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Abstract

The clothing sector has been a driver of diversification and growth for countries that have graduated into middle income. Using a partial adjustment panel data model, this study tries to explain the international location of clothing production based on a combination of variables suggested by the Heckscher-Ohlin theory and by New Economic Geography theory. Our Blundell-Bond system estimator results show that closeness to intermediates such as low-cost labor and textile production has a positive effect on clothing production. Factor endowment and closeness to the world market have inversed U-shaped effects. This is expected, because above a certain level several other sectors benefit even more from closeness and factor endowments, driving resources away from the clothing industry.

Keywords: Clothing Industry; New Economic Geography; Comparative Advantages; Industrial Agglomeration.

JEL classification: F12; F13; L13; L67; R12; R3.

1. Introduction

The global economic development has until recently been a disappointment for large parts of the world. For example, Easterly and Levine (2001) find that national income levels have diverged over the long run. Diagram 1 shows the big picture: East Asia has converged fast and steadily towards rich country income levels during the last 30 years, while South Asia has converged only since the late 1980s, and at a slower pace. At the same time, the other developing regions have been diverging more or less throughout and, compared to OECD, Sub-Saharan Africa has reduced its relative income since 1975 by half. This is alarming since poverty is much more widespread and incomes are much lower in Africa than in any other region. The relationship between international economic integration and growth in less developed countries does not seem to follow one common pattern. The fact that not all countries benefit from globalization is in contrast to the convergence predicted by standard neoclassical theory (e.g., Lucas, 2000).

This article looks at one aspect of the globalization process: the determinants of the international location of clothing industry. Clothing is important especially from a development perspective since it has played an important role in the early stages of development in many countries. This has been possible since it is labor intensive and prone to relocate as wages increase. Clothing still provides an opportunity for expansion of the manufacturing industry for low-income countries (Brenton and Hoppe, 2007). Getting a better understanding of what drives the location of clothing production should contribute to the convergence-divergence discussion. Clothing sector growth is to a large extent export-driven, and the international trade is relatively concentrated to a limited number of countries. China is the world's largest exporter of clothing with a market share of over 30 %, and the other countries in the 2002 top-10 list were Italy, Hong Kong, Germany, Mexico, France, Turkey, India, Indonesia, and Korea. (Nordås, 2004).[1]

The clothing industry has been strongly affected by trade restrictions (see, e.g., Spinanger 1999).[2] In the decades following the Second World War, world trade was liberalized and grew tremendously. Due to growing low-price competition from developing countries in labor-intensive industry sectors, especially in the clothing industry, trade in clothing has been regulated in different ways since 1955 to protect jobs and production in the OECD countries. The most important agreement has been the Multi-Fiber Agreement (MFA) from 1974. This included quantitative restrictions on textile exports from developing countries, and was discriminatory by country of origin; the exporting countries captured the quota rents from the export constraints. While the agreement stipulated a 6 % annual growth of export from developing countries, the growth rates of quotas were frequently lower than that (Yang et al., 1997). MFA was phased out 1995-2005, even though very little happened before the last year. Textiles and clothing are now (almost) fully deregulated, and a new agreement, the Agreement on Textiles and Clothing (ATC), is in place. It is notoriously difficult to find good data on MFA quotas, but we have tried two different measures.

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[1] The world's largest producers are shown in Appendix 3, Table A3.
[2] Trade barriers have a strong effect on the geographical distribution of industries. For example, Sanguinetti and Martincus (2005) present empirical evidence of this.

According to the Heckscher-Ohlin theory, a country will specialize in the sectors in which it has a comparative advantage due to factor endowments such as land, labor, and capital. Even though factor endowments can explain a lot of the basic patterns in the industry location in the world, there is considerably more to it. Lately there has been an increasing focus on the importance of institutions. For example, a common explanation of the East-Asian miracle is good institutions and policy (see, e.g., World Bank, 1993). While there is no doubt that lack of good institutions can help explain why some regions are less successful, we have also seen examples of the opposite. In fact, parts of East Asia come out as badly as Africa on many measures of institutional quality (e.g., corruption), yet show much better development over the last 30-40 years.

Two patterns observed in several sectors are the existence of agglomeration and that industrialization happens in waves. This is somewhat surprising since the concentration of an industrial sector in one geographical area should boost wages and hence induce firms to move to other regions. However, what we often observe instead is that firms cluster more than what can be motivated by factor endowments. And when the reallocation from the core to the periphery does occur, this process of convergence is not uniform. The New Economic Geography[3] (NEG) literature has tried to tackle these questions by considering second-nature geography, i.e., the geography of distance between economic agents. By assuming increasing returns to scale and imperfectly competitive markets, agglomeration is possible in this framework. But what drives agglomeration? The core in NEG is that industries are linked in an input-output structure, which creates forward and backward linkages. A straightforward example is a textile industry plant that moves to a town and thereby makes the demand for cotton in the area go up. It also creates forward linkage to the clothing industry.

[3] This literature is said to have started with Krugman (1991a and 1991b). Its roots go back to Samuelson (1952), Dixit and Stiglitz (1977), Krugman (1979), and Krugman (1980). It was further explored in, e.g., Fujita and Krugman (1995) and Krugman and Venables (1995). Fujita et al. (1999) is a synthesized presentation of the field. Geographers such as J. H. von Thünen have been working with related models for a long time (Fujita, 2000). NEG is also related to Gravity models, and already Harris (1954) argued that the potential demand for goods produced in one location depends on the distance weighted GDP of all locations.

The purpose of this article is to test empirically whether NEG can add something to traditional Heckscher-Ohlin theory in explaining the location of the clothing industry; i.e., are factor endowments all that matter or does closeness to markets and suppliers of intermediate goods also play a role? Crafts and Mulatu (2004) and Antweiler and Trefler (2002), among others, find empirical support for including NEG variables together with Hechscher-Ohlin variables.[4] This is to our knowledge the first study doing this for the international clothing industry. We use a partial adjustment panel data model, and the empirical strategy is inspired by the study of industry location in Europe by Venables and others (Midelfart-Knarvik et al., 2000). Our framework uses more detailed variables to capture proximity to suppliers, and adds variables for trade restrictions. Adjustment costs (lagged dependent variable) are used as well. The data available allows us to study 61 countries 1975-2000. Our Blundell-Bond system estimator results show that closeness to intermediates, low-cost labor, and textile production all have positive effects on output. Factor endowments and closeness to the world market have inverted U-shaped effects. This is expected since above a certain level several other sectors benefit even more from closeness, and as factor proportions change, comparative advantages change as well. Consequently, resources shift to other sectors.

2. Theory and earlier studies

NEG starts from an analytical model of monopolistic competition including economies of scale a la Dixit and Stiglitz (1977) and transport costs (Samuelson 1952). We follow Puga and Venables (1996) when presenting the NEG framework. Like many other trade theories, it is a very simplified model, giving us broad suggestions about what to consider. However, we need to look at empirics to evaluate the theoretical results. The model assumes that countries have identical technology and endowments, and contains two sectors: agriculture and industry. Firms in the industrial sector are linked by an input-output structure, which creates forward and backward linkages. The interaction of these forces creates externalities, encouraging the agglomeration of industry. In fact, if these forces are strong enough, industry will become concentrated to one single country.[5] Since exogenous overall growth increases the size of the industry relative to

[4] Antweiler and Trefler (2002), among others, claim that scale economies are an important source of comparative advantage in general. Craft and Mulatu (2004) find that NEG does matter, although it was mainly factor endowments that determined the location of the pre-1931 British industry.

[5] Brakman et al. (2005) argue that agglomeration effects are so strong that it is very hard to carry out regional policy.

agriculture, wages increase in this country relative to wages elsewhere. Eventually it will be profitable for firms to move out of this country, but since all countries are assumed to be identical in technology and endowments, it is random to which peripheral country the firms will move. And so it continues: as one country gets one step ahead of the others in the periphery, agglomeration forces will strengthen the process. As predicted, Barrios et al. (2003) find some empirical support for convergence as total market size increases.

Puga and Venables (1996) try to establish circumstances under which industrialization takes this form. The process of growth is captured in a simple way by assuming an exogenous increase in the labor endowment (in efficiency units). We can think of it as a process of technical change, raising the productivity of labor in both agriculture and industry. The model is a general equilibrium model and has a structure similar to Krugman and Venables (1995) and Dixit and Stiglitz (1977). However, Puga and Venables (1996) expand these models by having *s* industry sectors instead of two. The model includes N countries, and for the *ith* of them we have (all exogenous) labor force L_i and arable land K_i. Agriculture is perfectly competitive and has constant returns to scale. The production function for agriculture is Cobb-Douglas in land and labor, with a labor share of θ. The industrial sector produces a number of varieties of differentiated products, and $\sigma > 1$ is the elasticity of demand for a single variety. The input-output matrix consists of η^s, the share of agriculture inputs in the industry sector *s*, and $\mu^{r,s}$, the share of industry sector *r* in industry sector *s*. $\tau_{i,j}$ is the iceberg transport cost from country *i* to country *j* (the fraction of any shipment that "melts away" in transit). The consumer preferences are such that the consumers have a linear expenditure system. The subsistence level of agriculture consumption is e^0, and a proportion γ^s of income above this level is spent on industry *s* products. Raw materials are not included.

We do not present all the details of the model here, but given the production functions, consumer preferences, and the parameters, the model predicts the equilibrium output $y^*_{i,u,t}$ of each industry sector *u* in each country *i* at each point in time *t*:

$$y^*_{i,u,t} = f_u(\{\tau_{j,k}\}_t, \{L_j\}_t, \{\mu^{r,s}\}, \{\eta^s\}; \sigma, \theta, e^0, \{\gamma^s\}) \quad . \qquad (1)$$

This means that the variables explaining the size of an industry sector are all transport costs (even those between two other countries), labor in every country, and the full input output matrix. σ, θ, e^0 and $\{\gamma^s\}$ are parameters.

$f_u(\{\tau_{j,k}\}_t, \{L_j\}_t; \sigma, \theta, e^0, \{\gamma^s\}, \{\mu^{r,s}\}, \{\eta^s\})$ is not necessarily linear. This kind of complex general equilibrium model seldom has a simple solution. As a general equilibrium model it only predicts how the equilibrium responds to, for example, exogenous overall growth, but says nothing about the speed of this transition. By expanding the model to a dynamic model we make it more realistic.

Puga and Venables ask which industries relocate first when the world economy grows and transport costs decrease, and doing simulations they find that the answer depends largely on the strength of the linkages between industries, which involve the structure of the input-output matrix (the elements in this matrix are $\{\mu^{r,s}\}$ and $\{\eta^s\}$). They find three basic aspects: First, when industries differ in labor intensity, the prediction is that the labor-intensive industries move first. Second, when we can rank industries from upstream to downstream, there is no clear prediction. Third, when some industries are strongly linked to the rest and some are weakly linked, the weakly linked move first. Since the clothing industry is labor intensive and quite weakly linked, it should be one of the first to move. This is also what we observe.

The conclusion of the NEG theory is that the agglomeration forces act both through closeness to intermediate suppliers and through closeness to output markets. The clothing industry benefits from such closeness, *ceteris paribus*, but since other sectors might also benefit from the closeness, and thereby drive away resources from the clothing industry, the total effect might be the opposite: the clothing industry might actually lose from being close to, e.g., suppliers of advanced capital and technology. An industry sector might also benefit from closeness up to a certain level, and lose after that, i.e., there might be an inverted U-shaped effect of closeness. This could happen if the effect of other sectors driving away resources from the clothing industry is weak at low levels of closeness and stronger at high levels of closeness. The impact of the closeness variables is tested together with the comparative advantage in the form of physical capital, human capital, and arable land. These factor endowments might have negative or inverted U-shaped effects, since the arguments used regarding closeness also applies to factor endowments.

A lot of theoretical work has been done in the NEG tradition; recent papers include Holmes and Stevens (2005) and Gallo (2005). However, there is less empirical work focusing strictly on NEG. One implication of the NEG approach that can be tested is the "home market effects." Davis and Weinstein (1998) find strong such effects. On a sub-national level there are studies suggesting that clustering exists. There are few empirical studies of clustering at the international level (see Overman et al., 2001, for an overview of the field). Very few empirical studies have been done on geography and the clothing industry. Elbadawi et al. (2001) analyze empirically the export performance of manufacturers of textile and clothing from six countries in Sub-Saharan Africa, and find that geography is important and that domestic transport costs are even more influential than international transport costs.

3. Estimating equations and choice of variables

We put the variables from equation (1) and variables suggested by Heckscher-Ohlin theory in the same estimating equation, and use a partial adjustment panel data model. No guidance can be found in the literature on how to estimate such a relationship for a general trade model, but our model is in line with Midelfart-Knarvik et al. (2000), whose econometric analysis includes 13 EU countries and 33 industries. They construct a very general simulation model, and use the simulation output to inform their choice of functional form. The model is estimated for several industries simultaneously, but if we express the estimating equation for only the clothing industry we get[6]:

$$\ln s_i^* = c + \alpha \ln pop_i + \beta \ln man_i + \sum_j y_j^i \beta_j (z_j - \kappa_j) - \sum_j \beta_j \gamma_j z_j \qquad (2)$$

[6] Midelfart-Knarvik et al. (2000b) use shares instead of actual stocks. It could be argued that stocks are more based in theory since a firm considers actual numbers and not shares when making decisions, but apparently their simulations showed the opposite.

or

$$\ln s_i^* = c' + \alpha \ln pop_i + \beta \ln man_i + \sum_j \beta'_j y_j^i \,. \qquad (3)$$

In equation (3), $c' = c - \sum_j \beta_j \gamma_j z_j$ and $\beta'_j = \beta_j (z_j - \kappa_j)$. The share of country *i* in the total activity of the clothing industry is denoted s_i^*, which is the equilibrium value; c is a constant; pop_i is the share of EU population living in country *i*; man_i is the share of total EU manufacturing located in country *i*; y_j^i is the level of the *j*th country characteristic (i.e. closeness variables and factor endowments) in country *i;* z_j is the clothing industry value of the industry characteristic (e.g., capital intensity) paired with country characteristic *j*; and finally, $\alpha, \beta, \beta_j, \kappa_j$, and γ_j are coefficients. $\beta'_j = \beta_j (z_j - \kappa_j)$ measures the sensitivity of the clothing industry to variations in country characteristics, and is a combination of β_j, which measures the general sensitivity of all industries to country characteristic *j*, and $(z_j - \kappa_j)$, which measures how important characteristic *j* is for the clothing industry specifically.

Equation (3) can be seen as a special case of equation (1). We estimate a partial adjustment equation where equation (3) is considered the desired (or equilibrium) value. The country characteristics y_j^i are the factor endowments, closeness to markets, and intermediate suppliers. There are also a couple of differences compared to Midelfart-Knarvik et al. (2000). We focus on one industry sector, but go further in trying to capture forward and backward linkages. Instead of using market potential as a country characteristic that captures all NEG aspects, we use the relevant factors (textile output, etc.). We also expand the model by making it dynamic. We estimate both pooled regressions and panel data regressions. Our model is linear in the parameters, but in contrast to Midelfart-Knarvik et al. (2000) we allow the variables to be nonlinear.

When the equation is expanded and includes partial adjustment, we have a dynamic linear model. The adjustment equation is

$$\ln s_{i,t} - \ln s_{i,t-1} = (1-\lambda)(\ln s_{i,t}{}^{*} - \ln s_{i,t-1}) \ . \tag{4}$$

$(1-\lambda)$ is the coefficient of adjustment. This is rewritten as

$$\ln s_{i,t} = \lambda \ln s_{i,t-1} + (1-\lambda)\ln s_{i,t}{}^{*} ; \tag{5}$$

that is:

$$\ln s_{i,t} = \lambda \ln s_{i,t-1} + (1-\lambda)(c' + \alpha \ln pop_i + \beta \ln man_i + \sum_j \beta'_j \, y^i_j) \ . \tag{6}$$

Equation (6) is our estimating equation and the following variables are included as country characteristics y^i_j (the details concerning the variables are discussed in Appendix 1). Closeness to intermediate suppliers is represented by manufacturing wage, textile industry output, and distance to advanced technology (airdist). Manufacturing wage is used instead of size of the labor force,[7] since labor force is strongly correlated with the already included population (pop_i); i.e. having labor force and population in the same regression would give severe multicolinearity. When interpreting the results for manufacturing wage one should be aware that this variable might capture more than intended. The textile industry output is included as the share of total world output. Distance to advanced technology (airdist) is measured as the shortest distance to the closest city of Tokyo, Rotterdam, and New York. This variable was first used in Gallup et al. (1999), and is assumed to be a proxy for international transport cost of advanced capital goods that are unavailable at local or regional markets.

[7] There is not always a clear distinction between NEG variables and comparative advantage variables. Labor force can also be seen as a comparative advantage variable.

Closeness to output markets is represented by the distance-weighted world GDP (GDP-dist),[8] coastal population, tariffs, and infrastructure. GDP-dist captures how well located a country is with respect to markets, or in other words how close it is to the world market. It is calculated as the sum of the GDPs of all countries divided by the distance to that particular country. Coastal population is calculated as the percentage of the population living less that 100 km from the coast or a navigable river. This variable was first used in Gallup et al. (1999). Tariffs on clothing exports is the most difficult variable to find a good measure of; Appendix 2 provides a deeper discussion on this. A dummy indicating being under the risk of Multi-Fiber Agreement (MFA) quotas is to our knowledge the best available alternative and is therefore used. Unfortunately this dummy is quite rough, and there might be a risk of endogeneity. A country might be classified as a LDC and thereby avoid quotas because it has been less successful in expanding its industry. Two alternative measures, import duty (in percent of imports) and a developing country dummy, are used as robustness test. The developing country dummy refers to all countries that were OECD countries before 1994 except Turkey. Therefore there is no risk of endogeneity in this dummy. Telephone connections (per 1,000 people) is used as a proxy for infrastructure.

The comparative advantage effects are represented in the regressions by capital per worker, human capital, and arable land per worker. Capital per worker is based on the Bosworth and Collins (2003) estimate of capital stocks, human capital is represented by average years of schooling in the total adult population (older than 15) from the Barro and Lee (2000) dataset, and arable land per person is measured as hectares per person.

As mentioned earlier, the total effect of closeness and factor endowments might not be linear and positive, but could be inverted U-shaped or negative, since other sectors may benefit even more from the closeness and factor endowments and thereby attract resources away from the clothing industry. In the estimating equation manufacturing output as a share of world manufacturing output is controlled for. Therefore the effects of the right hand variables, given the level of manufacturing, are estimated. This makes it even more likely that we will find a negative or inverted U-shaped effect of closeness and factor endowments. What the effect is expected to be

[8] Measures like this are often used in empirical NEG work, but usually not as one of many variables. Breinlich (2005), for example, uses a “transport cost weighted sum of the surrounding locations’ GDP” and relates it to income levels.

depends on the importance of the variables for the clothing industry and for other industry sectors. Among the other industries we find many that are advanced, but also ones that are less advanced than clothing.

The size of the textile industry is expected to have a positive effect on clothing production, while being under the risk of MFA quotas is expected to have a negative effect. For most of the other closeness variables we expect a mostly positive, but perhaps inverted U-shaped, effect. Physical and human capital, as well as distance to advanced technology, are expected to have inverted U-shaped, mostly negative, effects. Arable land per person is expected to have a negative but probably small effect.

Based on the simulation results of Midelfart-Knarvik et al. (2000), we use the logarithms of all but four variables: Schooling is included without logarithms in line with the Mincer equation (Mincer, 1974), which relates the logarithm of earnings linearly to years of education. Coastal population can not exceed 100 % and airdist can not exceed approximately 10,000 km, and often when a variable has an upper limit it is more realistic to include it without logarithms. Including the logarithm of coastal population would be based on the assumption that going from 2 to 4 percent has the same effect as going from 20 to 40 percent, which is implausible. The same reasoning can be applied to airdist. MFA is a dummy.

The data used for clothing, textile, and manufacturing are from the Industrial Statistical Database from UNIDO (2005). It is mostly the data availability in this database, and in the capital stock estimates by Bosworth and Collins (2003), that has limited our study to 61 countries 1975-2000. The countries are presented in Appendix 3, Table A1.

The effects might be diminishing, which can be captured by a quadratic term. We test this successively (see Table 1) and find that only GDPdist, capital per laborer, and years of schooling have a statistically significant quadratic term. This finally gives us the following estimating equation:

$$\ln clothingshare_{i,t} = \lambda \ln clothingshare_{i,t-1} + (1-\lambda)(const + \beta_1 \ln popshare_{i,t} + \beta_2 \ln manshare_{i,t} +$$
$$\beta_3 \ln textshare_{i,t} + \beta_4 airdist_i + \beta_5 \ln manwage_{i,t} +$$
$$\beta_6 \ln gdpdist_{i,t} + \beta_7 (\ln gdpdist_{i,t})^2 + \beta_8 \ln pop100cr_i + \beta_9 \ln infrastructure_{i,t} + \beta_{10} MFA_{i,t} +$$
$$\beta_{11} \ln kaplabor_{i,t} + \beta_{12} (\ln kaplabor_{i,t})^2 + \beta_{13} schoolyears_{i,t} + \beta_{14} (schoolyears_{i,t})^2 + \beta_{15} \ln arable_{i,t}) \quad (6')$$

4. Econometric considerations

We use a panel model since we want to control for unobserved heterogeneity in the form of time invariant country specific effects. When estimating a dynamic panel data model the lagged dependent variable is correlated with the compound disturbance, and this makes it necessary to take some extra steps. The general approach relies on IV estimators. We use the Blundell-Bond (1998) system estimator (Bond, 2002 is a good introduction), which is based on the Arellano-Bond (1991) estimator, sometimes called "the difference GMM estimator." Consider the model

$$y_{it} = \alpha y_{i,t-1} + \beta x_{it} + (\eta_i + \upsilon_{it}), \quad (7)$$

where x_{it} is a vector of explanatory variables that might be strictly exogenous, predetermined or endogenous, η_i are unobserved group-level effects, and υ_{it} is a disturbance term. First-differencing (7) gives:

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \beta \Delta x_{it} + \Delta \upsilon_{it}. \quad (8)$$

Now $\Delta \upsilon_{it}$ is correlated with $\Delta y_{i,t-1}$, so we need an instrument. $\Delta y_{i,t-1}$ is instrumented with lagged $y_{i,t-2}$. Endogenous and predetermined variables in first differences are instrumented with two time lags of their own levels.

The difference GMM estimator can be expanded to a system estimator (Arellano and Bover, 1995, and Blundell and Bond, 1998). A system uses both difference equations and level equations. The level equations include a random effect.[9] The system has two advantages: The estimations are more efficient than when only using differences, since lagged levels are often poor instruments for first differences, and we can estimate the parameters of the time-invariant variables. In the level equations, lagged and endogenous variables are instrumented with lags of their differences.

The instruments we are using in the instrument matrix are standard 2SLS and not GMM instruments, since GMM instruments are highly biased in small panels. We use the two step estimator with the Windmeijer (2000) correlations of the robust standard errors. The Arellano-Bond (1991) test for serial correlation is applied to the first-difference equation residuals, $\Delta\upsilon_{it}$. First order serial correlation is expected, but higher order serial correlation indicates that υ_{it} is serially correlated. If υ_{it} itself is MA(1) , then $\Delta\upsilon_{it}$ is MA(2), so $y_{i,t-2}$ is not a valid instrument, but $y_{i,t-3}$ remains available as an instrument. If υ_{it} is AR(1), then no lags are valid as instruments.[10] The Arellano-Bond test for serial correlation is applied in our regressions to the difference-equation residuals. These residuals are found to be first order serial correlation as expected in most regressions, but the test does not indicate second order serial correlation in any of them. All our system regressions pass the Difference-in-Hansen tests of exogeneity of instrument subsets.[11]

Looking at the correlation matrix (see Appendix 3, Table A8) for levels we see that schoolyears, lninfrastructure and lnkapworker mainly have correlation coefficients of 0.8 and higher between each other, and the same between lnclothshare, lnmanshare and lntextshare. This indicate

[9] The level equations work as an extension of the Hausman and Taylor (1981) formulation of the random effects model, which utilizes instrumentation. Time-invariant variables correlated with the country effect are instrumented with time-varying variables uncorrelated with the country effect. However, we have no reason to suspect such a correlation in our model.

[10] If we suspect that υ_{it} is serially correlated, a Hansen J-test can be carried out to determine whether υ_{it} is MA or AR.

[11] This is used instead of a Difference-in-Sargan test since the Sargan statistic is not robust to heteroskedasticity or autocorrelation.

multicolinearity. Using both levels and differences in our system estimations leads to lower power with higher standard errors and lower statistical significance.

In this type of regression there is always a risk of spurious regression. The left hand side variable is most likely stationary. On the right hand side we have five non-stationary variables: schoolyears, capital per worker, GDPdist, manufacturing wage, and infrastructure, plus the squared terms of the first three of these. Since we have more than one non-stationary variable on the right hand side the regression might still be legitimate, even if the left hand side variable is stationary. At the end of the day the question is whether our model is correctly specified or misspecified; can these explanatory variables that are growing over time have a constant effect on the stationary variable on the left hand side? During this limited time period (1975-2000) and in the nearest future, it is not unreasonable to assume that the variables included with a quadratic term are correctly included in the model. This would mean that the "optimal level" of these variables is constant during this time period, which in turn means that nothing indicates that our model is misspecified or that we have a problem with spurious regression. Still, one should be careful. A Multivariate Augmented Dickey-Fuller panel unit root test cannot be done since the panel is not balanced. Using time dummies will make the potential problem of non-stationary variables smaller. We use time dummies as a robustness test, and the statistical significance falls as expected, but the parameter estimates change only a little (see Table 3).

5. Discussion of results

Table 1 reports regressions where we successively exclude the quadratic terms that are not statistically significant. As can be seen in Column 6, only GDPdist, capital per laborer, and schoolyears have statistically significant quadratic terms. This finally gives us the estimating equation (6') as reported earlier. Table 2 reports the main regressions and Table 3 reports regressions for robustness tests. Heteroskedasticity-consistent asymptotic standard errors are used in all estimations.

The first two columns in Table 2 report OLS levels estimates and within-group estimates. As discussed earlier, these are strongly biased and are only reported for comparison. The Arellano-Bond difference estimates reported in the third column are unbiased but less efficient than the

Blundell-Bond system estimates reported in the fourth column. We have reason to believe there is causality in both directions between clothing and textile, which if so will bias our parameter estimate for textile upwards. We therefore instrument textile with lagged values in Column 5. However, this makes the parameter estimate go up and not down as expected, indicating that something is wrong. When using arable land per person as an instrument, the same problem arises (as can be seen in Table 3, Column 5). While both instrumenting approaches pass the Hansen test, neither gives reasonable results[12]. We therefore do not instrument for textile. Columne 3-5 reveal that the difference estimation and the two systems produce very similar results. As expected, the standard errors are much higher in the difference estimation, giving us lower statistical significance, although the estimates are similar. Looking carefully at the preferred fourth regression (the Blundell-Bond system estimation without instruments), we see what follows below.

5.1. Partial adjustment

Regression 4 in Table 2 shows that the parameter of the lagged clothing output is estimated at around 0.44, which means that 56 % of the desired adjustment is done after one year. A permanent rise of an independent variable has both a direct effect, and an indirect effect via lagged clothing output. The total effect is the long-run effect. Since we are estimating eq. (6'), the estimates we get from our regression are estimates of $(1-\lambda)\beta_i$. However, we are primarily interested in eq. 3, and the long-run effects, β_i. Therefore we should divide our parameter estimates with (1-0.44) = 0.56, the estimation of $(1-\lambda)$, to get the estimates of the long-run parameters. These long-run parameters are what we discuss from here on.

5.2. Size variables

Population and manufacturing are control variables, but if the estimates of their parameters are unreasonable we should be worried. The parameter of manufacturing has a statistically significant positive point estimate and a long-run elasticity of approximately one, which is reasonable. The estimated parameter of population is negative and statistically significant. Since

[12] The Difference-in-Hansen test gives chi2(14) = 11.91 (p = 0.615) in the first approach and chi2(13) = 11.41 (p = 0.577) in the second.

we are controlling for manufacturing, one could expect population to have no effect at all. However, it is not unreasonable that smaller countries on average have more clothing production, since many small countries, e.g., Hong Kong, have traditionally been export oriented, which supports expansion of the clothing industry.

5.3. Closeness

In our regressions we control for the manufacturing industry, so if we find that one of our explanatory variables has a positive parameter,[13] the interpretation is that this variable has a more positive effect on the clothing industry than on other industries.

5.4. Closeness to intermediate factors

Textile output has a positive and statistically significant effect. The elasticity is estimated to 33 %. A one standard deviation (see Appendix 3, Table A2 for summary statistics) change makes the *clothoutshare*, and thereby the clothing output, approximately 250 % larger. As mentioned earlier we suspect reversed causality here, although we have not been able to find any strong and valid instruments. This parameter estimate is therefore probably biased upwards. As expected, closeness to advanced technology has a statistically significant negative effect; a one standard deviation rise changes clothing output by about 50%. The parameter estimate of manufacturing wage is negative and statistically significant; the elasticity is estimated to 0.30.

5.5. Closeness to output markets:

Distance-weighted world GDP has a statistically significant inverted U-shaped effect. The effect turns negative quite close to the mean value of the variable in our dataset. The clothing industry benefits from being close to output markets, but only to a certain point. Other industries probably benefit more from being really close to markets. As predicted, coastal population has a positive effect, with an elasticity of 0.70. However, infrastructure has no statistically significant effect. Since we use telephone lines as a proxy, this should be interpreted carefully; the result might not hold for infrastructure in general, for example in terms of roads. The MFA dummy is not

[13] In the case with a squared term included, e.g., $\beta_1 X + \beta_2 X^2$, the marginal effect is given by $\beta_1 + 2X\beta_2$. We focus on this linear combination of the two parameters instead of the parameters separately.

statistically significantly different from zero (p = 0.14), but the point estimate is negative and substantial.

5.6. The comparative advantage variables:

Both capital per worker and years of schooling seem to have the expected effects; positive to start with but negative for higher values. If the parameter estimates are true, then one extra year of schooling is associated with a 25 % higher clothing production for low levels of schooling. Then the effect declines, and when a country is at an education level of 8 years, the effect disappears. One should not take these computations too literally, but rather see them as hints of what the results say. For low levels of capital per worker the effect might be huge, with an elasticity of 0.85. The effect disappears around 10,000 USD, which is quite close to the mean value of the variable in our dataset. The parameter of arable land per person is far from statistically significant, and the economic effect is, if any, very low.

5.7. Robustness

Our results seem to be robust to several changes. Including the variable institutions[14], using import duty (in percent of imports, it comprises all levies collected on goods at the point of entry into the country) instead of the MFA dummy, or using a developing country dummy instead of the MFA dummy does not change anything substantially, as seen in Table 3, Columns 1-3. When using time dummies (Table 3, Column 4), we see that the results are very similar, although a bit less statistically significant. In column 5 the results when instrumenting textile with arable land per person are reported, as discussed earlier. The Arellano-Bond test for serial correlation is applied to the difference equation residuals, and we get the same result in all regressions. First order serial correlation is expected, but there is no indication of second order serial correlation. All regressions pass the Hansen J test.

6. Conclusions

The global economic development has until recently been a disappointment for large parts of the developing world. Several regions have been diverging more or less constantly. The worst

[14] We include institutions as a robustness test and use the Freedom House dataset since it covers the entire period. The data used is discussed in more detail in Appendix 1.

performer, Sub-Saharan Africa, is half as rich today as in 1975 compared to OECD, which is alarming. It appears puzzling why all countries have not benefited from globalization. After all, we are witnessing the opposite of the convergence predicted by standard neoclassical theory. The clothing sector has been a driver of diversification and growth for countries that have graduated into middle income. This study tries to explain the international location of clothing production by using a partial adjustment panel data model and a combination of variables suggested by the Heckscher-Ohlin theory and by the New Economic Geography theory.

Our results point to the critical importance of being close to intermediate suppliers of textile and low wage labor. However, being close to high technology suppliers is negative, probably since such closeness primarily benefits other more sophisticated industries and thereby drives resources away from the clothing industry. Being close to output markets is also positive, but under a certain distance other sectors seem to benefit even more. Access to markets via low transport costs from a high fraction of the population living close to the coast has a positive effect. The comparative advantage variables have the expected effect. The effects of physical and human capital are initially strongly positive, but then inverted U-shaped. This is expected since above a certain level several other sectors benefit even more from an abundance of capital, attracting resources away from the clothing industry.

Given our results, can we expect Africa to increase its market share in the clothing industry? Given the relative lack of both physical and human capital in African countries, one would expect them to have their comparative advantages in a low-tech sector like clothing. The fact that African countries are located far from the providers of high technology does not seem to constrain the expansion of the clothing industry. The result concerning the coastal population highlights the importance of physical infrastructure, so African economies need to improve this to become better connected to the world market. That low wage levels have an effect is good news for Africa, since the rising wages in Asia should make African wages relatively lower. However, it is worrying that African wages have been surprisingly high in some formal sectors. In conclusion, while the prospects for expansion of the African clothing industry seem to be good, certain preconditions have to be further improved to make it actually happen.

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Appendix 1. Data

GDP, industry output, and all other variables that give the monetary value of something, are expressed as constant 2000 US dollars.

Clothing industry, ln(clothshare) UNIDO (2005)

ISIC category 322 "wearing apparel, except footwear"

The share of the world clothing production located in country *i* is calculated as

$$clothingshare_{i,t} = \frac{clothingproduction_{i,t}}{worldclothingproduction_t}$$, which can also be expressed as:

$$\ln(clothingshare_{i,t}) = \ln(clothingproduction_{i,t}) - \ln(worldclothingproduction_t).$$

In this calculation we use output and not value added. The same goes for everything from Unido. To make worldclothingproduction more correct we interpolate so we can fill in the missing values for the biggest countries.

Manufacturing industry, ln(manshare) UNIDO (2005)

The share of the world manufacturing production located in country *i* is calculated.

Population, ln(popshare) World Bank (2004)

The share of the world population living in country *i* is calculated.

Textile industry, ln(textshare) UNIDO (2005)

The share of the world textile production located in country *i* is calculated.

Distance to advanced technology, airdist Gallup et. al. (1999)

The distance, in 1,000 km, from the country's capital to the nearest city of Tokyo, Rotterdam, and New York.

Wage, ln(manwage) UNIDO (2005)

Wages and salaries / employees for total manufacturing.

The distance weighted world GDP, ln(gdpdist) Subramanian and Wei (2003) and World Bank (2004)

We use the following definition:

$$GDPdist_i = \sum_j (GDP_j / dist_{i,j}),$$ $dist_{i,j}$ is distance between capitals when $i \neq j$. (9)

Where the own distance $dist_{i,i}$ (when $i = j$) is calculated as ((area / pi)^0.5) / (3/2).

Coastal population, Coastal population Gallup et al. (1999)

The share of the population living within 100 km from the coast or a navigable river.

Infrastructure, ln(infrastructure) World Bank (2004)

Telephone connections (per 1,000 people) is used as a proxy.

Capital per worker, ln(kapworker) Bosworth and Collins (2003) and World Bank (2002)

Bosworth and Collins (2003) estimate the capital stock with a perpetural inventory model,

$$K_t = K_{t-1}(1-d) + I_t, \tag{10}$$

where the depreciation rate, *d*, equals 5% . 1950 is the first year. This can be compared to Weil (2005) who uses the capital stock from Bernanke and Gurkaynak (2001) who assume a depreciation rate of 6%, following Hall and Jones (1999).[15] Their calculated capital stocks include both residential and nonresidential capital.

Education, schoolyears Barro and Lee (2000)

Average years of schooling for the total adult population (older than 15) is used. However, since this is only given for every fifth year, we interpolate between these years.

Arable land per person, ln(arable) World Bank (2004)

Hectares per person

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[15] Initial capital stocks are found by the assumption that capital and output grow at the same rate. If 1949 is the initial year, then the capital stock is

$$K_{1949} = I_{1950} / (g + \delta),$$

where *g* is the ten-year average growth rate of output and δ is the assumed rate of depreciation.

Rule of law, institutions Freedom House (2004)

As a proxy for Rule of Law we use Political Rights and Civil Liberties from Freedom House because we want numbers for several years. Political Rights and Civil Liberties are measured on a one-to-seven scale, with one representing the highest degree of freedom and seven the lowest. Freedom House only gives numbers for every fifth year, so we give all years in for example the interval 1963-1967 the 1965 value. We use the sum of these, and call it “bad institutions,” since a high score means lack of Political Rights and Civil Liberties. We are aware of the fact that this proxy is far from perfect, and we only use it as a robustness test. Both Chile and Uruguay have a perfect score. In the 1990s China and Vietnam scored 14, the worst, even though the business climate was obviously not that bad.

Trade barriers, MFA dummy and import duty World Bank (2002)

The MFA dummy indicates that a country is in the position where it can potentially be the object of quotas. It would have been better to have information on actual quotas, but this has not been possible.[16] Therefore we simply use dummies for being under the MFA system. A developing country dummy is also used. How these dummies are constructed is discussed in detail in Appendix 2.

Import duties, in percent of imports, is used as an additional robustness test. Import duties comprise all levies collected on goods at the point of entry into the country. The levies may be imposed for revenue or protection purposes and may be determined on a specific or ad valorem basis, as long as they are restricted to imported products. This seems to be an imprecise proxy: 228 of 2,548 observations are under 0.1 %.

Appendix 2. Trade restrictions for the clothing industry

To understand how trade restrictions in clothing industry have evolved one has to look back in history. In the decades following the Second World War, world trade was liberalized and grew considerably. The rich countries started to see growing low-price competition from developing countries in labor intensive industry sectors, especially in the clothing industry. To protect jobs and production in the OECD countries, trade in clothing became regulated in different ways

[16] This is discussed in more detail in Appendix 2.

starting in 1955 when Japan unilaterally restrained exports to the US (Francois et al., 2000). The Multi-Fiber Agreement (MFA) from 1974, which used the route of quantitative restrictions on textile exports from developing countries, provided rules for the imposition of quotas. The agreement was discriminatory by country of origin. Voluntary export restraints (VERs) were used, and thereby the exporting countries captured the quota rents. The MFA stipulated a 6 % annual growth of export from developing counties, but the growth rates of quotas were frequently below this (Yang et al., 1997). OECD (2003:9) notes that "Whenever textiles and clothing quotas became binding in one country under the MFA, investment was directed to initially unconstrained exporting countries, who then later became constrained also, with investment flowing yet elsewhere." The Uruguay Round Agreement on Textiles and Clothing (ATC) required a gradual phasing out of the quota restrictions during 1995-2005. Textiles and clothing were as of 2007 (almost) fully deregulated.

The developed countries did not face the risk of quotas ("developed country" refers to all OECD countries before 1994 except Turkey),[17] while most other countries did. However, there were a few exceptions. The two most important exceptions were the following. The Yaoundé and Lomé agreements, which started in 1963 and were then successively expanded, gave the African, Caribbean, and Pacific (ACP) countries the possibility to export to the EU under better terms than the MFA countries (Curran, 2007). The other very important exception was made for the LDCs (the Least Developed Countries) when the EU implemented the Generalized Scheme of Tariff Preferences (GSP) in 1971. Market access for products from the LDCs has gradually become fully liberalized. The LDCs and the ACP countries are presented in Appendix 3, Tables A6 and A7.

Measuring trade restrictions is a difficult task. As Milanovic and Squire (2005) put it, "All of the various ways of specifying variables representing trade liberalization are useful and answer interesting questions." In other words, there are a lot of measures out there that measure things that for most purposes are irrelevant. One has to choose carefully. We want to specify our variable representing trade restrictions in a way that answers the question we are asking. We are interested in the effect of tariffs and quotas. For example, what export tariffs does Tanzania

[17] West Europe, US, Canada, Australia, New Zealand, and Japan.

impose on a Tanzanian firm, and what import tariffs does it face when it tries to reach, say, the EU market? And what are the effects of quotas? Ideally one would use a measure of the total yearly effect of tariffs and quotas on clothing by exporting country. This exists by importing region, but not by exporting region.[18] We therefore try to use a measure of only the MFA quotas, which have been the most important trade restrictions for clothing.

Since to our knowledge there is no detailed information available on the actual quotas, we are forced to use a dummy for facing the risk of quotas.[19] The dummy has the value 0 for developed countries, LDCs, and ACP countries, and the value 1 for all other countries. Tariff equivalents could be an alternative, but it appears that tariff equivalents are only available for one or two years in the late 1990s. (See Appendix 3, Tables A4 and A5 for tariff equivalents for some countries). Even if actual quotas were available, there are problems. The MFA system was not transparent and had effect even when not binding (Linkins and Arce, 2002). For example, Francois et al. (2000:11) state that Japan and Switzerland did not impose MFA quotas, but "did send signals."

It can be argued that all developing countries in one way faced risk of quotas, even the LDCs ACP countries, since if these countries were very successful they might lose their preferences. Botswana actually did graduate from LDC status in 1994. therefore we also use a developing country dummy as an alternative measure. As an additional robustness test we would have liked to use a more general trade restrictiveness index. Kee et al. (2005) offer trade restrictiveness indices for 91 countries, the World Bank Overall Trade Restiveness Indices, but unfortunately only for one year. The IMF's overall trade restrictiveness indices (IMF-OTRI) were calculated on an annual basis for the period 1990-96 for 178 countries, but the IMF generally discourages the use of cross-country comparisons with the IMF-OTRI due to shortcomings in its methodology and data. Cline (2003) discusses these shortcomings. Market Access Maps did not start until 1999 and do not include any information on nontariff measures.

[18] Francois and Strutt (1999) offer average tariff rates by importing region, and Lankes (2002) offers export tax equivalents of MFA quotas also by importing region.

[19] Several papers deal with these quotas, but they do not have the data we are looking for. These include: Francois and Wörz (2006), who deal with only the period from 1996 and forward; Trela and Whalley (1990) who deal with only two years; OECD (2003), which is a survey of studies that gives no fruitful suggestions about where to find the needed data; and Harrison et al. (1997), who report for only one year.

IMF (2005) discusses supplemental indicators and mentions that “collection rates,” the amount of duties collected divided by imports, do provide useful information on the “effective” tariff rate. This value captures the effect of tariff rates and preferential arrangements etc. A problem discussed by IMF (2005) is that there is only a very weak correlation between the different trade policy indicators. If they had been strongly correlated one might have been able to argue that any of them could be used as a proxy for another, making the result robust to the choice of indicator. However, we cannot use that argument. Still, collection rates (as described above) are the only thing we are left with as an additional robustness test. Import duties from World Bank (2002) is used as this additional robustness test.

Appendix 3. Descriptive statistics etc.

Table A1. Countries in the dataset

Argentina	Malaysia
Australia	Nicaragua
Austria	Netherlands
Bangladesh	Norway
Bolivia	New Zealand
Brazil	Pakistan
Canada	Panama
Chile	Peru
China	Philippines
Cameroon	Portugal
Colombia	Senegal
Costa Rica	Singapore
Denmark	El Salvador
Dominican Republic	Sweden
Algeria	Thailand
Ecuador	Trinidad & Tobago
Egypt	Tunisia
Spain	Turkey
Finland	Tanzania
France	United States
United Kingdom	South Africa
Ghana	
Greece	
Guatemala	
Honduras	
Indonesia	
India	
Ireland	
Iran	
Israel	
Italy	
Jordan	
Japan	
Kenya	
Korea, Republic of	
Sri Lanka	
Mexico	
Mozambique	
Mauritius	
Malawi	

Table A2. Summary statistics

Variable	Obs	Mean	Std, Dev,	Min	Max
lnclothshare	1220	-6,12	2,14	-13,16	-0,93
lnpopshare	1220	-5,81	1,57	-9,94	-1,48
lnmanshare	1220	-6,01	2,02	-11,28	-1,00
lntextshare	1220	-5,99	2,14	-11,37	-1,34
airdist	1172	3,69	2,63	0,14	9,59
lnmanwage	1220	8,91	1,14	5,39	10,73
lngdpdist	1220	22,28	0,61	21,00	23,92
coastal population	1172	70,10	31,61	0,00	100,00
lninfrastr~e	1220	4,24	1,78	-0,20	6,63
MFA	1220	0,52	0,50	0,00	1,00
impduty	1034	9,27	9,36	0,00	73,71
lnkapworker	1220	9,88	1,56	6,48	12,44
schoolyears	1220	6,33	2,61	0,95	11,89
lnarable	1210	-1,76	1,27	-8,30	1,12
institutions	1141	5,90	3,61	2,00	13,00

Table A3. Clothing output 2000 (current USD)

Country	
United States	5.277e+10
China	2.768e+10
Italy	2.566e+10
Japan	1.515e+10
Germany	9.732e+09
France	8.618e+09
Korea, Republic of	8.087e+09
United Kingdom	7.660e+09
Spain	6.670e+09
Turkey	5.676e+09
Canada	5.097e+09
Hong Kong	3.689e+09
India	3.684e+09
Poland	3.385e+09
Portugal	3.158e+09
Indonesia	2.849e+09
Tunisia	2.710e+09
Belgium	1.879e+09
Australia	1.629e+09
Malaysia	1.360e+09

Source UNIDO (2005)

Note: 1997-2001 figures are used for some counties instead due to lack of data.

Table A4. EU protection for textiles and clothing – The estimated 1997 tariff equivalents of ATC/MFA quotas as % of imports at c.i.f. valuation

	Textiles	Clothing
Australia & New Zealand	0.0	0.0
Japan	0.0	0.0
Indonesia	14.0	30.6
Malaysia	21.6	34.8
Philippines	8.2	20.0
Thailand	10.3	23.6
China	20.5	24.0
Korea	8.2	14.4
Hong Kong & Singapore	7.9	14.2
Taiwan	9.4	16.7
India	20.2	24.6
Rest of South Asia and Indian Ocean	15.7	19.6
North America	0.0	0.0
Former Soviet Union	8.1	9.0
EFTA	0.0	0.0
Central & East European Countries	1.3	3.0
Rest of World	6.5	5.8
Weighted average NTBs	**5.6**	**10.2**

Source: Francois et. al. (2000)

Table A5. Trade-weighted export tax equivalents for MFA exports to US in 2002 (un-weighted average of cotton apparel and MMF apparel)

	%
Bangladesh	43
Cambodia	42
Pakistan	27
Sri Lanka	36
Turkey	41
Indonesia	43
Malaysia	40
Philippines	41
Thailand	38
China	39
Korea	41
Hong Kong	46
Taiwan	44
India	32
Macau	41

Source: Elbehri (2004) and own calculations.

Table A6. The Least Developed Countries, along with year when classified as an LDC

Afghanistan #	Madagascar (1991)
Angola (1994)	Malawi #
Bangladesh (1975)	Maldives *
Benin	Mali #
Botswana (graduated 1994)	Mauritania (1986)
Bhutan #	Mozambique (1988)
Burkina Faso #	Myanmar (1987)
Burundi #	Nepal #
Cambodia (1991)	Niger #
Cape Verde * (1977)	Rwanda #
CAR # (1975)	Samoa *
Chad #	São Tomé and Principe * (1982)
Comoros * (1977)	Senegal (2000)
DRC (1991)	Sierra Leone (1982)
Djibouti (1982)	Solomon Islands * (1991)
Equatorial Guinea (1982)	Somalia
Eritrea (1994)	Sudan
Ethiopia #	Timor-Lesté * (2003)
Gambia (1975)	Togo (1982)
Guinea	Tuvalu * (1986)
Guinea-Bissau * (1981)	Uganda #
Haiti *	Tanzania
Kiribati * (1986)	Vanuatu * (1985)
Lao #	Yemen (1975)
Lesotho #	Zambia # (1991)
Liberia (1990)	Mauritania (1986)

* Also SIDS # Also LLDCs
Source: UN (2005).

Table A7. Evolution of cooperation EU - ACP

Yaoundé I (1963) Benin - Burkina Faso - Burundi - Cameroon - Central African Republic - Tchad - Congo (Brazzaville) - Congo (Kinshasa) - Côte d'Ivoire - Gabon - Madagascar - Mali - Mauritania - Niger - Rwanda - Senegal - Somalia – Togo

Yaoundé II (1969) Kenya - Tanzania - Uganda

Lomé I (1975) The Bahamas - Barbados - Botswana - Ethiopia - Fiji - Gambia - Ghana - Grenada - Guinea - Guinea-Bissau - Guyana - Jamaica - Lesotho - Liberia - Malawi - Mauritius - Nigeria - Samoa - Sierra Leone - Sudan - Swaziland - Tonga - Trinidad and Tobago - Zambia

Lomé II (1979) Cape Verde - Comoros - Djibouti - Dominica - Kiribati - Papua New Guinea - Saint Lucia - Sao Tome and Principe - Seychelles – Solomon Islands - Suriname - Tuvalu

Lomé III (1984) Angola - Antigua and Barbuda - Belize - Dominican republic - Mozambique - Saint Kitts and Nevis - Saint Vincent and the Grenadines - Vanuatu - Zimbabwe

Lomé IV (1990) Equatorial Guinea - Haiti

Lomé IV revised (1995) Eritrea – Namibia - South Africa

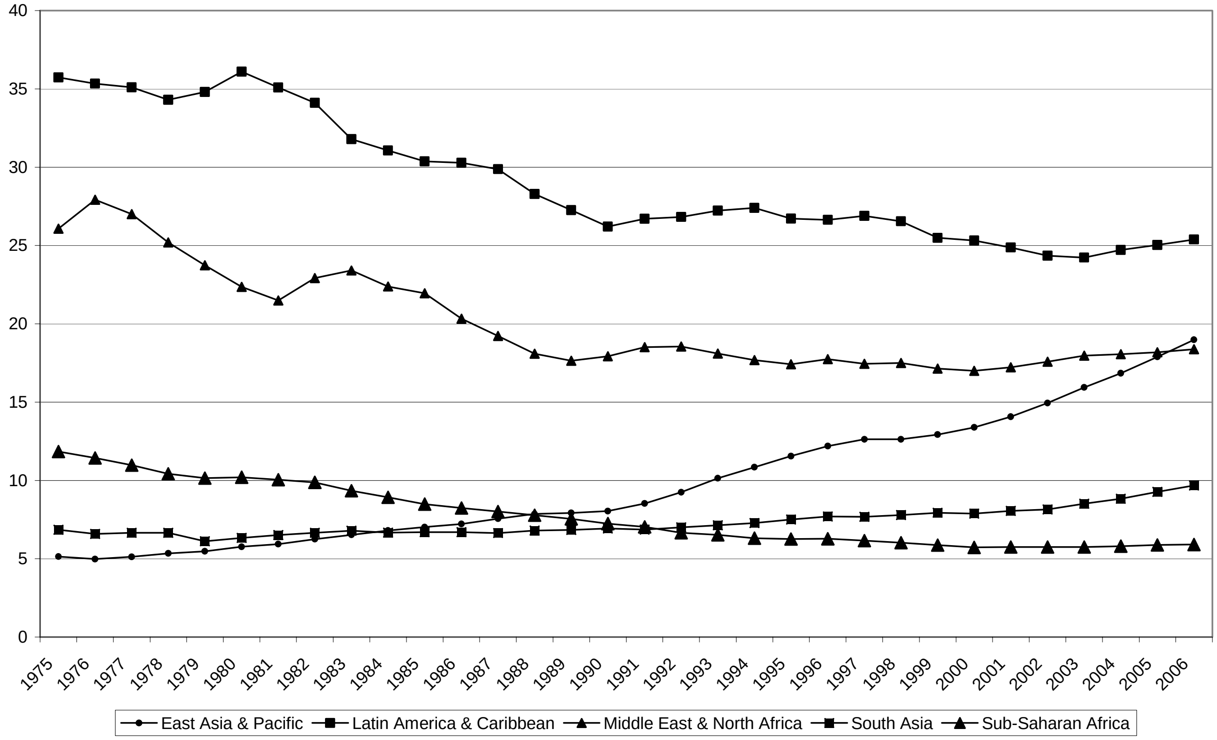
Cotonou (2000) Cook Islands - Marshall Islands - Federated States of Micronesia - Nauru - Niue - Palau

Source: European Commission (2007)

Table A8 Pairwise correlation coefficients

	lnclo	lnpop	lnman	lntex	airdi	lnmanw	lngdp	coast	ininf	MFA	lnkap	schoo	lnara
lnclothshare	1,00												
lnpopshare	0,50	1,00											
lnmanshare	0,89	0,67	1,00										
lntextshare	0,80	0,76	0,90	1,00									
airdist	-0,47	-0,13	-0,52	-0,43	1,00								
lnmanwage	0,48	-0,16	0,48	0,25	-0,38	1,00							
lngdpdist	0,48	0,12	0,48	0,38	-0,70	0,42	1,00						
coastal population	0,39	-0,04	0,39	0,21	-0,46	0,37	0,34	1,00					
lninfrastructure	0,52	-0,19	0,48	0,30	-0,51	0,65	0,64	0,49	1,00				
MFA	-0,03	-0,12	-0,10	-0,10	-0,11	-0,16	0,21	0,08	0,29	1,00			
lnkaplabor	0,63	-0,19	0,60	0,37	-0,48	0,87	0,61	0,48	0,95	-0,01	1,00		
schoolyears	0,60	0,02	0,59	0,40	-0,38	0,68	0,55	0,48	0,87	0,16	0,81	1,00	
lnarable	0,07	0,41	0,12	0,26	0,06	-0,05	-0,16	-0,33	-0,20	-0,21	-0,03	-0,05	1,00

Diagram 1. GDP per capita, PPP (% of OECD)



Source: World Bank (2007).

Table 1 Blundell-Bond system regressions with successive less quadratic terms included. *Dependent variable: Ln Clothing Share*

	1.maximal	2.	3.	4.	5.	6.
Lagged lnclothshare	0.537***	0.550***	0.550***	0.458***	0.453***	0.444***
	(0.114)	(0.111)	(0.107)	(0.116)	(0.119)	(0.110)
Lnpopshare	-0.277**	-0.293**	-0.279**	-0.306**	-0.298**	-0.276**
	(0.132)	(0.133)	(0.121)	(0.123)	(0.118)	(0.119)
Lnmanshare	0.554***	0.549***	0.528***	0.646***	0.640***	0.620***
	(0.155)	(0.148)	(0.144)	(0.154)	(0.151)	(0.146)
Lntextshare	0.153**	0.157**	0.162**	0.171***	0.175***	0.183***
	(0.063)	(0.062)	(0.063)	(0.063)	(0.064)	(0.065)
Airdist	-0.033	-0.019	-0.023	0.099***	0.101***	0.090***
	(0.131)	(0.127)	(0.124)	(0.032)	(0.031)	(0.030)
airdist2	0.012	0.011	0.011			
	(0.013)	(0.013)	(0.012)			
Lnmanwage	-0.659	-0.735	-0.682	-0.910	-0.869	-0.167**
	(0.470)	(0.488)	(0.501)	(0.545)	(0.526)	(0.083)
lnmanwage2	0.031	0.036	0.033	0.044	0.041	
	(0.026)	(0.027)	(0.028)	(0.030)	(0.029)	
Lngdpdist	14.426**	13.791**	13.105**	12.953**	12.866**	12.730**
	(5.758)	(5.586)	(5.459)	(5.303)	(5.100)	(5.007)
lngdpdist2	-0.319**	-0.303**	-0.288**	-0.283**	-0.281**	-0.279**
	(0.129)	(0.125)	(0.122)	(0.118)	(0.114)	(0.112)
coastal population	0.000	0.001	0.004	0.005*	0.004*	0.004*
	(0.009)	(0.009)	(0.003)	(0.003)	(0.002)	(0.002)
coastal population2	0.000	0.000				
	(0.000)	(0.000)				
lninfrastructure	-0.139	-0.103	-0.087	-0.102	-0.160*	-0.144
	(0.231)	(0.216)	(0.223)	(0.231)	(0.089)	(0.088)
lninfrastructure2	0.002	-0.004	-0.005	-0.008		
	(0.031)	(0.028)	(0.029)	(0.028)		
MFA	-0.041	-0.056	-0.075	-0.213	-0.218	-0.239
	(0.180)	(0.169)	(0.159)	(0.191)	(0.188)	(0.162)
Lnkapworker	1.343*	1.360**	1.324**	1.903**	2.035***	1.865***
	(0.680)	(0.670)	(0.658)	(0.777)	(0.695)	(0.626)
Lnkapworker2	-0.073**	-0.076**	-0.074**	-0.103**	-0.109***	-0.100***
	(0.035)	(0.034)	(0.033)	(0.039)	(0.035)	(0.032)
Schoolyears	0.157	0.141	0.136	0.143	0.168*	0.167*
	(0.111)	(0.104)	(0.100)	(0.088)	(0.095)	(0.088)
Schoolyears2	-0.011	-0.010	-0.009	-0.009	-0.011*	-0.010*
	(0.009)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)
Lnarable	0.029	0.047	0.031	0.042	0.042	0.029
	(0.099)	(0.057)	(0.046)	(0.046)	(0.044)	(0.046)
lnarable2	-0.000					
	(0.011)					
Constant	-166.028**	-159.511**	-151.749**	-152.630**	-152.467**	-152.651***
	(64.393)	(62.601)	(61.406)	(60.323)	(58.201)	(57.071)
Observations	1128	1128	1128	1128	1128	1128
Number of country2	61	61	61	61	61	61

Robust standard errors * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2. Main Blundell-Bond system regressions.
Dependent variable: Ln Clothing Share

	OLS levels	within groups	ABond diff	ABond system	iv textile
Lagged lnclothshare	0.912***	0.813***	0.722	0.445***	0.381***
	(0.021)	(0.040)	(2.661)	(0.110)	(0.100)
lnpopshare	-0.100***	-0.498***	-0.437	-0.276**	-0.533***
	(0.029)	(0.183)	(0.451)	(0.119)	(0.185)
lnmanshare	0.131***	0.348***	0.783***	0.620***	0.422**
	(0.030)	(0.075)	(0.183)	(0.146)	(0.170)
lntextshare	0.059***	0.106*	0.167	0.183***	0.576***
	(0.015)	(0.054)	(0.126)	(0.065)	(0.176)
Airdist	0.016	0.000		0.090***	0.092**
	(0.010)	(0.000)		(0.030)	(0.036)
lnmanwage	-0.093**	-0.027	-0.076	-0.168**	-0.161
	(0.038)	(0.042)	(0.252)	(0.083)	(0.114)
lngdpdist	1.570	3.876**	12.680	12.556**	13.268***
	(1.501)	(1.890)	(20.030)	(4.961)	(4.579)
Lngdpdist2	-0.034	-0.079*	-0.264	-0.275**	-0.290***
	(0.033)	(0.043)	(0.425)	(0.111)	(0.102)
coastal population	0.001**	0.000		0.004*	0.003
	(0.001)	(0.000)		(0.002)	(0.003)
lninfrastructure	-0.038	-0.069	-0.260	-0.143	-0.166*
	(0.032)	(0.054)	(0.759)	(0.088)	(0.092)
MFA	0.024	-0.272***	0.000	-0.239	-0.068
	(0.049)	(0.059)	(0.000)	(0.162)	(0.259)
lnkapworker	0.355*	0.342	0.114	1.863***	1.480
	(0.191)	(0.515)	(20.075)	(0.626)	(0.992)
lnkapworker2	-0.020**	-0.034	-0.042	-0.100***	-0.084
	(0.009)	(0.025)	(0.936)	(0.032)	(0.052)
schoolyears	0.032	0.215***	-0.224	0.167*	0.262**
	(0.024)	(0.079)	(1.034)	(0.088)	(0.123)
schoolyears2	-0.002	-0.013***	0.014	-0.010*	-0.013*
	(0.001)	(0.004)	(0.084)	(0.006)	(0.007)
Lnarable	0.013	0.175**	0.029	0.029	-0.018
	(0.010)	(0.079)	(0.631)	(0.046)	(0.040)
Constant	-19.025	-47.936**		-150.688***	-158.130***
	(17.800)	(21.159)		(56.530)	(51.656)
Observations	1162	1162	1073	1128	1128
R-squared	0.980	0.824			
Number of country2		61	61	61	61

Robust standard errors * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3. Robustness test of the Blundell-Bond system regressions.
Dependent variable: Ln Clothing Share

	institutions	developing	impduty	time_ dummies	iv_textil_ arable
Lagged lnclothshare	0.507***	0.457***	0.594***	0.689***	0.378***
	(0.128)	(0.097)	(0.123)	(0.084)	(0.098)
lnpopshare	-0.273**	-0.336**	-0.308**	-0.232**	-0.529**
	(0.109)	(0.133)	(0.129)	(0.103)	(0.217)
lnmanshare	0.584***	0.653***	0.513***	0.428***	0.480**
	(0.153)	(0.146)	(0.142)	(0.124)	(0.198)
lntextshare	0.165**	0.189***	0.169***	0.130**	0.527**
	(0.074)	(0.067)	(0.063)	(0.059)	(0.240)
Airdist	0.086***	0.095***	0.081**	0.097	0.099**
	(0.031)	(0.034)	(0.032)	(0.066)	(0.038)
lnmanwage	-0.165**	-0.203**	-0.139	-0.128	-0.162
	(0.080)	(0.092)	(0.087)	(0.092)	(0.122)
lngdpdist	12.742**	11.349**	9.715**	16.930	13.407***
	(5.061)	(4.400)	(3.974)	(13.111)	(4.777)
Lngdpdist2	-0.279**	-0.246**	-0.211**	-0.372	-0.292***
	(0.112)	(0.098)	(0.088)	(0.288)	(0.107)
coastal population	0.003*	0.004	0.004*	0.003**	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
lninfrastructure	-0.167	-0.150	-0.064	-0.161	-0.165
	(0.103)	(0.090)	(0.082)	(0.105)	(0.106)
MFA	-0.237			-0.178	-0.081
	(0.154)			(0.124)	(0.318)
Developing		-0.001			
		(0.168)			
Impduty			-0.002		
			(0.003)		
lnkapworker	1.895***	1.393***	0.891**	1.224**	1.575
	(0.637)	(0.517)	(0.436)	(0.498)	(1.053)
lnkapworker2	-0.100***	-0.075***	-0.054**	-0.066***	-0.090
	(0.032)	(0.027)	(0.021)	(0.024)	(0.057)
schoolyears	0.132	0.143	0.098	0.094	0.243*
	(0.088)	(0.086)	(0.085)	(0.075)	(0.125)
schoolyears2	-0.007	-0.008	-0.006	-0.005	-0.012
	(0.006)	(0.005)	(0.006)	(0.005)	(0.007)
Lnarable	0.032	0.073	0.055**	0.019	
	(0.043)	(0.044)	(0.026)	(0.035)	
institutions	0.003				
	(0.016)				
Constant	-152.924**	-135.457***	-114.293**	-196.914	-160.426***
	(58.146)	(50.068)	(45.061)	(149.805)	(53.923)
Observations	1079		963	1128	1128
Number of country2	61		57	61	61