries, they should primarily be of African origin. Empirically, we know that such firms are rare.

Figure 3 The general equilibrium effects of income convergence



4. The econometric model and the construction of variables

In order to test whether convergence in incomes between countries affects patterns of trade and FDI between them, we set up a simple econometric model using a panel of aggregated data on the national level spanning from 1980 to 1992. The panel contains observations for 28 African countries and their trade with and FDI inflows from the OECD countries. Although it would be correct to focus on FDI flowing both ways, we chose to only use the data for FDI

[6] An overview of per capita energy consumption in the least developed countries UNCTAD(2000) shows that the vast majority of the countries in our study have a very low energy intensity in the consumption, which again indicates that the capital/labour ratio is low. See section 4 in Markusen and Venables (1998) for more on how the composition of endowments change the effects of income convergence.

flowing from OECD countries to African countries since the registered flows in the other direction are both very small and highly unreliable.

Since the model to be tested is based on the behaviour of firms producing and trading homogeneous goods, the trade variable in our econometric specification is based on intra industry trade (IIT). We apply the most common measure of IIT, i.e. the Gruber-Lloyd measure defined as:

(11) $$IIT_{ij} = \sum_k 2 \times \min\left(X_{ijk}, I_{ijk}\right)$$

where k is an index over traded goods, X_{ij} is exports from country i to country j and I_{ij} is imports between the same countries (see Gruber and Lloyd (1975)). We use data collected by Feenstra, Lipsey and Bowen (1997) to construct the IIT measure. The data set allows us to calculate the measure on a highly disaggregated level, using trade flows on the 6 digit NACE level where goods are highly homogenous. Alternatively, one may use total trade (imports + exports) as a measure of trade. However, this is not consistent with the homogeneity assumption used in the model. African countries mostly export raw materials and agricultural products, while their imports represent a wide variety of products. Hence to use total trade with these countries as a measure of trade in homogeneous goods is not a good idea. Nevertheless, we also report estimates using this variable in order to study the robustness of the results.[7]

Data on FDI is based on OECD (1998) foreign direct investment statistics which maps FDI flows from OECD countries to other countries (including African) over the specified period. In principal, the aggregate FDI flows used in this study are not directly compatible with the assumption of homogenous goods in the model. In this respect, the optimal FDI variable would only include horizontal FDI, and drop out vertical FDI. Unfortunately, there is no data available that efficiently distinguishes between these to types of FDI flowing to African countries, hence, our aggregate FDI figures must be treated as a best proxy.

We run three econometric panel data models that separately test the empirical relevance of the Markusen and Venables model for trade, FDI and, most importantly, the relationship between trade and FDI. The model for the FDI/trade relationship is specified in the following way:

[7] The correlation coefficient between IIT and total trade in the model is relatively low (0.47).

$$\ln\left(\frac{FDI_{it}}{IIT_{it}}\right) = a + b_1 \ln\left(\frac{GNP_{it}}{GNP_{OECD_t}}\right) + b_2 \ln\left(\frac{GNP_{it}}{GNP_{OECD_t}}\right)^2 + b_3 \ln GNPcap_{it} + b_4 \ln Aid_{it}$$
$$+ b_5 \ln Tariff_{it} + b_6 \ln Distance_i + d_1 Lome_{it} + d_2 WTO_{it}$$
$$+ d_3 Ocean_i + d_4 French_i + d_5 English_i + d_6 yeardummies + u_{it} \quad \textbf{(12)}$$

The same right hand side variables enter the models for FDI and IIT separately, but in these models, we substitute the left hand side variable with FDI and IIT only. The index *i* represents countries (the 28 countries listed in Table 4 minus Mauritius, Seychelles and Uganda which are which were found to represent outliers in the data set), and *t* is an index for time (1980-92).[8] The relative size of GNP compared to the OECD is the core variable to be tested in the model.[9] It captures the income gap between an African country and the OECD and corresponds to the income variable *M* in the Markusen and Venables model, which is transferred from one to another country in the theoretical exercise in section 3. We also enter the squared of this variable since the model predicts that the relationship is not linear. Although the model emphasises that there will be a substitution from intra industry trade to multinational production as countries converge in terms of income, implying that the squared component should have a positive coefficient, it is not directly clear whether it is also possible to observe stronger growth in IIT than in multinational activities measured in terms of FDI as countries converge. We will come back to this element in the next section.

A series of other variables are traditionally believed to affect trade and FDI, such as the income per capita (GNPcap) which is often seen as a proxy for human development, the quality of social and technological infrastructure as well as the skill level in the population.[10] We also include the amount of aid[11] flowing into the respective countries in our regressions. This is due to the fact that aid is often linked to conditionalities that relate to the volume of trade and FDI. The amount of aid may also say something about the long term cooperation between the donor and the recipient countries, which may support larger amount of economic interactions. The size of tariffs (both on imports and exports) is naturally an important explanatory variable when trade volumes are to be studied. The tariff jumping argument is also regarded as an important explanation for FDI.[12] Finally, geographic distance between the African country and the OECD area is included in order to take account for transportation

[8] South Africa is left out of the sample since the country deviates siginificantly with respect to income levels and structural caracteristics.
[9] Data on GNP is taken from World Bank (1999).
[10] For a thorough survey of the determinants of FDI, see Agarwal (1980) and Caves (1996)
[11] Aid data is also based on statistics form World Bank (1999).
[12] The data describing tariff barriers is taken from the data set used in Rodrik (1998), taking account of both export and import taxation.

costs.[13] We also add a series of dummy variables that may contribute to the understanding of the patterns of trade and investment in these countries. The dummies relate to whether the country is a member of the Lome treaty with the EU, a member of GATT/WTO, whether it is land-locked or not and whether English or French is used as a major language in the country.

5. Econometric results

We run three separate regressions for each of the three variables FDI/IIT, FDI and IIT. In addition, we also report for regressions based on total trade instead of IIT. All variables are in logs and the estimated coefficients can be interpreted as respective elasticities. All regressions include year dummies. A Hausman specification test rejected the null hypothesis stating that a full panel specification using the GLS estimator is superior to a pooled data set using OLS. Hence the three regressions are based on 1) the full model from (12) estimated using OLS, 2) a limited model only based on the relative GNP variables, and finally 3) a fixed effects model where only the variation within countries is studied. The last one allows us to draw conclusions based on the historical experience of each country without considering international comparisons.

Insert Tables 5, 6 and 7 here

In Table 5 and 6, we report on the separate regressions for the variables FDI and IIT. All three models give support to a positive relationship between income convergence and trade measured in terms of IIT, with elasticities varying between 1.3 and 4. When it comes to FDI, the OLS estimates in regression (4) and (5) reported in Table 6 also indicate such a positive relationship, but the fixed effects model provides a significant negative elasticity. This gives us reason to believe that convergence among African countries over time not necessarily drives up FDI, but that large sized African countries – remember that GNP level corresponds strongly with the size of a country – are attracting more FDI than smaller ones. This view is supported further by the fact that the variable GNP per capita has a highly significant positive coefficient both in the OLS and the FE regressions, implying that as African countries become more developed in terms of income per capita, i.e. independent of size, multinationals start investing more in the country. This observation stands in direct contrast to the effect of GNP per capita on IIT, which is not significant. This is somewhat surprising since many of the conclusions drawn from the new trade theory (see e.g Flam and Helpman (1987) and

[13] The distance measure is as simplistic as possible, based on the geographic distance between the capital of the African country and Paris. Thus the measure is primarily a North-South measure strongly related to trade flows going to and from the European continent.

Markusen (1986), predict a growing volume of IIT as countries converge in terms of income per capita, e.g. due to the correlation between sector composition and income levels in a country. However, in regression (7) and (9) reported in Table 7, the effect of growing GNP per capita on total trade is positive, as predicted by e.g. Dixit and Norman (1980) as well as the well-known gravity equation for trade.

It does not come as a surprise that tariffs subdue trade, yet we are somewhat surprised to observe that FDI is growing in tariffs, which may indicate that the tariff jumping motive for FDI into Africa is rather strong. IIT is falling in distance which is consistent with the cost of transportation but distance has no significant effect in the model for total trade. FDI on the other hand is positively related to distance, which may indicate that servicing remote locations in Africa through exports is costly, implying that FDI emerges as an efficient alternative. A country's access to oceans appears to increase both IIT and total trade, whereas FDI is actually spurred by landlockedness. The estimated coefficients for aid are either not significant or not stable across the different regressions, and the same also accounts for membership in the Lome treaty. Membership in the WTO/GATT as well as having English as a major language appears to improve inflows of FDI.

Insert Table 8 and 9 here

When we focus on the relative relationship between FDI and IIT (i.e. FDI/IIT) as reported in Table 7, the explanatory power is reduced from somewhat above 80% to below 60%, and in general, the results become more blurred. The size and sign of the elasticities reported in Table 8 and 9 are mostly consistent with the results we provided in Tables 5 to 7, where we looked at FDI and trade separately.[14] Hence we concentrate the discussion of regressions (10) to (15) to the core variables: relative GNP and GNP per capita. When we estimate the full model (using OLS), the relative size of GNP has a positive coefficient, but the result is not robust when we look at alternative model specifications. If we look at the fixed effects regression (12) and the limited regression (11), both report negative and highly significant coefficients. The same tendency is observed when we use total trade instead of IIT.

As mentioned earlier, the Markusen and Venables model does not explicitly provide a prediction of whether the coefficient for relative GNP should be positive or negative, since the model allows for faster growth in trade than FDI at high levels of income divergence between the trading countries. However, as divergence is reduced, the model predicts that

growth in FDI shall pick up faster than trade, implying that the squared expression shall be assigned with a positive coefficient. The full regression (10) supports such a prediction. Yet once again, this econometric result is not robust since the limited regression, the fixed effects model and the models based on total trade predict the opposite. Thus, we will have to conclude that our estimates do not give strong support for the predictions drawn from the Markusen and Venables model.

Finally, it is important to notice that the econometric evidence gives more robust predictions for GNP per capita. The higher per capita income, the higher is FDI relative to trade, and this applies both for the full sample as well as only variations within each country. In other words, the econom tric results indicate that when you want to explain the pattern of FDI and trade among African countries, a country's level of development measured in terms of GNP per capita is more important than the country's relative size of income.

6. Conclusions

Our econometric study of factors explaining the patterns of trade and FDI in Africa gives only weak evidence supporting the Markusen and Venables (1998) model where multinational production is expected to gradually take over for trade as countries converge in terms of income. Our main empirical model gives some support to this prediction, yet alternative specifications provide opposite conclusions, implying that there is actually a possibility that trade (both in terms of intra industry trade and total trade) may take over for multinational production as African countries converge with the OECD area in terms of income. The empirical study shows that FDI inflows correlate strongly and positively with income per capita. This indicates that it is not the relative size of the economy that explains the relative importance of trade and FDI, but rather the level of human development as well as the quality of the social and technological infrastructure, which is well proxied by the measure income per capita. Our estimates indicate further that geographical distance reduces trade but gives momentum to FDI and multinational production in Africa. The same pattern is observed when we look at African trade barriers.

A more thorough study of the patterns of trade and multinational production among African countries should look more specifically at activities on the industry level, since African countries deviate strongly with respect to sectoral composition. Unfortunately, data on multinational production and FDI for separate industries in Africa is not easily available. Furthermore, as mentioned in section 2, a country's own investment activities may explain a

[14] With consistent, we mean that the elasticities reported are in line with the FDI elasticities devided by

lot of the variation in international investment. Future research should take this aspect into account when trying to explain the forces behind patterns of FDI and multinational production in African countries. Finally, data that covers multinational production directly would be preferred to data on FDI which may be a biased indicator of multination production activities. But once again, data on multinational production volumes for these countries is hard to get.

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Table 1:
Foreign direct investment inflows by region (1982-1997), Millions of US$

	1982-87 (annual averages)	1989	1991	1993	1995	1997	Avg. annual growth from 1989-97
Developed Countries	52757	168488	120616	138887	211465	233115	4.1
Percent of total	(78.1)	(85.9)	(74.4)	(63.8)	(63.9)	(58.2)	
South East Asia	6273	15416	20245	47348	66571	82411	23.3
Percent of total	(9.3)	(7.9)	(12.5)	(21.8)	(20.1)	(20.6)	
Latin America	6042	6248	15032	17247	31929	56138	31.6
Percent of total	(8.9)	(3.2)	(9.3)	(7.9)	(9.6)	(14.0)	
Africa	1878	4891	2713	3647	5136	4710	-0.5
Percent of total	(2.8)	(2.5)	(1.7)	(1.7)	(1.6)	(1.2)	
World (total)	67526	196132	162124	217559	331189	400486	9.3

Source: UN(1993-1999)

Table 2:
Foreign direct investment outflows by region (1982-1997), Millions of US$

	1982-87 (annual averages)	1989	1991	1993	1995	1997	Avg. annual growth from 1989-97
Developed Countries	66547	212009	185017	205810	306465	359236	6.8
Percent of total	(98.0)	(95.3)	(96.4)	(85.4)	(86.9)	(84.8)	
South East Asia	812	9013	5452	30419	41816	50157	23.9
Percent of total	(1.2)	(4.1)	(2.8)	(12.6)	(11.9)	(11.8)	
Latin America	294	703	1196	2827	2346	9097	37.7
Percent of total	(0.4)	(0.3)	(0.6)	(1.2)	(0.7)	(2.1)	
Africa	79	122	170	812	591	1130	32.1
Percent of total	(0.1)	(0.1)	(0.1)	(0.3)	(0.2)	(0.3)	
World (total)	67876	222395	191889	240900	352514	423666	8.4

Source: UN(1993-1999)

Table 3
Trade in the regions of the world

Billion Current US$		1982	1985	1988	1991	1994	1997
Africa	Exports of goods and services	96.3	95.3	91.2	110.6	111.7	147.1
	Percent of World exports	(4.7)	(4.5)	(2.9)	(2.7)	(2.2)	(2.3)
	Imports of goods and services	115.6	91.6	99.0	112.1	123.8	152.0
	Percent of World imports	(5.7)	(4.3)	(3.1)	(2.7)	(2.4)	(2.3)
Latin America	Exports of goods and services	77.2	80.6	91.9	109.9	145.0	191.0
	Percent of World exports	(3.8)	(3.8)	(2.9)	(2.7)	(2.8)	(2.9)
	Imports of goods and services	84.9	57.8	73.4	94.5	144.9	219.7
	Percent of World imports	(4.2)	(2.7)	(2.3)	(2.3)	(2.8)	(3.4)
South east Asia	Exports of goods and services	314.4	374.1	610.3	814.9	1171.4	1516.2
	Percent of World exports	(15.4)	(17.5)	(19.1)	(19.7)	(22.7)	(23.3)
	Imports of goods and services	314.7	334.7	526.5	756.1	1073.9	1435.5
	Percent of World imports	(15.4)	(15.7)	(16.5)	(18.3)	(20.8)	(22.0)
OECD	Exports of goods and services	1537.2	1660.8	2610.6	3336.7	3904.6	4799.2
	Percent of World exports	(75.3)	(77.9)	(81.6)	(80.6)	(75.7)	(73.6)
	Imports of goods and services	1537.0	1676.3	2598.9	3324.5	3800.0	4670.7
	Percent of World imports	(75.3)	(78.6)	(81.2)	(80.4)	(73.6)	(71.6)
World	Exports of goods and services	2040.7	2133.1	3198.7	4137.3	5159.8	6519.3
	Imports of goods and services	2078.7	2163.8	3196.2	4156.9	5070.4	6423.4

Source: World Bank (1999)

Table 4:
Growth, Trade and FDI in Africa: Descriptive statistics

Country	Average annual growth in GNP per cap. 1980-1992	Average annual growth in GNP 1980-1992	Average annual growth in total trade 1980-1992	Average annual growth in FDI inflow 1980-1992	Trade/GNP 1980	Trade/GNP 1992	FDI-inflow/GNP 1980	FDI-inflow/GNP 1992
Seychelles	9.2	10.1	6.8	16.7	35.6	24.7	27.4	54.8
Mauritius	7.5	8.5	8.6	21.1	61.3	61.9	1.7	6.2
Guinea-Bissau (ı	6.5	7.9	0.3	14.4	96.8	40.4	0.8	1.7
Senegal	3.0	6.0	2.2	2.3	32.3	20.8	12.0	7.9
Burkina Faso	2.3	4.9	1.4	7.1	16.0	10.7	1.0	1.3
Cameroon	2.2	5.2	-0.2	10.0	43.9	23.4	5.5	9.4
Tunisia	1.9	4.4	5.2	13.9	54.3	59.5	6.3	18.0
Rwanda	1.8	5.0	-1.5	12.5	20.2	9.4	4.2	9.6
Congo	1.7	4.9	5.0	5.0	72.4	62.9	20.8	20.9
Egypt	1.7	4.3	1.8	14.7	33.1	24.8	10.3	32.4
Morocco	0.9	3.0	7.6	15.8	23.6	39.8	1.6	6.5
Uganda	0.9	3.1	-4.4	3.8	21.0	10.5	0.3	0.4
Malawi	0.8	4.2	3.2	0.4	35.6	31.8	8.5	5.5
Ghana	0.6	3.7	2.6	3.1	30.2	26.6	6.2	5.8
Burundi	0.4	3.1	1.4	13.5	23.6	19.5	0.8	2.6
Gambia	0.2	4.1	9.1	8.7	51.4	90.8	9.0	15.0
Benin	0.2	3.2	0.1	4.9	30.2	21.1	2.2	2.7
Ethiopia	0.0	2.4	3.8	1.5	19.2	14.0	2.1	1.8
Togo	-0.2	2.9	-1.6	2.7	54.2	31.9	16.0	15.7
Kenya	-2.3	0.9	-0.9	3.1	29.9	24.0	9.0	11.6
Niger	-4.1	-0.9	-6.6	2.8	35.1	17.2	7.1	11.1
Zambia	-4.1	-1.2	-5.0	8.9	56.5	35.4	11.5	37.2
Tanzania	-4.5	-2.7	-1.8	2.6	14.4	24.0	3.4	5.0
Angola	-4.6	-3.4	8.5	31.6	37.4	118.7	9.3	33.6
Madagacar	-5.6	-2.7	-2.3	11.9	20.8	21.8	0.9	4.8
Mozambique	-5.6	-4.2	0.8	16.1	27.9	56.1	0.9	7.5
Sierra Leone	-6.7	-5.1	-0.8	-20.4	45.5	78.0	6.3	-0.2
Nigeria	-10.5	-7.9	-5.7	12.3	43.1	57.1	2.9	30.8

Source: Feenstra, Lipsey and Bowen (1997)

Table 5:
The effect on FDI-inflow

	(1) OLS		(2) OLS		(3) FE	
Relative GNP	2.172	*	1.755	*	-3.335	*
	(0.509)		(0.383)		(0.987)	
Relative GNP squared	0.075	*	0.041	***	-0.082	**
	(0.028)		(0.022)		(0.040)	
GNP per capita	1.197	*			2.104	*
	(0.165)				(0.785)	
Aid	0.132				-0.026	
	(0.143)				(0.064)	
LOME	0.088					
	(0.396)					
WTO	0.561	*				
	(0.109)					
French	-0.150					
	(0.140)					
English	0.387	*				
	(0.141)					
Ocean	-0.428	*				
	(0.132)					
Distance	0.309					
	(0.231)					
Tariff	0.400	*			-0.710	**
	(0.152)				(0.284)	
Constant	6.164	***	16.933	*	-27.049	**
	(3.561)		(1.593)		(11.155)	
N	282		292		282	
Prob>F	0.000		0.000		0.000	
R2	0.8206		0.641		0.461	
Root MSE	0.740		1.039			

* = 1% significance level. ** = 5% significance level. *** = 10% significance level.

Figures in parenthesis are heteroscedastisity robust standart errors

Table 6:
The effect on intra industry trade

	(4) OLS		(5) OLS		(6) FE	
Relative GNP	1.272	**	3.974	*	2.668	
	(0.499)		(0.532)		(1.749)	
Relative GNP squared	0.135		0.178	*	0.090	*
	(0.028)		(0.030)		(0.066)	
GNP per capita	0.238				-1.061	
	(0.216)				(1.420)	
Aid	0.441	*			-0.149	**
	(0.105)				(0.181)	
LOME	-0.185					
	(0.571)					
WTO	-0.122					
	(0.150)					
French	-0.234					
	(0.288)					
English	0.360					
	(0.261)					
Ocean	0.855	*				
	(0.133)					
Distance	-1.486	*				
	(0.202)					
Tariff	-0.525	*			0.050	
	(0.123)				(0.172)	
Constant	32.749	*	30.045	*	30.811	
	(2.943)		(2.264)		(20.197)	
N	291		301		291	
Prob>F	0.000		0.000		0.000	
R2	0.8439		0.5975		0.379	
Root MSE	0.744		1.156			

* = 1% significance level. ** = 5% significance level. *** = 10% significance level.

Figures in parenthesis are heteroscedastisity robust standart errors

Table 7:
The effect on total trade

	(7) OLS	(8) OLS	(9) FE
Relative GNP	2.145 *	2.883 *	-0.362
	(0.288)	(0.179)	(0.778)
Relative GNP squared	0.086 *	0.122 *	0.115 *
	(0.016)	(0.010)	(0.030)
GNP per capita	0.433 *		2.630 *
	(0.079)		(0.617)
Aid	-0.079		-0.031
	(0.065)		(0.051)
LOME	0.186		
	(0.168)		
WTO	-0.078		
	(0.062)		
French	-0.299 *		
	(0.073)		
English	-0.044		
	(0.071)		
Ocean	0.227 *		
	(0.063)		
Distance	0.015		
	(0.109)		
Tariff	0.083		0.178 **
	(0.051)		(0.078)
Constant	22.015 *	29.036 *	-13.410
	(1.881)	(0.742)	(8.797)
N	292	302	292
Prob>F	0.000	0.000	0.000
R2	0.9058	0.813	0.342
Root MSE	0.385	0.563	

* = 1% significance level. ** = 5% significance level. *** = 10% significance level.

Figures in parenthesis are heteroscedastisity robust standart errors

Table 8:
The effect on FDI-inflow/iit

	(10) OLS	(11) OLS	(12) FE
Relative GNP	1.362 **	-2.072 *	-5.841 *
	(0.592)	(0.534)	(1.966)
Relative GNP squared	0.094 *	-0.127 *	-0.109
	(0.032)	(0.032)	(0.079)
GNP per capita	0.863 *		3.953 **
	(0.222)		(1.608)
Aid	-0.354 *		0.094
	(0.118)		(0.124)
LOME	0.137		
	(0.585)		
WTO	0.623 *		
	(0.147)		
French	0.095		
	(0.271)		
English	-0.051		
	(0.244)		
Ocean	-1.212 *		
	(0.160)		
Distance	1.927 *		
	(0.252)		
Tariff	1.173 *		-0.811
	(0.175)		(0.551)
Constant	-26.214 *	-12.611 *	-65.386 *
	(3.622)	(2.175)	(22.773)
N	281	291	281
Prob>F	0.000	0.001	0.000
R2	0.585	0.062	0.174
Root MSE	0.839	1.209	

* = 1% significance level. ** = 5% significance level. *** = 10% significance level.

Figures in parenthesis are heteroscedastisity robust standart errors

Table 9:
The effect on FDI-inflow/total trade

	(13) OLS	(14) OLS	(15) FE
Relative GNP	0.188	-1.093 *	-2.849 **
	(0.393)	(0.328)	(1.238)
Relative GNP squared	-0.001	-0.078 *	-0.193 ***
	(0.020)	(0.019)	(0.051)
GNP per capita	0.758 *		-0.590
	(0.130)		(0.984)
Aid	0.214 **		0.008
	(0.095)		(0.080)
LOME	-0.101		
	(0.336)		
WTO	0.625 *		
	(0.106)		
French	0.157		
	(0.136)		
English	0.405 *		
	(0.127)		
Ocean	0.650 *		
	(0.271)		
Distance	0.324 ***		
	(0.185)		
Tariff	0.365 *		-0.953 *
	(0.124)		(0.356)
Constant	15.522 *	-11.986 *	-12.411
	(2.586)	(1.350)	(13.983)
N	282	292	282
Prob>F	0.000	0.000	0.000
R2	0.525	0.1367	0.2865
Root MSE	0.612	0.788	

* = 1% significance level. ** = 5% significance level. *** = 10% significance level.

Figures in parenthesis are heteroscedastisity robust standart errors