Growth Effects from Trade Diversification in The East African Community

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Abstract

The purpose of this thesis is to investigate the relationship between trade diversity and growth in the East African Community. This was done by measuring different levels of diversification in exports and further test if they could contribute to explaining the different growth levels between member countries. Using data collected for the five member countries; Burundi, Kenya, Rwanda, Tanzania and Uganda over a thirteen year period, the tests investigated whether the traditional growth models, with the assumption of unconditional convergence, could explain the different growth rates or if there seemed to be other underlying structures that can't be explained through these models. A sign of divergence in growth was found indicating other explanatory variables than used in traditional models. Further adding measures of export diversity, a correlation between export diversity and GDP per capita growth was found.

Keywords

Export diversification, extensive margin, East African Community, growth divergence.

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1 Introduction

Diversification as a development objective is important because it widens opportunities for development in several sectors instead of focusing on one or a few branches of production. The natural causalities are growth, creating possibilities as diversification. By breaking in to new markets, either with new products or into new geographical regions, the productivity can increase, rising opportunities to value-added production creating higher revenues. Also, it can through more diversified trade relationships create stronger hedge for volatility on demand in international trade and macroeconomic relations (Newfarmer et al, 2009, p56).

The benefits of diversification to trade are, as mentioned, likely to have a positive effect in many areas. In this paper I study whether the relationship between growth and trade further can be linked into a relationship between growth and export diversity. When observing export patterns in regards to diversity a recognized method is to divide changes in export growth into different categories where the extensive margin is the new products exported and thus is the one that contributes to export diversity. The other main category is the intensive margin showing the part of export growth that is accounted for by growth in already established export markets.

Even though different studies argue on the causal relations to export growth, there are studies claiming that a larger part of the export growth is due to extensive margins of trade. The differences between the results of these studies are most probably due to different levels of aggregations in data and also because of different kinds of regression models (cross sectional vs. time series) (Newfarmer et al, 2009, p61). Either way, most studies seem to conclude that there is a relatively large extensive margin contribution to export growth in Sub Saharan Africa (Brenton & Newfarmer, 2007), which implies that the extensive margin could have a significant effect on SSA in comparison to other regions. With this said, the main purpose of this paper is to investigate how trade diversification has been affecting growth between countries in this region to further learn about policy implication opportunities to export growth.

In this thesis I use product level data to identify differences in the diversification patterns, focusing on extensive margins of trade, trying to identify a relationship between trade patterns and growth in the East African Community.

I have through a study in growth theory investigated the correlation between export diversity and economic growth in the members of the East African Community during the period 1997 - 2010. Whilst building a simple framework for testing a linear regression I have tried to find empirical results on correlation between growth and trade diversity in this region using different measures of trade diversity, primarily using the extensive margin of trade representing trade diversification patterns. The data on GDP has been retrieved from the Penn World Tables database and is used to create a sliding average on growth for different lengths of time. Further on I create measures on export diversification using trade theory to divide trade growth into different margins, focusing on the level of export diversity and the extensive margin of trade. The data for creating this measure is retrieved from the COMTRADE database and I have used the product classification SITC Rev. 3 (Standard International Trade Classification, Rev. 3), this being the data classification giving me the most observations available over the time period with as highly aggregated data as possible.

From this introduction the thesis continues in section two with a short presentation and background of the observed area. Section three and the two following sections present the literature on which I lay my foundation for this thesis. Here section three presents growth models and how they can be used to involve different aspects of trade. Section four presents the subject of diversification and trade and in the fifth section, trade, diversity and growth are linked together creating arguments for the unity I proceed to work with. This is followed by the data in section six. Here the data is presented and further I present how the data is handled to create different measures on export diversification and growth. This data is later applied in the empirical analysis of section seven, merging the theoretical models with our collected measures of diversification and growth. This is followed by the conclusion discussing results from the empirical analysis, including possibilities for further research.

2 Background: Integration in East Africa

I have chosen a geographical region for my study with developing countries facing a similar integration process regionally and globally. Since 2001 the countries together also form the East African Community. This was initiated by the republics of Kenya, Uganda and Tanzania and was a revival of the East African Cooperation between the three countries that collapsed in 1977 after having existed for ten years. Five years after the revival, in November 2006, Rwanda and Burundi were accepted as members creating the East African Community as it is today (Katembo, 2008, p2). Comparing the export patterns between the different countries could tell something about causalities of trade. This thesis will investigate the extensive margins of trade within the East African Community, studying differences at product level between the countries' progress in breaking in to new markets and maintaining the survival of new exports.

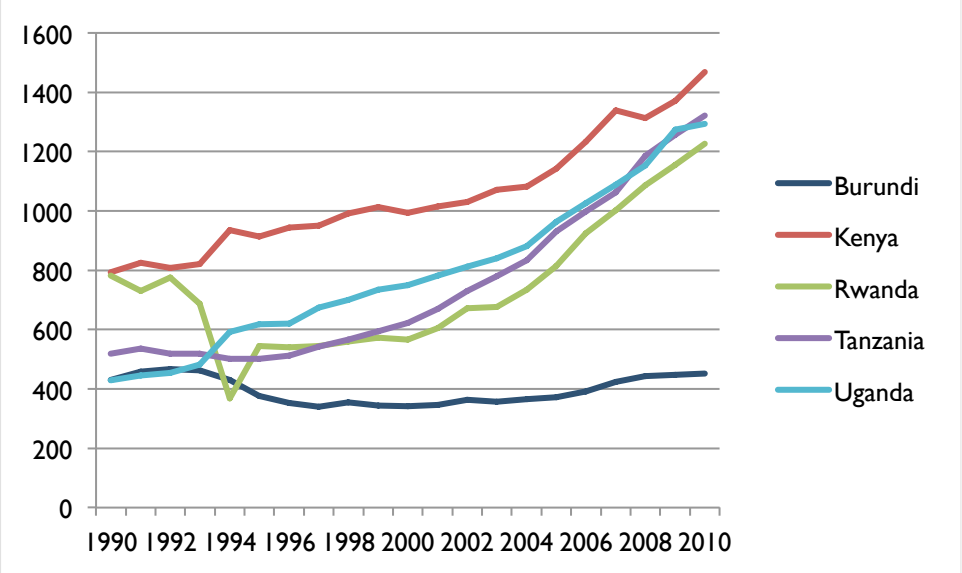

Figure 2.1. PPP Converted GDP Per Capita, G-K method, at current prices (in I$). Source: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 7.1, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, July 2012.

Figure 2.1 provides an overview of the BNP per capita development in the different countries of the East African Community over the period between 1990 and 2011. As shown, despite the geographical similarities of the different countries, the countries vary in growth. Kenya has since the late eighties been the wealthier nation but with lower growth rate in comparison with Tanzania catching up over the period. Uganda has had similar growth rates to Tanzania, starting at a lower level in 1990. Rwanda started in 1990 with similar GDP/capita level as Kenya but suffered from the genocide in 1994. Meanwhile, Burundi has suffered from political instability during most of the period and is the only country in the study with virtually the same GDP/capita as from the start in 1990.

3 Growth And Trade

The topic of differences in growth between countries is widely covered and there are different views on growth regarding how countries will progress in comparison to each other. Arguments for possible effects on growth will through theory be presented further on in this section to create a greater understanding of the differences between countries and how they work together with the view of trade and growth. Further on a view on the relationship between trade and growth will be presented with a further analysis on trade diversification.

But first of all, two different assumptions in growth models; the basic difference between the two hypotheses is that they have a different outcome in the aspect of country relations. The traditional growth theory is built on assumptions that will make countries per capita income levels converge to the same level after closing up to each other for some time. Further this theory is developed, based on an endogenous growth in technology or openness to trade and instead argues for that the differences in countries income and productivity itself may contribute to even larger differences between countries in long-term growth.

3.1 Traditional Growth Models

The traditional growth model is built on assumptions making countries income levels close up over time, due to economic restrains making growth decrease over time. In the traditional growth model we start with two assumptions, one is that there are constant returns to scale, meaning that if all inputs are doubled the output will also double (Jones, 2002, p 22). The other is that there are diminishing returns to capital meaning if only one of all the inputs increase, the productivity per increased input will decrease since the new input doesn't have all resources to be as productive as if all inputs would increase. In other words: for all capital we give to a worker, the productivity for each unit of capital we give would increase the output of that worker by less and less (Jones, 2002, p 23). With these assumptions, capital investment without increase in other inputs will create a higher level of total production but a lower level of productivity per capital. This is important in our view of traditional growth theory and is the reason for restricted growth possibilities over time.

The simplified traditional model for GDP per capita y, is explained by the input factors capital, K and labor L. Income per capita is: $y = \frac{Y}{L}$. Here Y is total GDP. Further the model is built on a Cobb-Douglas production function:

$$y = f(k) = K^{\alpha}L^{1-\alpha},$$

and capital labor ratio is referred to as k=$\frac{K}{L}$.

This model explains the relationship between capital and labor. And here, α is a number between 1 and 0. The model assumes constant returns to scale. Further the model is built on capital accumulation and the function for physical capital accumulation tells us that the derivate of physical capital in respect to time is the difference when subtracting capital depreciation (dk) from investments (I). Thus the physical capital increases as long as the investments are higher than depreciation of capital (Jones, 2002, p23). Further, if we assume that investment equals total savings and that total savings is proportional to income, this gives us:

$$I = sy = sK^{\alpha}L^{1-\alpha}$$

Where I is investments and sy is the savings rate given the income y, sy is expressed as percentage of income per capita. And according to growth theory, in the Cobb-Douglas production function, output per worker is:

$$y = k^{\alpha}$$

Since α is less than one, output per worker will increase by less and less for every increase in k. To further study the per capita income levels we need to consider the population growth, defined as: $n = \frac{\Delta L}{L}$, here ΔL is the change in labor over time. When studying the change in physical capital considering population growth and depreciation of capital, where Δk is the change in capital labor ratio, we get that:

$$\Delta k = sy - (n + d)k$$

With this model we can illustrate the relationship in the Solow diagram: 3.1

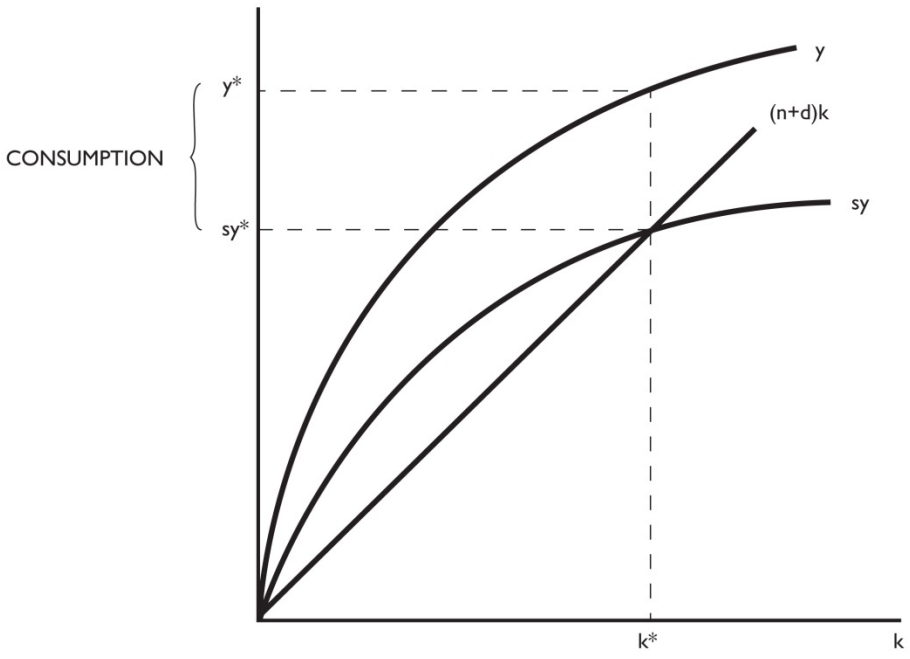

Figure 3.1. The Solow diagram.

Here, sy is the amount of investments per capita. (n+d)k, where k is capital labor ratio, n is the population growth rate and d is the depreciation rate of capital. Thus the line (n+d)k explains the amount of investment per person required to obtain the amount of capital per capita. So when sy is lower than (n+d)k the investments are larger than necessary which keeps k and thus y growing until the gap between actual investments and the "necessary" disappears. So for the steady state level of capital per worker we get

$$\Delta k = 0; 0 = sy - (n + d)k.$$

This leaves us with capital, i.e. capital per capita, as the only explanatory variable for growth and since there are diminishing returns to capital, there comes a point where capital investment no longer increases in output. This theory explains the differences in growth between countries as a result of differences in capital per capita. With low levels of capital per capita you would have a higher pace of growth per capital investment since diminishing of return means that the marginal product of capital is higher for lower capital per capita and in the long run catches up with high capital stock countries. In the classical theory, variables for technology or human capital can also be included. In this case productivity can increase without a rise in capital stock, but the model is still based on the assumption that there is a diminishing return to capital. This implies that there is only one difference between regions - the production volume. The lower production volume the greater possibilities for growth since there is more potential in newly invested capital for production (Gullstrand, Hammarlund, 2007, p73f). In addition, there is the assumption of technology being exogenous. Technological change is in other words not accounted for in this model, but this can be included in the traditional model. When including technology in the traditional growth model the variable is simply added to the production function affecting K and/or L making them more or less productive.

$$Y = f(k) = AK^{\alpha}L^{1-\alpha}$$

This will not change the pattern in figure 3.1. The difference is that you now can take levels of technology into account when creating a model but these levels of technology will be exogenous in this type of model leaving the savings rate or the technological progress unexplained and it will still exhibit diminishing returns to capital. This means that a change in technology wouldn't change the pattern showed in figure 3.1 but only move the patterns to different levels creating another steady state. The model based on unconditional growth takes its point of departure in the following capital accumulation per capita:

$$\Delta k = sy - (n + d)k$$

Combining this equation with the per capita production and adding technology, A, leaves us with:

$$\Delta k = sAk^{\alpha} - (n + d)k.$$

Finally, by dividing both sides with k we obtain a formal expression of capital growth per capita (γk):

$$\gamma k = \frac{\Delta k}{k} = sAk^{\alpha-1} - (n + d).$$

Since the growth of y is proportional to the growth of k, this equation also describes per capita income growth rates. Further, assuming that structural parameters s, n and the level of technology, A are constant over time. This would imply that countries with lower capital labor ratio, k, will grow faster than countries with high capital labor ratio.[1] Thus according to this theory, nations with different levels of GDP per capita will converge over time (Arbia, 2006, p10). In order to test for convergence, the pace in which an economy is moving towards the steady state:

[1] Further derivations from this model to the following equations can be found in Arbia, 2006, p 11f.

$$b = (1 - \alpha)(d + g + n),$$

where g is the constant growth rate of the technological term A, is estimated following (Gullstrand, Hammarlund, 2007, p155):

$$\ln\left(\frac{gdpc_{i,t}}{gdpc_{i,0}}\right) = \alpha + \beta lngdpc_{i,0} + \varepsilon_{i,t},$$

where $\text{gdp}c_{i,t}$ is the value for GDP per capita in period T, and $\text{gdp}c_{i,0}$ is the value of GDP per capita the initial year.

Through the estimated value of β we can then retrieve the value of unconditional convergence, b accordingly:

$$b = -\ln(1 + \beta)/T.$$

Through b we can then draw conclusions about the assumption of unconditional convergence and evaluate whether this is applicable to the observed data. b shows us the pace of movement towards steady state and for all b>0 there is unconditional convergence, meaning poor regions will catch up to richer regions eventually converging into the same level of GDP. The traditional model with exogenous technology predicts unconditional convergence in growth between countries although this does not always seem to fit well with empirical observations. It may however be that countries converge conditionally to different levels due to differences in underlying economic structures giving countries other conditions for growth (Gullstrand, Hammarlund, 2007, p74). One such structure that might contribute to growth is export diversification. In other cases the differences in growth could be constant or diverge further. If this assumption was valid, there would be other variables affecting the growth rate. An equation for studying conditional growth through adding explanatory variables is:

$$\ln\left(\frac{gdpc_{i,t}}{gdpc_{i,0}}\right) = \alpha + \beta lngdpc_{i,0} + \sum_t \delta_t Z_l + \varepsilon_{i,t},$$

where δ is a third parameter that will be tested given the variables in Z. This model is used studying conditional growth where economies are not assumed to converge to the same level of income per capita but to different levels depending on other economic structures than capital labor ratio. (Gullstrand, Hammarlund, 2007, p155).

4 Trade Diversity And The Extensive Margin

In the late 1970's early 1980's Paul Krugman presented a new trade model creating the foundation of new trade theory. This model is important for further developing our theoretical framework. It was a new equilibrium model for estimation of trade patterns called the monopolistic competition model (Krugman, 1980). This model was later criticized for not taking into account the problem of heterogeneity and sunk costs. Several years later in a paper by Melitz from 2002 the model is further developed to regard the problems of heterogeneity and sunk cost (Melitz, 2002).

Melitz expands the monopolistic competition model of Krugman by including two types of trade frictions. The first friction is a per-unit cost (or variable trade cost), and the other friction is a fixed cost for firms starting to export. Hence, this model shows that an integration process may lead to an expansion in trade due to two different margins. First, the extensive margin of trade (i.e. new firms, products or markets) due to that a reduced cost of trade makes it possible for firms with lower productivity to enter the export market. Second, the intensive margin of trade (i.e. an expansion of already established trade flows) increases as trade costs falls.

With new ground created by Melitz 2002 regarding the reallocation of firm activity within intra industry firms as an effect of trade, Amurgo-Pacheco & Denisse-Pierola (2008) and Baldwin & Di Nino (2006) further explored the microeconomic view of trade by dividing export diversification into the intensive and extensive margins of trade. This is a new way of studying export patterns and

the different margins may have different implications depending on the context. The results from this research argue for different importance for total trade expansion between the extensive and intensive margin, although the different publications argue for different patterns. These different margins are identified as followed; intensive margin of trade growth refers to products already exported, these are referred to as "old products" that hasn't been exported before, versus the "new products", not only referring to products that didn't exist before but also to existing export products that are new to the exporting country's production structure (this would be the extensive margin) (Klinger, Lederman, 2006, p1). This division is later developed further in a publication by Amurgo-Pacheco & Denisse-Pierola (2008) where a geographic dimension is added. This considers whether the product has been exported to the geographic region before, in which it would belong to the intensive margin, versus if it hasn't been exported to this region before. This creates two dimensions, new versus old products, and new versus old destinations. Criteria for belonging to the intensive margin is fulfilling the dimension of old products to old destination. In the extensive margin everything is new, i.e. new products to new destinations, old products to new destinations and new products to old destinations (Amurgo-Pacheco, Denisse-Pierola, 2008, p4).

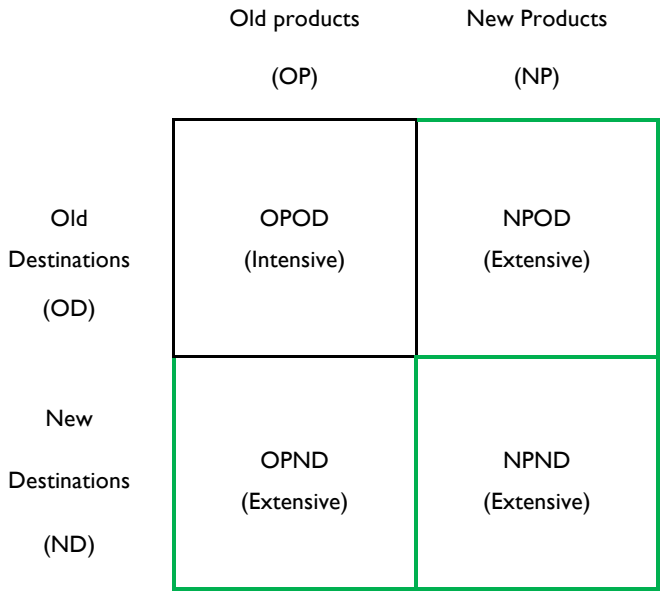

Figure 4.1 from (Amurgo-Pacheco & Denisse-Pierola, 2008) shows the different criteria that should be matched to place them in different categories.

As you can see in figure 4.1 all new export patterns will be considered extensive margin. Further research based on this theory is divided into emphasizing the importance of either intensive margin or extensive margin. Several publications agree that the intensive margin of trade is accountable for the largest factor of export growth. Most of the time series data tells us that the intensive margin is larger than the extensive margin in export growth for both developed and developing countries but SSA seem to separate itself from the rest of the world on this subject having a higher extensive margin contribution to trade growth than other areas, some times as high as intensive margin (Newfarmer et al, 2009, p5).

5 Trade, Diversity And Growth

A study by Imbs and Wacziarg (2000) investigates the relationship between sectorial concentration and per capita growth in an economy. This is not a study about trade diversification, but about diversification in production. It shows that during an economy's development path, in line with an increased income per capita economies grow through two different stages of diversification. It has for a long time been argued that, although developing countries mainly concentrate production in specializing in exploiting natural resources, it could be profitable to diversify into a larger number of productions to dampen aggregate effects of sector specific chocks. This implies a negative relationship between concentration in production and per capita income. On the other hand, rich countries tend to specialize in some productions contributing to a larger amount of GDP (Imbs, Wacziarg, 2000, p63). The empirical results from this study show a U-shaped pattern between diversification and income per capita implying that during the development path, the direction of production pattern changes. In low levels of income per capita, the rise in income seems to correlate with an increase in production diversification, up to a certain point. After this level, production seems to lower in levels of diversity again concentrating its production. (Ibs, Wacziarg, 2000, p64)

Both when studying trade diversification and production diversification, the literature seem to flourish separately from growth. Nevertheless both these factors are quite similar in patterns over time and as implied earlier they could have similar effects on development.

Since the birth of development economics the causality between growth and trade has been a topic of interest. In 1950 a paper by Paul Prebisch was presented emphasizing the importance of diversifying traded goods from primary products to manufactures in Latin America in order to gain purchasing power (Prebisch, 1950). The paper made an impact on policy-making in developing countries and diversifying into manufactures has been a major objective in policy-making for developing countries since. A problem with this view has been the concentration of a few produced goods that often are commodities with a high volatility on demand. This in turn creates high instabilities on the market causing income and growth volatility (Amurgo-Pacheco, Denisse-Pierola, 2008, p2). Later, Paul Krugman presented a new trade model creating the foundation of new trade theory and recently new questions regarding the importance of export diversification have risen. In a paper by Melitz (2002) a theoretical framework was created explaining the microeconomic perspective of trade diversification further. With the paper by Melitz, new focus emerged and Amurgo-Pacheco & Denisse-Pierola (2008) further explores the microeconomic view of trade and explores the different margins of export diversification - the intensive and extensive margins of trade.

In this study the extensive margin of trade is the main interest since it can be viewed as a measure of growth in export diversification. Extensive margin is the rise of new export in an economy and is here used as an index of the direction in trade diversity.

So, traditional theory tells us that a country's growth rate depends on the level of investments and the productivity of investments. There are three main theories of growth; the traditional growth theory presented in the previous section, the models of endogenous growth (which is also mentioned briefly), and the learning-by-doing models. All of these models can be developed to include trade.

In the endogenous model technology is endogenous and thus decided within the model. When linking trade and technology economic integration may affect growth by changing incentives to R&D investments through knowledge spillovers, market size effects and competition effects. In the learning-by-doing model the contribution to growth comes through increase in total factor productivity due to by-products of production activities and patterns of specialization which both can be stimulated through an increase in exports and an increased market size (Donaldson, 2011).

In the traditional trade theory, when in autarky, the investment rates changes with the stock of capital. But due to the assumption of diminishing returns the investments become less and less productive the more capital that is invested. This is why absolute convergence is shown in these models, i.e. poor countries will grow faster than rich countries once differences in labor productivity are controlled. However, when including trade to the model the law of diminishing returns is only consistent with the world average. Here, the investments are equally productive in each economy at any given time. A more diversified economy may however escape the trap of diminishing returns since it's possible to upgrade and change the production mix to more capital-intensive goods (Ventura, 1997, p80).

So, the prediction that if there are diminishing marginal returns to capital, different labor capital ratios will lead to different growth rates, can be overturned with an open economy.

6 Data

Data has been collected for the five members of the East African Community using the UN COMTRADE database and the time frame for the study is the years 1997 - 2010. The data used was exports from each member country to the rest of the world. The reason for this quite narrow time frame is the lack of data for some of the countries chosen to study before the year of 1997 as well as the lack of data after 2010. Despite this short time period enough observations have been retrieved to continue the study. Unfortunately different time frames have not been able to be

used to compare results and thus a similar outcome using another observation period cannot be guaranteed. From a microeconomic perspective the preferred dataset would consist of firm level export data. Since these are not available less disaggregated data has been used, here using the SITC Rev. 3 classification. More highly disaggregated data such as the Harmonized system from COMTRADE could be used, however this classification was chosen to maintain the same product classification over the years, avoiding problems with transforming products specifications when converting between different classifications over the time period. Data aggregated on a 4-digit level was used which gave between 1024 and 700 observations for each country and year. To avoid interference with price changes over the years, focus was on the quantity of the products exported rather than their actual value, this to avoid differences in price change and so will help us study the actual effect of increased exports.

The observation period is shorter than was intended due to some of the countries' lack of data in the COMTRADE database for this classification. Since we watch a series of observations over time the outcome of any other starting point in time could give another outcome. This could not be tested since there was a lack of data around the period of this study making it impossible to start the period earlier, later or over a longer period. Another lack of observations has been found within the time series. Missing for Rwanda is the year of 2000, to get around this problem it was replaced with the mean value of the observations before and after. Other missing observations are from Burundi in the year of 2003 where the same approach was applied, replacing with the mean of surrounding observations. Simultaneously the other part of the value after the missing year will be considered intensive

An additional point to make is the fact that the level of aggregation on our data SITC. Rev. 3 is not fine enough to observe individual products. Some products might start exporting without being detected since they fall under a category with other products already being exported. The only new exports observed is thus where export in categories switch from zero to a positive value. For this reason our collected data underestimates the value of new exports.

6.1 Number of Zeros

When studying export diversification and the extensive margin the number of zeros in the trade matrix can be an interesting observation. When a zero changes to a positive, it means that a new product is being traded. There are different ways in retrieving the extensive margin but the simple trend for an increase in extensive margin, and as a result export diversification, is created by a downward sloping trend in the number of zeros. To plot a visual overview between the correlation of export diversification and growth, the number of zeros can thus be observed. The total number of products available in the survey includes every product exported from the area during this period.

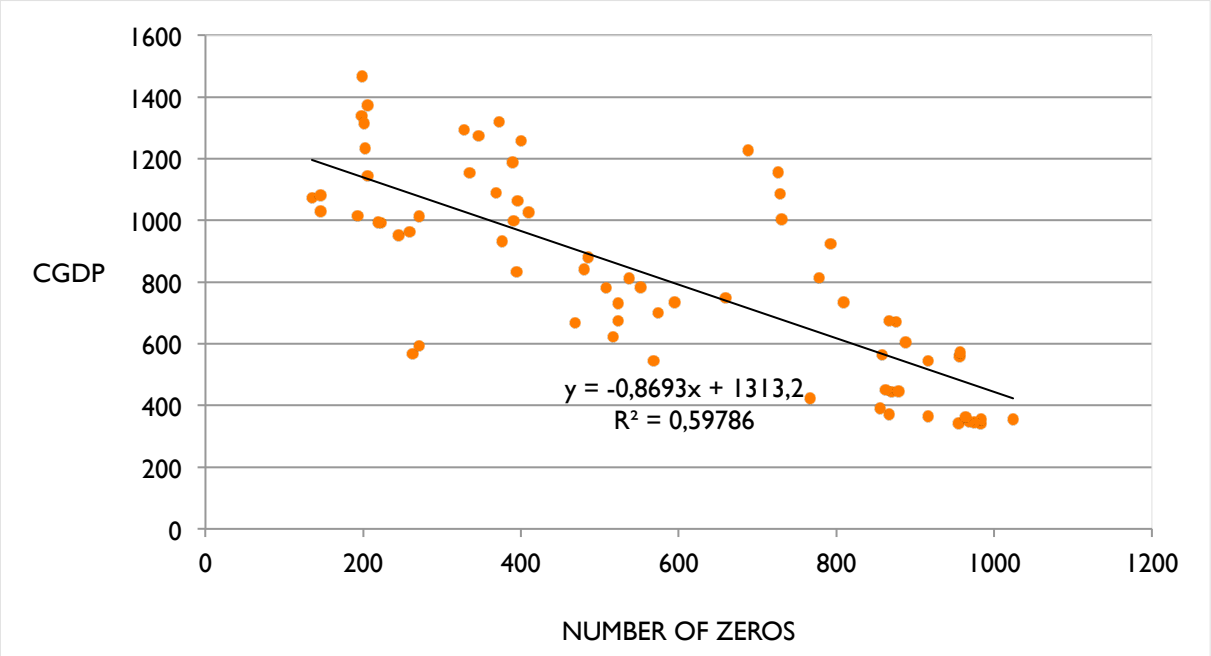

Figure 6.1. On Y axis show: Number of zeros in exports, using all product classifications registered as exported over the period. In SITC.Rev3. COMTRADE-data

On X axis show: PPP Converted GDP Per Capita, G-K method, at current prices (in I$). Source: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 7.1, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, July 2012

We also see a correlation between growth-rate/GDP level and decline in zeros when comparing countries. Burundi has the lowest level of GDP and the highest number of zeros while Kenya has the highest level of GDP and the lowest value of

zeros. Over all, the different patterns indicate that countries with a more diversified export have a higher level of GDP per capita or the other way around. This indicates on correlation between export diversity and growth.

6.2 Herfindahl Index

Another way of measuring export diversity is through the Herfindahl index, most commonly used to study competition. It is also commonly used when studying production diversity as in the case of Imbs & Wacziarg, 2000. Since there are reasons to believe there is some kind of resemblance between production diversity and export diversity, and the fact that this method occasionally is applied in some studies to measure export diversification (Newfarmer et al, 2009, p55), this model is used:

$$H = \sum_{i=1}^{N} s_i^2.$$

Here s is the market share of product i creating values between 1 and 1/N; N being the total number of products in the market. Since we use the sum of squared market shares a Herfindahl index closer to 0 indicates a high export diversity. Plotting calculations of the retrieved Herfindahl index from our collected data gives us the following chart:

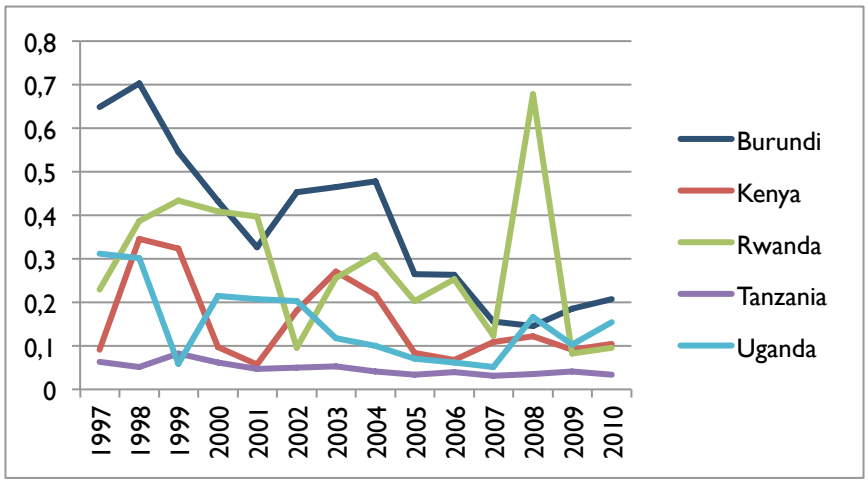

Figure 6.2. Herfindahl index using ln SITC.Rev3. COMTRADE-data

6.3 Extensive Margin

6.3.1 Short-term Measures

In the first testing extensive margins were labeled the easiest way possible, that is, if a product observation equals zero in the export-matrix, i.e. was not exported in $Year_{t-1}$, but shows a positive quantity of export in the observation for $Year_t$, the product was considered extensive margin. Simultaneously all products with reported exports in $Year_{t-1}$ with an increase in export quantity the following year was considered intensive margin. All observations that in this case weren't considered extensive margin was here considered intensive margin. This is not a fair measure of intensive margin since it includes the decline of exports in making the intensive margin smaller than it in fact would be. Since the main focus for this study was diversity this wasn't considered interfering with the results of our main interest - the extensive margin. When measuring diversification in this way the extensive margin is accounted for a relatively small part of exports since the only credited year for extensive exports is the initial year a new export is emerged. A consideration here could be creating a criterion including some of the following years allowing for new products to grow stable and contribute in higher levels of data. Thus another measure was created counting every observation containing a zero within the previous three years. This would give a higher value for extensive margins since the same product can be credited several years in a row, which wasn't possible in the previous method. A problem with this approach is the presence of one-year export deaths or a lack of observations; in this case exports would be wrongly accounted for as extensive margin. Although there might be some problems in measures for the short term extensive margin, in this measure the extensive used for each time period is the initial one, this creates a possibility to argue for causalities from extensive margin followed by growth.

6.3.2 Long-term Measures

Further the model was tested using different criteria for extensive and intensive classifications among the products. Here the method of Amurgo-Pacheco & Denisse-Pierola (2008) was followed to look at the intensive versus extensive composition of trade. This method was used with the difference of a slightly shorter time frame and, more importantly, the geographical trade patterns were disregarded. This method is more static in the way that it considers the same products extensive or intensive over the whole period of observations.

So when viewing the whole period, products are accounted to either the classification of extensive margin or intensive margin. This is done with regards of whether the product has been established before a given year or if the product is a newcomer on the export market after this year. A comparative advantage with this method is that it doesn't fluctuate as much over time and that it takes export survival over a time period into account. The main difference when viewing results made from this measure, compared to the previous one, is that this measure is even weaker in explaining causalities and can only be used to view the correlations.

In this method the export diversification was measured using a breakpoint in the time period creating enough time after breakpoint to be able to tell if a product was established for exporting, yet still being able to say something about the product status on the export market before breakpoint. The breakpoint chosen was the year 2001, creating a time frame for studying export development over nine years after breakpoint and four years before breakpoint. Old products were classified as products being exported for at least two years before 2001. In the same way new products were defined as products being exported at least four times after 2001. This method is the same as used in previous studies on intensive and extensive margin made by Amurgo-Pacheco & Denisse-Pierola, with the difference of observed years. This has been due to lack of observations; a shorter time series of fourteen years has been the foundation on which the thesis is built. Despite the short period of observations, the number of observations for each year and country should make the total number of observations sufficient for making conclusions on relations with our dependent variable, y.

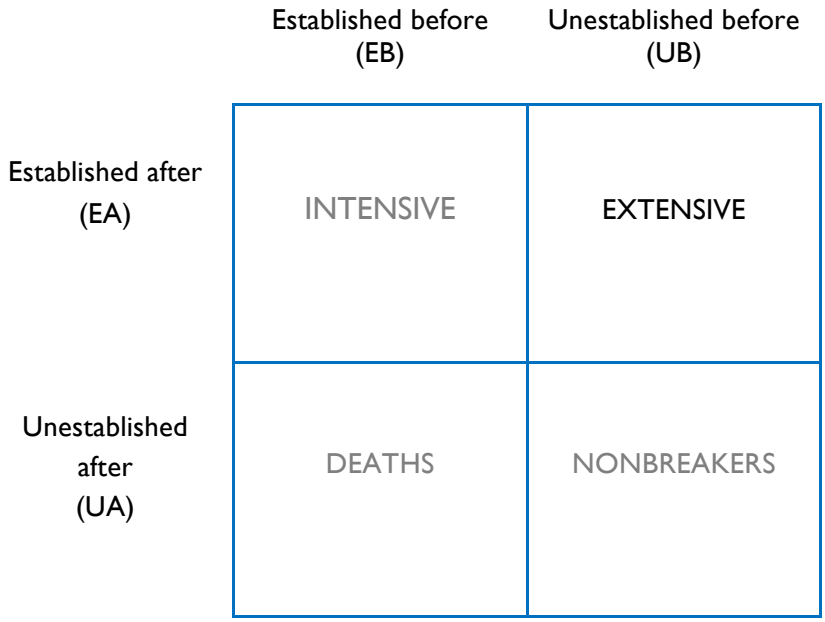

Figure 6.3. Matrix of margin classification

Above is another explanatory diagram (figure 6.3) explaining how different observations were reviewed. Notice that this diagram differs from the 4.1 diagram since it doesn't include geographical patterns in exports. Here, the established after and before refers to the breaking point of 2001. The intensive margin fulfills both the criteria of EA and EB. The extensive, EA and UB. Death fulfills UA and EB and non-breakers UA and UB. This means that the number of "deaths" can be used to decrease the value of the intensive margin since it considers existing exports. The extensive margin is separated from the others and the non-breakers are outsider exports that represent a very small share of total exports and are not represented in this study.

6.4 Growth

When testing the different models different measures of growth were used. They were all measured from cgdp and when obtaining data on growth the Penn World Table database was used, working with PPP converted GDP per capita using the G-K method at current prices in dollars. In order to investigate the robustness of the results three different growth periods were tested using moving average. This captures both the short, medium and long run growth patterns so that x in the model would represent 1, 2 or 3 for the different approaches. This was done to see if one was able to view an increasing significance in correlation over time.

7 Empirical Analyses

In the process of this thesis, arguments have been shown for the possibility of trade affecting growth as well as arguments for diversification being an important key to development. Now the measurement of export diversification will be used as an index on trade patterns testing the correlation between the trade diversification and economic growth.

Several ways of measuring export diversification have been used, presented in the data section, testing the different values.

First the pace of motion will be established towards steady state according to the theoretical framework presented in section 3.1 to investigate whether traditional growth theory, only with respect of initial GDP per capita, can explain the differences in growth, using the model:

$$\ln\left(\frac{cgdp_{i,t}}{cgdp_{i,0}}\right) = \alpha + \beta lngdpc_{i,0} + \varepsilon_{i,t}$$

Retrieving b from: $b = -\ln(1+\beta)/T$:

Testing the pace of motion towards steady state using only levels of GDP per Capita using three different regressions with growth per cgdp for one, two and three year growth periods of moving average, the following results are:

	1 YEAR GROWTH	2 YEAR GROWTH	3 YEAR GROWTH
b	0.596928	-0.0235	-0.01889
β	-0.4495	0.048118	0.058311
P-value	*0.091*	*0.016*	*0.043*
R-squared	0.0447	0.1046	0.083
Observations	65	60	55

Table 7.1. Pace of motion towards steady state assuming unconditional convergence.

The year to year growth show a positive value on b at a 10% significance level indicating unconditional convergence but this growth pace is also more volatile. Nevertheless, when further testing these results through a moving average, the values on b changes into negative values not showing any convergence between the countries. This test does not show a sign of unconditional convergence meaning that countries with different levels of GDP per capita not necessarily converge over time. Thus there could be other variables affecting growth, and in this case we test indicators on export diversification according to previous arguments. Adding the Herfindahl index as a measurement on export diversification, the model takes this shape:

$$\ln\left(\frac{GDP/c_{i,t}}{GDP/c_{i,0}}\right) = \alpha + ln\beta GDP/c_{i,0} + lnHerfindahl_{i,t} + \varepsilon_{i,t}$$

The Herfindahl index from section 6.2 was added as a measurement on export diversification using three different regressions with growth per cgdp for one, two

and three years of moving average. The following results are retrieved to the model giving us:

	1 YEAR GROWTH	2 YEAR GROWTH	3 YEAR GROWTH
Ln-Herfindahl	-0.0118965	-10.54548	-0.337344
P-value	*0.052*	*0.074*	*0.026*
β	0.0128387	5.298894	0.1313317
P-value	*0.307*	*0.001*	*0.003*
R-squared	0.1498	0.2027	0.1751
Observations	60	55	50

Table 7.2. Pace of motion towards steady state with conditional convergence including Herfindahl index.

Here the Herfindahl-coefficients show a negative value, in this case, since the Herfindahl index is shown by its natural logarithm a negative value on the coefficient will show export diversification having a positive impact on growth. Thus the results show a positive correlation between export diversification and growth with a significance level of 10%. We also have retrieved a slightly higher explanatory value.

When observing the beta coefficient in this regression it indicates divergence between countries in respect to initial gdpc on a 5% significance level.

Further we test the extensive margin as an index on export diversification effects on growth. To analyze these effects further, a model creating a bit more hands on results was used telling us about the correlation between growth and patterns of export diversification in the shorter run, using the extensive margins of trade. This model was set up to investigate the correlation between the extensive margin and growth. Testing the model:

$$\ln\left(\frac{GDP/c_{i,t}}{GDP/c_{i,0}}\right) = \beta_1 + \beta_2 lnGDP/c_0 + \beta_3 lnExtensive_1 + u,$$

where $\beta_1$is a constant and u is the error term.

This index of trade diversification is used more frequently in the empirical literature on trade, the extensive margin. Here I test two different classifications on the extensive margin presented in section 6.3

When regressing the model on data from the short-term approach with a continuous margin classification according to the theory presented in section 6.3.1, using three different regressions with growth per cgdp for one, two and three years of moving average, the following results are retrieved:

	1 YEAR GROWTH	2 YEAR GROWTH	3 YEAR GROWTH
Extensive	-0.0026008	-0.0054882	-0.0048099
P-value	*0.392*	0.274	*0.521*
Cgdp	0.0255075	0.0463032	0.052325
P-value	*0.051*	*0.038*	*0.119*
R-squared	0.3089	0.4479	0.3881
Observations	60	55	50

Table 7.3, Using Short term approach with continuous margin classifications over time

For regressions including extensive margin, time-dummies has also been used to check for extraordinary results in some years using the initial year as a reference to avoid multicollinearity.

For the extensive margin we retrieve high p-values telling us there is no, or very little, significance in the correlation between the extensive margin and GDP/capita growth. The value on cgdp still indicates divergence on a 5% significance level.

Since the division between intensive and extensive margin in this method only is created by observing the change from year t to year t+1 with the criteria of all extensive margin being zero at year t, the extensive values retrieved from the data will be very small in comparison to the intensive margin with values established over time. This could be a reasonable explanation for the higher

coefficient values in the intensive margin with significance on a 10% level for the moving average of two and three years.

When regressing the model with a long term margin classification over time, according to the approach presented in section 6.3.2, using three different regressions with growth per cgdp for one, two and three years of moving average the following results are retrieved:

	1 YEAR GROWTH	2 YEAR GROWTH	3 YEAR GROWTH
Extensive	0.00502	0.010855	0.017027
P-value	*0.005*	*0.0000*	*0.000*
Cgdp	0.025786	0.055851	0.080391
P-value	*0.008*	*0.001*	*0.001*
R-squared	0.1979	0.2937	0.3376
Observations	65	60	55

Table 7.4. Using Long term approach with constant margin classifications over time.

For the extensive margin we retrieve low p-values telling us there is significance in the correlation between the extensive margin and GDP/capita growth in the 1% level for this classification on extensive margin. For all of the regressions it seems we get the same development in significance as in the previous results - when using moving average for growth, the significance increases when studying the longer moving averages. No significant differences in extensive margin effects has been shown using time-dummies.

Notice that this model only investigates correlations between growth and the extensive margins of trade. That is, if a country extends its extensive margin, given a certain level of gdpc, does it diversify in export and thereby increase in growth?

8 Conclusions And Summary

In this thesis the aim has been to study the relationship between trade diversity and growth in the East African Community. In order to do this, growth theory with the assumption of conditional convergence was used applying measures on export diversification to compare the five countries over the period between 1997 and 2010.

Starting off I conducted a test for the assumption of unconditional convergence in the selected countries over the time period. The results showed signs of divergence rather than convergence implying that other factors contribute to the growth than current productivity.

When further studying the relationship between trade diversification and the number of zero trade flows, I plotted a scatter chart showing a linear trend indicating a connection between number of exported goods and gdpc.

Imbs and Wacziarg (2000) investigate the relationship between sectorial concentration and per capita growth in an economy. Even though this study is not about trade diversification, but about diversification in production, the conclusions from this study could explain a relationship between trade diversification and growth. When crediting different margins of trade, depending on what region of interest, the contribution size vary between extensive and intensive margin. The low-income countries, especially Sub Saharan Africa, have a higher level of extensive margin contribution to trade growth. We can also see a connection between gdpc growth and diversity in production. In the same way export diversification could contribute to gdpc growth, and would in this case explain the reason for high levels of extensive margin contribution to SSA growth trade compared to the rest of the world.

Further testing the export diversification effects on growth I continued with the Herfindahl index, inspired by studies made on a production level and levels of competition, although some studies on exports has been made as well.

With this measure a positive correlation between diversification and growth could be shown.

Further on, when testing patterns of trade as indication on export diversification, different levels of extensive margin were used. These were calculated in two different ways. The first way of measuring extensive margin was conducted using the simplest criteria, counting every start in export from zero to a positive value, for each product classification and year. The second measurement was retrieved for a study by Amurgo-Pacheco & Denisse-Pierola (2008) where the extensive margin criteria was measured using the export pattern of the entire time frame of observations.

When conducting the test with short term measures of the extensive margin, which is the test giving the best prognosis for causality since it views the initial level of extensive margin comparing it to growth for the following years, a relationship between the two couldn't be established with any significance. Note that, since this short-term measure is more volatile than the long-term method, it isn't affected by the long-term development in production.

When applying the context of export diversification using the long-term approach onto the unconditional growth model we receive a model that has a higher explanatory value than the classical model with unconditional convergence. These results show a correlation between export diversification and GDP/capita growth which indicates that a move towards a more diversified export market could to some extent contribute to growth in the region. But since this model views the trend for the whole period at once, it becomes even harder to say anything about the causalities in the relationship even if it confirms correlation between extensive margins of trade and growth. Because this measure views the whole time period it's more stable and thus could have a stronger connection to the trend in diversified production.

Given these arguments and the conducted tests, correlation in trends between trade diversification and growth in the East African Community can be shown in the observed period, although causalities between the two cannot be identified. There are also signs of divergence between countries in respect to initial GDP per capita that indicates that there are other underlying factors to growth than capital per capita levels.

Further research on this topic could, with benefit, include production diversification and its effects on both extensive margin of trade and the gdpc growth since this could be the underlying reason for correlation in the different trends. Also, a geographical dimension could be added for further understandings of trade relation effects. A longer observation period with disaggregated data on a higher level could also show clearer results.

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