



UNIVERSITY OF NAIROBI
School of Economics

**MEASURING REGIONAL PER CAPITA INCOME
CONVERGENCE IN THE EAST AFRICAN
COMMUNITY //**

By:

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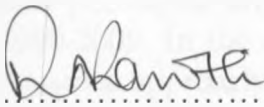


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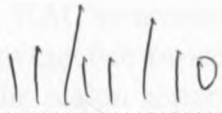
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Declaration

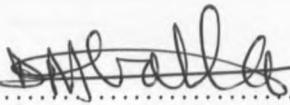
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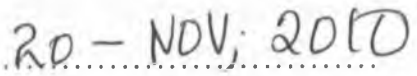
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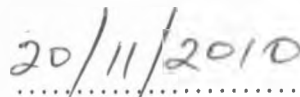
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Abstract

Abstract

The increasing diversity of average growth rates and income levels across countries has generated a large literature on testing the income convergence hypothesis. Some of the countries in East Africa have experienced economic growth, with the pace of growth having varied substantially across countries. Recent empirical studies have found evidence of several convergence clubs, in which per capita incomes have converged for selected groupings of countries. This paper investigates per capita GDP convergence among the EAC countries during the period 1990-2009. In the empirical analysis of the convergence processes we use the neo-classical approach. The paper concludes that the region experienced some level of absolute convergence of per capita GDP during the period. When national effects were included into convergence equations, there was also some level of conditional convergence albeit at relatively lower rate of less than 2%. The results of the analysis therefore imply that there is need for policies to be put in place to speed up and sustain the rate of regional income convergence in the EAC region.

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To my wife for the support she gave me throughout the process of writing the paper as well as taking care of our children during my studies.

Dedication

To my wife Esther and our children Joy and Amy

List of Acronyms

CEMAC	Central African Monetary and Economic Community
CLA	Central Legislative Assembly
COMESA	Common Market for East and Central Africa
EAC	East African Community
EAHC	East African High Commission
EASCO	East African Common Services Organisation
ECOWAS	Economic Community of West African States
GDP	Gross Domestic Product
GoK	Government of Kenya
SADC	South African Development Community
SIDA	Sweden International Development Agency
UEMEA	West African Economic and Monetary Union

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CHAPTER ONE

INTRODUCTION

1.1 Background

The East African Community (EAC) is the regional intergovernmental organisation of the Republics of Burundi, Kenya, Rwanda, Uganda and Tanzania covering a combined area of approximately 1.82million Square Kilometres (EAC, 2010a). The five countries hold a combined population of approximately 126million people by 2009 who share cultural, economic and geographic characteristics. Across the geographical borders, they share common climatic conditions, trade and agricultural practices and social set-ups. These characteristics, which are key to human development, provide the partner states with a unique framework for regional integration. In the background of a combined Gross Domestic Product (GDP) of approximately US\$ 73billion, economic factors have taken centre stage and the urgency for integration cannot be ignored (EAC, 2010a). The land locked partner states of Uganda, Rwanda and Burundi have over the decades transited their trade with the rest of the world through ocean-fronting Tanzania and Kenya. The region therefore has had a long history of cooperation.

Documented cooperation among the EAC countries can be traced back to over a century ago. The landmarks then included a customs union operated between Kenya and Uganda as early as 1900, which was later joined by Tanganyika in 1922 (Mkenda, 2001). In the union, the three countries jointly administered customs, excise and income taxes, and other services such as, medical and industrial research, education, transport and communication, as well as agriculture. Besides the services that were jointly run, a monetary union and a high degree of fiscal integration existed. Labour was also fairly mobile within the region (Ibid).

A common legislative body and administrative organisation for East Africa labelled

the East Africa High Commission (EAHC) was established in 1948. The Commission was made up of the three governors of the three territories, and its policy decisions were effected through its Secretariat in Nairobi. There was also a Central Legislative Assembly (CLA), which considered and enacted legislation relating to aspects of the common services.

The momentum and discourse for a formal integration gained pace during the post-independence period when political leaders made a joint declaration to establish an EAC (EAC, 2004; Fanta, 2008). In 1961, Tanganyika attained her independence, and later, Kenya and Uganda gained their independence too. With the attainment of independence, a number of changes were effected in the machinery of co-operation.

The High Commission was transformed into the East African Common Services Organisation (EASCO), which consisted of chief executives of the three governments. The CLA was enlarged, and also, the authority operated through various committees composed of three ministers from each country. The operations of the common market, however, continued without any formal enactment, until 1967 when the Treaty establishing the East African Community was signed. The Treaty also established the East African Council, which consisted of the three presidents and five council members, each assigned to the following areas; common market, communications, economics and planning, finance and research, and social affairs.

Besides a common market and services, the East African countries also belonged to a monetary union, whose conditions were set up during the colonial period. The East African Currency Board had been established in 1919, and a single currency was in use until 1966. The Currency Board, among other things, was responsible for issuing and redeeming local currency for sterling. The East African countries belonged to the Sterling Exchange System, whereby the external reserves were held

in sterling securities. During this period there was a high degree of monetary integration, such that there were no restrictions on the movement of capital between the countries.

Although by 1967 separate central banks were created in each of the countries, the three states agreed to harmonise their monetary policies to the extent required for the proper functioning of the monetary union and the fulfilment of the aims of the Community (Mkenda, 2001). As one of the requirements for harmonizing their monetary policies, the three governors of the central banks were required to meet regularly. Some problems however emerged in the monetary union soon after the Treaty was signed.

The first problem was the nationalisation of banks in Tanzania in 1967, in the wake of the Arusha Declaration¹, and the ensuing exchange controls that were imposed against Kenya and Uganda to restrict capital flight. In retaliation, the free circulation and redemption of Tanzanian notes were suspended in the other states effectively putting a temporary break in the union lasting up to mid year. A major disruption in the union again occurred in 1970. There was a heavy outflow of capital from Uganda after a nationalisation policy was announced. Exchange controls against Kenya and Tanzania were imposed, and the export and import of the Ugandan currency was banned. The exchange controls triggered retaliatory measures by the other states. The restrictions were directed at capital, and not goods and services. When the exchange controls were in place, the countries pursued divergent policies regarding pegging for their currencies. This created suspensions in transactions for a couple of days, until it was agreed that all currencies were to be pegged to the dollar which continued until the EAC collapsed in 1977 followed by dissolution in 1983.

¹ The Arusha Declaration was made by Tanzanian President Julius Nyerere on 5th February 1967, outlining the principles of "Ujamaa" (Socialism) to develop the nation's economy. The declaration called for total overhaul of the economic system through African socialism and self reliance in locally administered villages in a villagization programme.

As Mkenda (2001) notes there are several reasons that may explain the collapse of the EAC. Firstly, there was a feeling that the benefits of the community were accruing more to Kenya than to Tanzania and Uganda. The differences in the benefits arose due to the differences in the level of industrialisation of the three countries which was rooted in colonial times, where Kenya was taken to be a permanent colony of Britain, and hence invited more investment, while Uganda and Tanganyika were more of temporary colonies. The fact that Kenya's industrial sector was relatively more developed than in the other member states meant that the relatively less developed countries were buying more goods from Kenya than the amount Kenya was buying from them. A trade imbalance in favour of Kenya thus ensued, with Tanzania and Uganda remaining deficit countries in East African trade.

Secondly, the ideological differences between the three countries exacerbated the tensions that were already there in the EAC. While Tanzania pursued a socialist-oriented path of development and was slowly drifting its attention southwards in its bid to help with the liberation movement together with other frontline states, Kenya, on the other hand, was committed to 'the capitalist path of development, becoming increasingly isolated in a region that was predominantly socialist. Uganda, however, had witnessed several ideological shifts.

In the late 1960s, Uganda had closer ideological affinity to Tanzania. Presidents Obote, Nyerere and Kaunda (of Zambia) teamed up in what was called the Mulungushi Club² to spearhead the liberation of the Southern African countries of Mozambique, Zimbabwe, Angola, Namibia, and South Africa, from colonial rule

² The Mulungushi Club was later turned into a group of frontline states that included Tanzania, Zambia, and Botswana, and later joined by Mozambique, Angola, Zimbabwe and Namibia. The frontline states' objectives were to co-ordinate military, diplomatic and economic support to the liberation movements. The group dissolved when apartheid collapsed in South Africa but as an outcrop, the Southern African Development Co-operation Conference, *SADCC* (later renamed, Southern African Development Co-ordination, *SADC*), emerged as an organisation co-ordinating economic co-operation and integration among the former frontline states, including South Africa and a few other countries.

and racial supremacists (Mkenda, 2001). Zambia, Tanzania and Uganda were then pursuing some form of African Socialism (Humanism in Zambia, Ujamaa in Tanzania, and Common man's charter in Uganda). Western countries had refused to support the liberation movements militarily, thus the communists countries filled in the void. The Mulungushi Club countries had no problem hosting Soviet and Chinese trained guerrilla armies for liberation movements. In this score, Kenya was isolated from Tanzania and Uganda.

In the same connection, Tanzania and Zambia invited the Communist Chinese Republic to build a railway line to connect the two countries in a bid to reduce Zambia's dependence on colonial Rhodesia and apartheid South Africa. This did not augur well for Kenya both because of the involvement of Communist China, but also because the Tanzania-Zambia railway line was independent of the EAC run East African Railway.

In 1971, Idi Amin overthrew the government of Obote in Uganda and established a military dictatorship. This did not go well with Nyerere, both because of the affinity that he had developed with Obote (Obote took refuge in Tanzania), and because of the utterly chaotic and brutal nature of Idi Amin's dictatorship. Tanzania hosted military groups opposed to Idi Amin and refused to recognize Idi Amin's leadership. This meant that the summit meetings of the three leaders of East Africa could not be held at the time when ideological and economic disparities were crippling the EAC. Inevitably, the *EAC* collapsed in 1977.

The history of the new EAC started with the signing of the agreement for the establishment of the Permanent Tripartite Commission for East African Co-operation in 1993 followed by the launching of the Commission Secretariat three years later (EAC, 2010a). The initial three partner states of Kenya, Tanzania and Uganda signed the Treaty for the establishment of the EAC on 30th November, 1999, which came into force on 7th July, 2000, following its ratification (EAC,

2010a). As noted by the World Bank (2005), regional economic communities have been experiencing unprecedented expansion. In this regard the EAC membership grew in 2007 with the accession of Rwanda and Burundi. The EAC headquarters is located in Arusha, Tanzania and this is where its Secretariat is stationed (EAC, 1999). Just as in the case of the similar regional economic communities, the other organs of the EAC are shared among the partner states; except Burundi and Rwanda which host non of these institutions due to the fact that they were established before the two countries joined the Community.

The main goal of establishing EAC is underpinned by the desire of the EAC partner states to attain sustainable and equitable growth and development that in turn improves the standard of living of the people through increased competitiveness, value-added production, trade and investment (EAC, 2009). Haunted by the collapse of the previous EAC, the current process is done at the back-drop of the need to ensure equitable distribution of the benefits of integration. The integration process of EAC is guided by the Treaty for the establishment of East African Community and 5 year Development Strategies.

According to the Treaty, the objective of the EAC is to develop policies and programmes aimed at widening and deepening co-operation in economic, political, social and cultural integration for mutual benefits for all partner states (EAC, 1999). This was envisaged to be achieved through the establishment of a customs union which was to be an entry stage, then a common market, monetary union and ultimately a political federation. The integration process is further spearheaded through 17 areas of cooperation within which numerous milestones and drivers are incorporated. These are achieved through negotiated protocols, of which 11 have been concluded and 6 are being negotiated.

The EAC's achievement of its goals and objectives is premised on the promotion of sustainable growth and equitable development of the region, including rational

utilization of the region's natural resources and protection of the environment. In this regard, the Treaty provides for fundamental principles of mutual trust; equitable distribution of benefits; people-centred; and private sector-led integration process (EAC, 1999). The long-standing political, economic, social, cultural and traditional ties and associations between the partner states in promoting people-centred development have been emphasized. As a key consideration and out of emerging global realities, the Treaty gives emphasis on the promotion of good governance, including the adherence to principles of democracy, rule of law, accountability, transparency, social justice, equal opportunities and gender equality. Its implementation is guided by the EAC development strategies.

Since its establishment, three development strategies have been implemented. The first Development Strategy, 1997-2000 focused on the development of the policy framework for regional co-operation and culminated in the signing of the Treaty for the Establishment of the East African Community (EAC, 2009). The Second Development Strategy, 2001-2005 focused on the implementation of selected regional projects and programmes; institutional development; and the operationalization of the EAC Customs Union which commenced in January 2005. The third Development Strategy, 2006-2010 focuses on the consolidation of the Customs Union as a foundation for the establishment of a Common Market in 2010.

Following an intensive negotiation process spanning five years, the EAC Customs Union was established in 2005 as an agreed entry stage in the integration process. Its implementation is guided by a protocol along with other instruments. One of the two main tenets of the Customs Union is application of a Common External Tariff (CET) structure of 0% for raw materials; 10% for intermediate products; and 25% for finished products coming from outside the Community. The second tenet is elimination of duties on intra-EAC trade for locally produced products (EAC, 2004, 2009). In recognition of the varying degrees of production

development, the elimination of these internal duties was carried out in an asymmetrical reduction process. In this process, selected Kenyan products were subjected to varied rates of duties while entering Tanzania (800 tariff lines) and Uganda (400 tariff lines) on a reducing trend commencing January 2005 (EAC, 2009). These duties collapsed to zero by January 2010. However duties on trade between the other partner states and their exports into Kenya were reduced to zero upon coming into force of the customs union protocol. For products to qualify under this tenet, the customs union provides for use of rules of origin which define their 'economic nationality' by classifying them as either locally wholly-produced; imported material content of at most 60%; value addition of at least 35%; or undergo change in tariff heading.

The Protocol on the establishment of the EAC Common Market was signed on the 20th November 2009 and entered into force on 1st July 2010, following finalization of the ratification process by all partner states. While providing for the tenets of the customs union, the common market is to operate as a single market with free movement of goods, services, labour and capital; and right of establishment and residence.

A monetary union is where countries share a single currency, which is monitored and controlled either by a single regional central bank, or national central banks implementing a coordinated monetary policy. The indicative timeframe for the establishment of the monetary union is 2012. A major challenge to be encountered in this process is attaining macro-economic convergence among the states.

A political federation is where states consolidate their institutional governance into single regional arms-of-government. According to the EAC Treaty, a federation is the ultimate stage of integration. Although regional experts have been holding discussions on the establishment of a political federation, more ground work is still to be covered in this direction.

EAC economic performance and indicators

The EAC economies are varied in size and scope. Table 1.1 shows the economic sizes of the partner states in terms of GDP for the period 1990-2008. It indicates that the economies of Kenya and Tanzania are the largest by GDP sizes while Burundi and Rwanda are the smallest.

Table 1.1:
EAC GDP at current market prices, US\$ billion

State	2000	2001	2002	2003	2004	2005	2006	2007	2008
Burundi	0.71	0.66	0.63	0.6	0.68	0.8	0.91	0.94	1.11
Tanzania	10.18	10.37	10.8	11.65	12.83	14.14	14.16	15.41	20.72
Uganda	6.27	6.34	6.67	7.05	8.43	10.04	11.01	13.55	16.47
Kenya	12.71	12.98	13.15	14.99	16.25	19.13	22.78	26.95	30.35
Rwanda	1.82	1.73	1.78	1.77	1.98	2.39	2.85	3.41	4.69
EAC	31.69	32.09	33.03	36.05	40.17	46.5	51.71	60.25	73.34

Source: Compiled from the EAC Economic report, 2010c and 2009

Selected indicators of the five partner states in 2008 are shown in Table 1.2. As indicated in the GDP figures, the economies of Kenya and Tanzania are the largest while those of Burundi and Rwanda are the smallest in terms on trade and population figures.

Table 1.2
Selected EAC Indicators in 2008

Indicators	Burundi	Kenya	Rwanda	Tanzania	Uganda
Area ('000 sq.km)	27.8	580	26.3	945.2	236.1
Population (million)	8.1	38.3	10.8	43.7	32.4
GDP growth (%)	4.3	1.7	11.2	7.4	9.1
Intra-EAC exports (US\$ million)	22.4	1,036.60	38.1	310.5	195.2
Intra-EAC exports change (%)	41.2	24.80	45.5	83.3	31.2
Intra-EAC imports (US\$ million)	86.8	181	330.4	425.3	566.8
Intra-EAC imports change (%)	36.4	-3.7	50.1	286.3	7.65

Source: Compiled from EAC Economic Report, 2010 and IMF World Economic Outlook, 2010

In the next section we discuss the problem to be studied followed by both the general and specific objectives of the study

1.2 Research problem and objectives

1.2.1 Research Problem

Since the signing of the Treaty for the establishment of the EAC in 1999 and subsequent launching the following year, negotiations on various projects and programmes has been going on throughout the region involving substantial investment by the respective governments. As the region establishes a common market and moves towards establishing a monetary union an issue arises regarding the readiness of the region to move forward while addressing the concerns raised in the former community. These relate to the equitable and positive change in the regional incomes and thus balanced growth under regional integration.

In this regard, questions may be asked as to whether the region is achieving macroeconomic convergence among the five partner states. Specifically are the incomes of these partner states converging? For example, is there a tendency for poorer EAC partner states to catch up with richer ones? And does this catch up trend lead to convergence? Or instead, are there tendencies for the rich states to get richer, and the poor ones to get poorer, so that the gap between rich and poor states tends to widen over time? It is therefore necessary to carry out a study on the per capita income convergence in the region. This study focuses on the need for establishing the level of per capita GDP convergence in the EAC for the period of 20 years (10 years before and 10 years after its establishment in 1999).

The findings of this study are expected to shed light on the above questions, regarding the prospects for the EAC per capita convergence, the decrease of regional disparities with respect to income levels and the development of a more equal EAC. Undoubtedly, these answers have serious implications for both theory and policy. The findings of this study will give useful contribution for both theory

and policy especially during this period when decisions are being made on the process of forging forward the deepening of EAC regional integration.

1.2.2 Objectives of the study

The general objective of this study is to analyze the convergence in per capita income among the EAC partner states.

The specific objectives are as follows:

- i. To establish whether there is convergence in per capita income of the EAC partner states over the period 1990 – 2008;
- ii. To estimate the magnitude of the convergence or divergence in EAC Partner States over the period 1990 – 2008;
- iii. To make policy recommendations based on the findings of the study.

1.3 Justification of the study

Following the commencement of implementation of the Common Market Protocol, the EAC is scheduled to embark on laying ground for negotiations on the establishment of a monetary union. One of the main pre-conditions for the establishment of monetary union is attainment of macro-economic convergence (Grandes, 2003). This covers Gross Domestic Products (GDP) growth rates, Per Capita GDP, Balance of Payment (BoP), exchange rates, inflation rates, among others. Given the fact that one of the fundamental principles of establishing EAC is people centred and private sector led integration, the citizens of the EAC would expect equitable positive change in their incomes as a result of the integration process. This implies that their per capita incomes not only grow, but also exhibit a tendency for growth convergence.

Over the years, income disparities and convergence among countries in regional integration groupings has continually become important research field, giving

additional information for development of regional policies (Paas et al, 2007a). The argument behind this importance is the idea that a balanced regional development is a prerequisite for social cohesion and increase of competitiveness of the countries and regions. It is therefore, important to measure convergence among partner states of EAC, in terms of per capita income especially for the late period where all member countries are making a strong effort to satisfy the macroeconomic criteria for the establishment of a monetary union. This analysis will help in deriving some conclusions on past performance of EAC and the future of the regional policy discourse.

In this paper, we explore regional Per capita GDP convergence in the EAC for the period 1990-2008. This period pivots around 1999 when the new EAC has been in operation and decision to deepen and widen integration has been made. In this study, the hypothesis of convergence is tested empirically, using the most recent data available on the per capita GDP trends.

It is worth noting here that much of the ever increasing body of work in this area, though relevant and informative with great level of in-depth explanation and analysis, is not safe from lacking in coverage in other aspects. While authors have widely written about the economic convergence in the rest of the world economies, investigation on the EAC has not been widely explored. In this regard a number of aspects require in-depth analysis and these form the basis of this paper. Such areas include exploring whether EAC partner states are achieving macro-economic convergence as they move towards a monetary union. In doing so, the paper will dwell on the per capita income convergence as a component of macro-economic parameters. Here it is assumed that regional integration promotes trade and free movement of factors of production and thus has positive effect on growth. Hence income convergence is expected to occur in EAC where poorer countries grow faster than the richer ones. To do such a measurement a neo-classical approach to convergence is used here based on the simple idea that

convergence implies that poorer countries grow faster than richer ones in terms of their per capita income. Accordingly, a relationship between the growth of per capita income and the initial level of per capita income is investigated.

While doing so, we recognize that this does not amount to navigating an uncharted debate. Indeed, we are aware that there is no uncontested understanding of per capita income convergence in regional integration. The paper therefore takes cognisance of various views which have informed and taken centre stage in this discourse.

Consequently, this paper makes a contribution in the debate on per capita income convergence under regional integration and its implication to developing economies. The intention is to provide a forum for the policy makers and the regional development practitioners in making an informed decision while targeting promotion of regional integration for economic development.

The rest of this paper is organised as follows. Following this introduction, the next chapter presents a review of the literature on per capita income convergence. A discussion is also attempted on the theories and concepts which provide a framework for analysing per capita income convergence in the EAC regional integration. Chapter three presents the methodology to be used in the study followed by chapter four which covers the analysis of the data on per capita income convergence for period 1990-2008. The final chapter presents the conclusion based on the analysis of per capita income convergence. From the findings and conclusions, a number of policy suggestions are presented in this chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Do the incomes of different integrating economies have a tendency to converge? In the last two to three decades, regional convergence/disparities have become a hotly debated topic, in light of the pressure for greater integration and enlargement of the regional integration blocs (Villaverde and Maza, 2009; Pass et al, 2007a; Quah, 1993). Recognizing this fact, this section forms the basis for anchoring the ongoing debate on regional integration discourse. Hence, the goal is to review literature on which convergence under regional integration has been described and analysed. It covers a brief theoretical reflection on the work done by others on this discourse. The reflection is necessary as a build-up to the analysis that will be undertaken in the subsequent chapters.

2.2 Regional integration

Regional integration schemes have multiplied in the past few years and the importance of regional groups in trade, finance and politics is equally increasing. Regional integration is, however, not a new phenomenon with leagues, commonwealths, unions and pacts spreading through out history (Mattli, 1999).

A number of important issues have been raised regarding the justification for integration and explanations on them are equally as many. In attempting to address such issues, Blomström and Kokko (1997) noted that the most serious challenge facing a study of the regional integration is the multi-dimensional character of the issue. They argue that there is a reason to believe that the discourse will vary between different integration agreements, and between countries and industries participating in any specific agreement.

Mattli (1999), however attempts to categorize the explanations for the issues into

three main broad objectives. The first set of reasons relate to politically driven motives such as the effects of wars or conflicts. This reasoning perhaps explains the proliferation of regional groupings during the first and the second world wars. For example, politicians haunted by the horrors of the Second World War, were naturally driven to establish European common governance capable of addressing the very roots of intra-European conflicts. In deed, Hanggi (2000) argues that regionalisation can be viewed as external challenges that encourage states to engage in regional cooperation in order to reassert their political control on a higher level but also to jointly manage the increasingly complex global interdependence and to balance off regionalist challenges from other world regions. The second set of explanations centers around the notion of leadership. In this regard insightful, charismatic leaders spearhead cooperation among states even against domestic and regional resistance. The third explanation refers to social-change preferences. In this category, the coming together of states is driven by the pressure from the society desirous of being connected with their neighbouring states.

Borrowing from the work by the World Bank, SIDA (2002) adds the economic motives such as increasing bargaining power, trade arrangements or project cooperation in areas where countries share resources. SIDA however concludes that the result of integration in terms of classical welfare gains depends on the mix of trade creation and trade diversion. Generally regional integration provides a number of benefits including greater bargaining power vis-à-vis the outside world; minimization of duplication; thin spreading of resources and wasteful competition; division of labour and specialization in production; greater prospects for technological advances and innovation; expansion of trade, incomes and employment due to free movement of goods, services, labour and capital; and enhance greater political stability.

2.3 Convergence/divergence

In order for the regional integration schemes to have the possibility of being

successful, one of the many necessary conditions to be fulfilled by the participating countries is that the economic disparities among them should exhibit a convergence tendency (Villaverde and Maza, 2009). According to the traditional Heckscher-Ohlin-Samuelson model, international trade economists come to the conclusion that international economic integration brings about territorial convergence, either as a result of factor mobility or as a consequence of trade relations (Villaverde and Maza, 2009).

The debate on income convergence claims its origin from the neo-classical model of Robert Solow (1956)³. The basic assumptions of the Solow's model are: constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labour. As a result the model highlights the savings or investment ratio as important determinant of short-run economic growth. The further away an economy is from its steady-state⁴ level of capital, the faster will be the growth of income levels. In other words, economies converge towards their steady states at a declining growth rate. According to this neo-classical growth theory, if economies are homogeneous (identical technology, savings rate, population growth rate and depreciation rate), convergence can occur in an absolute sense since they will converge towards the same steady-state due to diminishing returns to physical capital (Feldkircher, 2006). Countries with low initial income per capita have low ratios of capital to labor, and hence they also exhibit a higher marginal product of capital. Conversely, if economies are heterogeneous, convergence may occur only in a conditional sense

³ The Solow model predicts that countries reach different steady states. Cross-country differences in income per capita can be traced to differing determinants of the steady state in the Solow growth model: accumulation of human and physical capital and population growth (Mankiw *et al*, 1992). The model predicts income per capita convergence to the country's steady-state value. It also makes quantitative predictions about the speed of convergence to the steady state. Thus, the growth of income is a function of the determinants of the ultimate steady state and the initial level of income.

⁴ A steady state is a situation in which the various quantities grow at constant (perhaps zero) rates. Some economists use the expression balanced growth path to describe the state in which all variables grow at a constant rate and use steady state to describe the particular case when the growth rate is zero.

since economies will grow toward different steady-state positions. In this case, diminishing returns to capital do not necessarily lead to diminishing dispersion of income.

The role of technological progress as a key determinant of long-run economic growth has been scrutinized by more recent studies, which accept constant and increasing returns to capital. These theories, known as endogenous growth theories, propose that the introduction of new accumulation factors, such as knowledge, innovation, and the like, will induce self-sustained economic growth (Lall and Yilmaz, 2001). Triggered by Romer's (1986) seminal study, work within this framework highlighted three significant sources of growth: new knowledge, innovation and public infrastructure (Sachs and Warner, 1995, Barro, 1990)⁵. As a result, and in contrast to the neoclassic counterpart, economic policies are deemed to play a substantial role in advancing growth on a long-run basis.

The ever increasing interest in the convergence question was triggered off by a study conducted by Baumol (1986). Baumol found an inverse correlation between initial productivity levels and productivity growth rates (unconditional convergence) among a subset of 16 developed countries over the period 1870-1979. However, when the sample was enlarged to include less developed countries, convergence could not be found. In other words, this study reached the conclusion that the advanced countries in the world appear to converge with each other, while the world as a whole does not. Subsequent researches by Barro and Sala-i-Martin (1992) and Mankiw *et al* (1992) confirmed Baumol's finding across a wide sample of 98 countries in the period 1960-1985. In addition, Barro and Sala-i-Martin

⁵ Romer (1986) provided a major spur to the debate by introducing a theoretical growth model with increasing-returns-to-scale production technology, which results in a strong tendency for rich countries to maintain or even increase their lead over poorer countries. Romer stressed that the more standard technology assumptions of the Solow growth model lead to the presumption that the poorer countries would experience faster growth. Romer noted that his theoretical model with increasing returns to scale seemed to be broadly consistent with the cross-country growth experience of the post-war era, in which there was no discernable trend for the poorer nations to converge with the richer nations.

(1992) found evidence of conditional convergence when human capital is included in the econometric model, a result that is compatible with the traditional neoclassical model. In their definition, the existence of convergence means that the dispersion of real per capita income across groups of economies tends to fall over time.

Whether economies converge or diverge over time is a topic of great importance for both theory and policy (Sala-i-Martin, 1996b). In particular, evidence of convergence illustrates the validity of the neoclassical growth theory contesting the importance of economic policy at all levels. In turn, indications of divergence (or even, very slow convergence) favour explanations postulated by endogenous growth theories and support the development and reinforcement of economic policies in order for disparities to be reduced.

Reverting to the factor price equalization, international trade can influence per-capita income by enforcing the factor price equalisation theorem, as earlier presented, and by encouraging the international flow of technology and by trading capital goods (Slaughter, 2001). It is however arguable that, the factor-price equalisation theorem revealed outcomes in a steady state free trade equilibria but not in the process of trade liberalisation. In this case empirical studies fill this gap in their analytical framework by considering proxies such as high levels of trade between countries and the removal of obstacles. Among the pioneers of this analysis are Mankiw *et al* (1992), Barro and Sala-i-Martin (1992) and Ben-David (1993, 1996) who examined the effect of trade on income convergence on a regional basis and concluded that most sample countries exhibited significant income divergence during the pre-war (pre-trade reforms) period but tended towards convergence when trade liberalisation was introduced. Based on this relationship, authors have identified a number of economic forces that can give rise to convergence including: diminishing returns to capital within each country; spatial capital mobility; spatial labour mobility; and the diffusion of innovations

across countries (Jones, 2002).

Traditionally, convergence has been taken to involve bringing the economies of a regional integration group into a desirable average level (Paas et al, 2007). This borrows from the Quah (1993) definition to the effect that each country eventually becomes as rich as all the others—the cross-section disparity diminishes over time through what is commonly referred to as a catch-up theory.

In the economic literature devoted to the integration theory, there are two distinct positions relative to the process of regional growth and the catching up hypothesis. The first, is the hypothesis of regional divergence, which argues that a deeper integration is expected to increase factor mobility which can be in favour of the prosperous countries. Concentration of economic activity in the attractive centres which dispose more developed markets and higher level of industrialisation can create additional difficulties to the less developed countries and delay their catching up process. The second position is the hypothesis of regional convergence arguing that a deeper integration will attenuate the initial regional disparities and in the long run the tendency is regional convergence rather than divergence. According to the convergence argument the fact that one group of countries shows lower disparity than another is the result of a deeper economic integration, including monetary integration and a common currency. Consequently, regional economic communities would have additional reasons for a faster and deeper integration.

Ben-David (1993) examined the effect of trade on income convergence on a regional basis and concluded that most countries among particular groups exhibited significant income divergence during the pre-war period but this tended towards convergence when trade liberalisation was introduced. The author concludes that it is the former that produces the latter, rather than the other way around. The trade reform programs examined in this analysis were performed according to specific timetables that varied from one group of countries to

another. Although no intra-group income convergence was evident prior to the inception of the individual trade reforms, significant convergence, together with significant increases in the volume of trade, began to occur simultaneously with the removal of the trade barriers among themselves. These findings provide evidence that it is the removal of obstacles to trade, rather than just the similarity of the countries, which acts as a catalyst for income convergence (Ben-David, 1996). While traditional trade theory tends to emphasize that it is the increased openness, and not necessarily the actual volume of trade that should lead to an equalization of incomes, the evidence from the earlier work by this author points to a very strong relationship between the two. Hence, the premise here is that high levels of trade between countries are a good proxy for the degree of openness between them (Ben-David, 1996).

Further to this analysis, in a study on international trade and convergence among five members of the Association of South East Asian (ASEAN) countries, Jayanthakumaran and Lee (2008) concluded that regional integration had a greater impact on increasing both trade and convergence among the participating countries.

Revisiting the catch-up theory, the convergence hypothesis articulates three reasons why poor economies within a region are expected to grow faster than wealthier economies during regional integration (Jayanthakumaran and Verma, 2008; and Cashin and Loayza, 1995). First, poor economies (late comers) are more likely to adopt existing technologies which pioneers have already developed, and trade raises factor prices for poor economies and thus per capita income. Second, the growth theory assumes diminishing returns to factor inputs and therefore capital productivity is higher among poor economies subjected to scarce capital. The expectation is that the capital-labour ratio converges across a region and thus per-capita income. Third, workers are likely to move from low productivity agricultural activities to various high productivity manufacturing and service

sectors where there are cost advantages.

According to the same authors convergence hypothesis cannot be interpreted as the growth aspect only but also as distributional outcomes that are widely known as the income trickle down effect. This supports earlier work by Charles (2010) and Carmignani (2003) which concluded that the higher the integration across a region, the higher will the trickle down effect be, as regionally-oriented trade and investment reforms tend to allocate resources internally in response to comparative advantages, and then incomes trickle down over time to the respective booming sectors.

Access to wider regional markets encourages deeper economic and institutional integration, and extra economic reforms enhance regional cost advantages which eventually allow a region to reach global efficiency (Jayanthakumaran and Lee, 2008b). In addition, regional reform policies are likely to trigger economic activities and factor mobility by creating links between regional firms and industries due to lower transaction and transport costs (Sato and Zhang (2006). Advancing this argument, Rey and Janikas (2005), emphasize that regional member countries are relatively competent at exploiting these advantages mainly because of lower transportation costs, similar ethnic and cultural links, and lower transaction costs.

There are three well-known competitive convergence hypotheses: absolute (unconditional) convergence hypothesis; conditional convergence hypothesis; and the club convergence hypothesis (Paas et al, 2007b; Villaverde, 2006 and 2009).

In the absolute convergence hypothesis, the per capita incomes of countries converge with one another in the long-term regardless of the initial conditions (Paas et al, 2007b; Rey and Montouri, 1999; Barro and Sala-i-Martin, 1992). Poorer countries grow faster than richer ones and there is a negative relationship between average growth rates and initial income levels even if no other variables are

included in the regression model as explanatory factors. It is assumed that all economies converge to the same unique and globally stable steady state equilibrium, which is a reasonable assumption in the case of a homogeneous sample of countries (Arbia et al 2005; Kosfeld et al, 2005).

Absolute convergence deals with the cross-section regression of the income growth on the initial per capita income. The traditional absolute convergence equation is given by:

$$\left(\frac{1}{T}\right) \log \left(\frac{y_{iT}}{y_{i0}}\right) = c + \beta \log (y_{i0}) + \mu_i \quad (1)$$

Where:

c is the constant term;

$\beta = - \{1 - e^{-bT} / T\}$ is a parameter indicating the relationship between growth and initial income, being the speed of convergence;

y_i is the per capita income of observation i ;

T is the sample period; and

μ is the error term.

When the regression coefficient on the initial per capita income (β) bears a negative sign (meaning that poor economies grow faster than rich economies), it is said that there exists absolute convergence⁶.

According to the conditional convergence hypothesis, the per capita incomes of

⁶ Given $\beta = - \{1 - e^{-bT} / T\}$, if we solve this expression for β we obtain that $\beta = - \log[1 - \beta T] / T$. The half-life is the number of years required to eliminate one half of the initial deviation of y_i from its steady state value (y^*). The traditional dynamics of equation (1) is given by

$\log y_{it} - \log y^* = e^{-bt} (\log y_{i0} - \log y^*)$. As we want to cover half the gap to the steady state, we substitute the first part of this equation ($\log y_{it} - \log y^*$) by $0.5(\log y_{i0} - \log y^*)$. Then we have that $0.5(\log y_{i0} - \log y^*) = e^{-bT} (\log y_{i0} - \log y^*)$, and solving for T we obtain that the half life equal to $-\log(0.5) / \beta$.

countries converge with one another in the long-term provided that their structural characteristics (eg technologies, human capital, institutions, population growth rates, preferences, infant mortality rates) are identical (Paas et al, 2007a). The initial conditions, as in the case of absolute convergence, are irrelevant. In the case of conditional convergence, equilibrium differs by economy, and each particular economy approaches its own but unique equilibrium. In other words the evidence suggests the existence of conditional convergence if the negative relationship between initial per capita incomes and their growth rates holds only after the possibility of the above-mentioned structural characteristics has been controlled for (Mankiw et al 1992).

The classical equation for conditional β -convergence is given by the expression:

$$\left(\frac{1}{T}\right) \log \left(\frac{y_{it}}{y_{i0}}\right) = c + \beta \log (y_{i0}) + \gamma X_i + \mu_i \quad (2)$$

Where:

y_i is the per capita income of observation (country) i ;

X_i is a vector of conditional variables.

T is the sample period under review

In the club convergence hypothesis, the per capita incomes of countries that are similar in both their structural characteristics and initial factors (eg GDP per capita, human capital, public infrastructure) converge with one another in the long-term (Islam, 2003; Canova, 1999; Durlauf and Johnson, 1995). Borrowing from the work of Fischer and Stirböck (2004), Paas et al (2007a) define club convergence as the club-specific process by which each country belonging to a club (grouping) moves from a disequilibrium position to its club-specific steady-state position⁷. At

⁷ The term 'club convergence' is based on theoretical models that yield multiple-steady-state equilibria and classify countries into different groups with different convergence characteristics (Durlauf and Johnson, 1995). Club convergence implies convergence to a common level only for countries that are both similar in their structural characteristics and similar in their initial conditions.

the steady-state the growth rate is the same across the regional economies of a club. The club convergence hypothesis allows multiple and locally stable steady-state equilibria. Martin (2001) explains that if regional economies differ in their basic growth parameters (for example technological innovativeness and human capital development under his definition) or knowledge spill-overs between them are weak, they may not converge to a common per capita income, but instead to different economy-specific equilibrium levels of per capita income. Under such circumstances there might be convergence among similar types of economies (clubs, regimes). It is however notable that despite the conceptual distinction, it is not easy to distinguish club convergence from conditional convergence empirically (Islam, 2003).

Beta and sigma convergence

There are two main approaches that are used to quantify the extent to which the growth process is leading to convergence or divergence in regional performance over time: the traditional approach is referred to as “sigma” convergence (σ -convergence) and the neo-classical approach known as the “beta” convergence (β -convergence).

The widely used tool for testing convergence hypotheses is *beta*-convergence analysis or growth-initial level regression as it is some times referred to (Barro and Sala-i-Martin 1992, Sala-i-Martin 1996a, Fischer and Stirböck 2004). *Beta*-convergence is defined as a negative relationship between the initial per capita income level and subsequent per capita income growth rate. If poorer economies grow faster than richer ones, there should also be a negative correlation between the initial income level and the growth rate. As already mentioned earlier, the conditional β -convergence hypothesis assumes that the negative correlation occurs only if some structural characteristics are identical in the economies under consideration. There exists a negative correlation between the growth rate and the distance that the per capita income level is away from its steady state equilibrium.

A distinction between absolute convergence and conditional convergence is usually made when discussing *beta*-convergence processes, as the absolute β -convergence hypothesis rests on the assumption that there is a negative correlation between the initial per capita income level and its growth rate. Therefore the incomes of the poorer economies grow faster than richer ones and will catch them up in the long run. The absolute β -convergence hypothesis is usually tested by the following cross-sectional equation, in matrix form (Baumont *et al* 2002):

$$g_T = \alpha S + \beta y_0 + \varepsilon \quad \varepsilon \sim N(0, \sigma_\varepsilon^2 I) \quad (3)$$

Where:

g_T is the ($n \times 1$) vector of per capita GDP average growth rate (where n is the number of partner states) in the period (0, T);

y_0 is the vector of per capita GDP (natural logarithms) initial levels (at time 0);

S is the unit vector and ε is the vector of error terms.

The absolute convergence hypothesis can be accepted if the estimate of beta is statistically significant and negative. The existence of negative value would imply that there exists convergence among the countries being analysed while the size of the values indicate the degree of the convergence. In this case, $\beta \geq 0$ is expressed as the no convergence null hypothesis.

The use of *sigma*-convergence (σ – convergence) approach has been popular since the work by Daniel Quah in the beginning of the 1990s. Using the connection with Galton's famous fallacy, Quah (1993) showed that the traditional growth-initial level relationship does not give a clear answer about convergence as the relationship tends to be negative even if the income differences have not decreased. *Sigma*-convergence pertains to the decline in the cross-sectional dispersion of per capita incomes over time. It measures the dispersion of real per capita income or product between countries based on the standard deviation of the

cross-section series (Marques and Soukiazis, 1998). When the standard deviation tends to fall over time, such a result indicates that the differences of the per capita income between regions in absolute terms decrease with the passage of time, which is an evidence of convergence. On the other hand, divergence implies that the standard deviation of the series in terms of per capita income increases over time.

As the same authors suggest, σ -convergence should be of interest since it answers directly the question whether or not the distribution of income across economies is becoming more equitable. On the other hand, as also pointed out by Islam (2003), methodologies associated with the investigation of β -convergence also provide information on the structural parameters of growth models.

Although many indicators of inequality can be considered as a measure of σ -convergence (or divergence), specialised literature usually employs indicators such as the variance (standard deviation) or the coefficient of variation (Chowdhury, 2004). The coefficient of variation (σ) is given by the expression:

$$\sigma = \frac{s}{\bar{y}} \quad (4)$$

Where:

s is the standard deviation; and

\bar{y} is the mean of the distribution of the per capita income.

Concerning the “beta” and “sigma” convergence an interesting question is to know which of the two concepts is preferable. According to Sala-i-Martin (1994), both concepts are useful since they measure convergence or divergence in a different manner and they give different information. However, the author suggests that “beta” convergence is a more interesting concept since it responds to questions, such as, whether incomes of poor economies are predicted to grow faster than rich ones, how fast the convergence process is, whether the convergence process is conditional or unconditional and whether there is a different convergence process

between groups of economies with different structures. All these questions can be answered independently of whether the “sigma” convergence predicts that the aggregate cross-sectional variance is falling or rising over time. It should however be noticed that *beta*-convergence is a necessary but not sufficient condition for *sigma*-convergence to occur (Barro and Sala-i-Martin, 1992; Sala-i-Martin, 1996a; Bernard and Durlauf, 1996; Quah, 1996a; Young *et al*, 2004)). A negative β from a growth-initial level regression does not necessarily imply a reduction in variation of regional income or growth rates over time.

2.4 Empirical literature

A number of empirical studies have been undertaken in the past covering the aspects of regional economic convergence. As a brief reference to some of the work done in this area, it is worth mentioning the old but excellent survey by Ben-David (1993). More recently, papers like those of Badinger *et al.* (2004), Meliciani (2006) as well as by Paas (2007a, 2007b) have informed debate in this area. Across the board, in this range of work, conclusion is drawn that there is convergence between states in Europe.

Regarding Asian region, the work by Togo (2001) and the more recent papers by Lim and McAleer (2004) and Sato and Zhang (2006) are among those that have gained reference authority in this debate. The general conclusion of this body of work is that economic integration has been instrumental in reducing income disparities between countries through trade and there is more room for further reduction. This so because reducing income disparities is likely to reduce tension between countries in the specific regional bodies.

Regarding Latin America, the papers by Holmes (2005) and Camarero *et al.* (2006) are informative examples of the experience in this part of the world. In particular, the work by Camarero *et al.* (2006) shows the existence of a productivity convergence process which is mainly the result of higher economic integration.

Additionally, Holmes (2005) has found evidence of an important convergence process among the Central American Common Market members.

As for the Africa region, there are few studies covering the processes of economic integration and income convergence. However, those that are available have obtained mixed results. For example, Jones (2002) found convergence in ECOWAS over 1960-1990 similar to the finding by Mutoti (2006) and Carmignani (2003) in COMESA. On the other hand, based on an econometric analysis using data from 46 African countries Hammouda *et al* (2007) found that the link between regional integration and income convergence is low for the members of SADC, COMESA, ECOWAS, CEMAC and UEMOA mainly due to the weak growth performance and the low level of intra-African countries trade. Venable (2003) and McCoskey (2002) came up with similar conclusions for SADC using time series data.

2.5 Overview of the Literature

In the literature discussed in this chapter there is mixed findings in estimating the convergence or divergence in per capita GDP across regions and periods. While some of the authors have found convergence among trade partners, results obtained by others do not support their convergence hypothesis. There are also different views and arguments regarding the approaches suitable for estimating convergence.

It is worth noting that the convergence concepts and tests have been criticized in the recent literature both on theoretical and methodological grounds and several econometric problems are often raised. For example, the standard β -convergence concept and test are criticized by Quah (1993) who raises the Galton's fallacy problem. Quah argues that convergence should be studied by taking into account the shape of the entire distribution of per capita GDP and its intra-distribution

dynamics over time and not by estimating the cross section correlation between growth rates and per capita GDP levels or computing first or higher moments. In addition, the author raises another criticism concerning the neglected spatial dimension of the convergence process: countries are actually treated as “isolated islands” in standard approaches while spatial interactions due to geographical spillovers should be taken into account.

Baumont, *et al.* (2002) offers some suggestions that club convergence could address the areas of criticism. Using the work of Durlauf and Johnson (1995), the authors argue that, in regard to the heterogeneity concerns, the concept of club convergence offers some promise⁸. This concept is consistent with economic polarization, persistent poverty and clustering. In case of unconditional convergence, there is only one equilibrium level to which all economies approach. In case of conditional convergence, equilibrium differs by economy, and each economy approaches its own but unique, globally stable, steady state equilibrium⁹. In contrast, the concept of club convergence, is based on endogenous growth models that are characterized by the possibility of multiple, locally stable, steady state equilibria (Magrini, 2003). Which of these different equilibria an economy will be reaching, depends on the range to which its initial conditions belong. In other words, economies converge to one another if their initial conditions are in the “basin of attraction” of the same steady state equilibrium. According to Durlauf and Johnson (1995) multiplicity of steady state equilibria and thus club

⁸ If economies are homogeneous (i.e. similar in technology, savings rate, population growth rate and depreciation rate), convergence can occur in an absolute sense since they will converge towards the same steady-state. But if economies are heterogeneous, convergence may occur only in a conditional sense since economies will grow toward different steady-state positions. In this case, diminishing returns to capital do not necessarily lead to diminishing dispersion of income.

⁹ When there are differences in economic conditions between countries, convergence between them may still occur but towards different steady states of growth. This supports the case for conditional β -convergence where the correlation between growth and initial income is negative, under the assumption that the influence of these factors is held constant (Barro and Sala-i-Martin, 1992). Thus, it can be said, that while the existence of absolute β -convergence implies that less advanced economies tend to catch up with more advanced ones, the existence of conditional β -convergence implies that each economy converges to its own steady state.

convergence is consistent with standard neoclassical growth models that exhibit diminishing marginal productivity of capital and constant return to scale if heterogeneity across individuals is permitted.

Finally, while authors have widely written about convergence in the rest of the world economies, a significant gap is encountered in review work done on convergence in the EAC region. This study attempts to fill this gap by estimating the convergence in per capita GDP in the region. Using the Ben-David model, we fill this gap by extending the arguments of Baumont, *et al.* (2002) in estimating convergence in the EAC five partner states.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section outlines the theoretical framework forming the basis for the analysis of per capita income convergence in the EAC. Definition of the model as well as the variables and data to be applied are discussed in this section.

3.2 Theoretical Framework

The hypothesis that openness within a regional grouping can lead to income convergence between rich and poor economies and relatively better economic growth by poor countries has been widely tested (Dawson and Sen, 2007; Ghose, 2001; Slaughter, 2001). Past studies show empirical tests of the convergence hypothesis by using stochastic convergence, which implies that shocks to the income of a given country relative to the average income across a set of countries will be temporary. They also use β -convergence to show that an initially poorer economy grows faster than an initially richer one.

Various authors have used time series data for determining the existence, or lack thereof, of convergence (Bernard and Durlauf, 1993; Ben-David, 1996, 1994 and 1993b). Barro and Sala-i-Martin (1992) supplemented their cross-country convergence results with some time series evidence as well. The Ben-David (1993) convergence model which uses time series sums up the approaches to overcome the limitations of the cross-sectional analysis. Using annual dispersion measures the model focuses on groups of countries that formally liberalized trade among themselves and show how the timing of the convergence process is related to the timing of their intra-trade liberalization.

Many time-series tests of convergence are based on the notion of “stochastic” convergence (Loewy and Papell, 1996). Stochastic convergence implies that shocks

to the income of a given country relative to the average income across a set of countries will be temporary. Thus, a common test for stochastic convergence involves testing for a unit root in the log of the ratio of per capita income relative to the group average. Failure to reject the unit-root null hypothesis is evidence against convergence. Rejection of the unit-root null hypothesis, on the other hand, is taken as evidence in favour of convergence. The existing time-series evidence is generally supportive of stochastic convergence.

This paper uses the Ben-David model and extends the time-series tests of convergence to the EAC five partner states over the period 1990-2008. The emphasis here will be on providing an examination of the extent of income convergence or divergence since the establishment of the EAC. While there are clearly more methods available for estimating convergence (Quah, 1993; Arbia *et al*, 2005; Bernard and Durlauf, 1993), the primary attractiveness of this method lies in its applicability to relatively small groups of countries like the case of EAC, and its usefulness for conducting relatively quick convergence comparisons across groups of countries.

In addition, a subtle but important point is to recognize that the evidence of stochastic convergence provided in existing time-series studies is a necessary, but not sufficient, condition for the notion of convergence implied by β -convergence growth theory. The additional time-series test for convergence have been suggested (Loewy and Papell, 1996). Specifically, if per capita incomes are converging, then regression of the log relative income on an intercept and trend should produce opposite signs on their estimated coefficients. We use this test to determine which countries' relative income series are converging, and indicate whether the "opposite-signs" condition is a valid test for absolute convergence. We reconsider the properties of the test in the context of conditional convergence.

In addition, as Quah (1993) notes, the real test of a tendency to convergence is in

showing a consistent diminution of variance among individual countries. We therefore test whether the coefficient of variation in per capita incomes across the EAC countries generally declines during the period under review.

3.3 Definition of variables

The variables used in this study are defined as follows:

i) Dependent variable:

The dependent variable is the growth in GDP per capita of the five countries in time t . Time t captures the period of analysis from 1990 to 2008, the two years inclusive.

ii) Explanatory variables

The independent variables are the GDP per capita of the five countries.

iii) Random variable

The random variable, ϵ_{it} , represents other variables related to per capita GDP growth that are not included in the explanatory variables but have an effect on the outcomes of the model.

It is hypothesised that regional per capita income convergence is likely in the EAC regional integration.

The main assumption in this paper is that of diminishing marginal productivity such that a country with low initial per capita output is growing faster than the ones with higher initial per capita values. Taking the case of time series analysis, this may be interpreted to imply that differences in per capita GDP among the five EAC partner states is transitory.

3.4 Model specification

Ben-David (1993) model captures how quickly each country's per capita income converges to the average level of per capita income of the group studied. It calculates the log differences between each country's level of per capita income and the group's average and then examine how these differences behave over time. As the author argues, this method reduces the dependence of the outcomes on the period's initial and terminal years.

The model, which is used to describe the convergence/divergence behaviour of the EAC, is expressed as follows:

$$(y_{i,t} - \bar{y}_t) = c + \beta(y_{i,t-1} - \bar{y}_{t-1}) + \epsilon_{i,t} \quad (5)$$

Where:

$y_{i,t}$ is the log of country i 's per capita income at time t ¹⁰

c is the intercept

β is, as defined earlier, a parameter indicating the relationship between growth and initial income, being the speed of convergence

\bar{y}_t is the average of the log per capita incomes of the 5 EAC countries at time t and is given by expression (6).

$$\bar{y}_t = \left(\sum_{i=1}^5 y_{it} \right) / 5 \quad (6)$$

If $\beta < 1$, this indicates the existence of income convergence within the EAC, and if $\beta > 1$ it indicates divergence. Once calculated, the estimated β provides an indication of the rate of convergence within the region.

According to the catch-up definition of convergence, countries i and j converge between dates t and $t + T$ if the log per capita GDP disparity at time t decreases.

¹⁰ We express the variables in terms of logarithm thus working with elasticities since the empirical literature on convergence has generally focused on logs rather than levels.

To control for country specific factors that affect income growth in a country, we introduce country-specific dummy variables. Authors have used various approaches to capture and quantify these variables. For example, in their investigation of convergence in Europe, Paas *et al* (2007b) have used the travel time of freight vehicles between the countries being studied to quantify distance differences and border impediments. Chowdhury (2004) used rates of growth of population and gross domestic savings as a proportion of GDP as the control variables while Sachs and Warner (1995) used political and openness dummies (1 for non-qualifiers, 0 for qualifiers) in their estimation.

In this study we use the percentage share of manufacturing in the country's GDP as an estimated measure of the countries specific variables such as adoption of technology, policies and governance. This is based on the argument that value addition of products in these countries has both direct and indirect impact on the growth of GDP per capita. It is also linked to sustainable export base of a country with less global price fluctuations besides being a reflection of confidence attached to the economy by investors in manufacturing sector. The country specific dummy d_i in equation (7) is used to test the influence of the variables. This form of the equation tests for the conditional convergence hypothesis. We then estimate the equations both with and without country specific intercepts (corresponding to the conditional and unconditional convergence hypotheses respectively).

$$(y_{i,t} - \bar{y}_t) = c + \beta(y_{i,t-1} - \bar{y}_{t-1}) + \sum_{i=1}^5 \gamma_i d_i + \epsilon_{i,t} \quad (7)$$

Where

γ is the parameter to be estimated

d_i country specific factors

We further estimate the equations for all 5 EAC countries (EAC-5), the original three members (EAC-3) and then the two new members (EAC-2). This will enable

us to control for possible convergence clubs (or convergence regimes) inside the EAC. If the speed of convergence is significantly higher for those two groups compared to the EAC as a whole we can conclude that different convergence clubs exist.

Letting, $z_{i,t} = y_{i,t} - \bar{y}_t$ in equation (5) and $\Delta z_{i,t+1} = (z_{i,t+1} - z_{i,t})$, Lim and McAleer presented that for each time period, z changes according to the following process¹¹:

$$z_{i,t+1} = a + \Psi z_{i,t} + \epsilon_{i,t} \quad (8)$$

If $\Psi > 1$, per capita GDP in country i diverges from the EAC and if $\Psi < 1$, convergence of per capita GDP takes place. Two-tailed t -tests will be calculated in each case to determine whether the estimated Ψ differ significantly from zero.

The number of years required for the average disparity to be cut into half (when $\Psi > 0$), or doubled (when $\Psi < 0$) will also be estimated. Given the convergence rate estimate, the approximate convergence times can be calculated. As Ben-David (1994) explains it, this is done by estimating the half-life of the convergence process, or the number of years that it takes for the income gap to be cut into half.

This is given by $\log(.5)/\log \beta$.¹² The convergence time estimates utilize a standard

¹¹ The fundamental equation of the Solow – Swan model implies that the derivative of $\frac{\dot{y}}{y}$ with respect to y is negative. Here, the speed of convergence is measured by how much the growth rate declines as the capital stock increases in a proportional sense.

¹² Derived as follows:

$$\text{If } z_{t+1} = \beta z_t,$$

$$\text{then } z_{t+x} = \beta^x z_t.$$

Since $z_{t+x} = .5z_t$ by definition, then

$$.5z_t = \beta^x z_t,$$

$$\text{or } .5 = \beta^x.$$

result from elementary physics, that the half-life (H) of a radioactive substance decaying at the constant rate, β , is $H = \log_2(2) / \beta$ (Fingleton, 1999). Assuming a country with output per capita higher than its equilibrium level and converging toward equilibrium, the half-life gives the time by which the expected log of output per capita equals one half of its original value. Similarly other proportions can be calculated using the same formula. This is taken as the time needed for convergence to be in effect accomplished.

Several estimation methods have been used in studying convergence. These include the Ordinary Least Square (OLS) and the Generalized Method of Moments (GMM) as put forward by Prucha and Kelejian a (1999). In this paper we use the OLS method in estimating the convergence in per capita income for the EAC region.

Testing for catch up

Under the assumption of diminishing marginal returns, the empirical implication of the convergence hypothesis is that countries with low initial per capita GDP are growing faster than those with high initial per capita GDP. Lim *et al* (2003) has shown that, in time series framework, a distinction is made between long-run convergence and convergence as catching up.

Borrowing from the work of these authors, the following equation is used to test for catching up:

$$(y_{i,t} - y_{j,t} = c + \alpha t + \beta(y_{i,t-1} - y_{j,t-1} + \sum_{i=1}^5 \gamma_i d_i + \epsilon_{i,t} \quad (9)$$

Where

$y_{i,t}$ is the per capita GDP of country i (or j) at time t

α is the catching up parameter

NB. Taking logs of both sides and dividing by $\log \theta$ gives x .

β is the convergence parameter

The statistical tests are interpreted as follows:

- a) If $y_{i,t} - y_{j,t}$ contains a unit root (i.e. $\beta = 1$) per capita GDP for the countries diverge over time.
- b) If $y_{i,t} - y_{j,t}$ is stationary (i.e. $\beta < 1$), then either (i) $\alpha = 0$ (i.e. the absence of a deterministic trend) indicates long-run convergence between the countries; and (ii) $\alpha \neq 0$ indicates catching up (or narrowing of the differences) between the countries.

Testing for Stochastic Convergence

In this section, we test for stochastic convergence across the 5 EAC countries over the period 1990-2008. The test for stochastic convergence will be carried using Standard Unit-Root Tests to evaluate the stochastic convergence hypothesis, where evidence against the unit-root null hypothesis is consistent with stochastic convergence. The unit-root tests are applied to the relative per capita real GDP series for each country, measured as the individual country's per capita GDP as a percentage of the aggregate per capita GDP of the group. Specifically, the natural log will be taken of the ratio of the individual country's per capita real GDP to the aggregate per capita GDP of the group.

To do the test, we will first calculate conventional Augmented Dickey-Fuller (ADF) unit-root tests for the relative per capita real GDP series for each country.

The Augmented-Dickey-Fuller (ADF) form of equation (5) is:

$$z_{i,t} = \beta z_{i,t-1} + \sum_{j=1}^k c_j \Delta z_{i,t-j} + \sum_{i=1}^N \gamma_i d_i + \varepsilon_{i,t} \quad (10)$$

Where;

$$z_{i,t} = y_{i,t} - \bar{y}_t$$

$$\Delta z_{i,t} = z_{i,t} - z_{i,t-1}$$

In lieu of an intercept and trend, the applicable critical t -values for the estimations of this equation are the standard t -values (Ben-David, 1996). As Quah (1994) has shown, it is possible to use the standard t -statistic for testing the unit root null since, in the presence of pooling, the t -statistic will have an asymptotically normal distribution. This is corroborated in Levin and Lin (1992) who calculated critical t -values for small samples and found that in the case of pooled data without an intercept or trend, the critical values are nearly identical to the standard t -values.

Test of Spatial Autocorrelation of Variables

Spatial autocorrelation can be considered as the coincidence of value similarity with locational similarity (Gallo and Ertur, 2000). Therefore, there is positive spatial autocorrelation when high or low values of a random variable tend to cluster and there is negative spatial autocorrelation when geographical areas tend to be surrounded by neighbors with very dissimilar values.

As Gallo and Dall'erba (2004) have argued, integrating spatial autocorrelation into convergence models is useful for three reasons. First, from an econometric point of view, the underlying hypothesis in the estimation methods is based on the independence of the error, which may be very restrictive and should be tested since, if it is rejected, the statistical inference based on it is not reliable. Second, it allows capturing geographic spillover effects within the region using different spatial econometric models: the spatial lag model, the spatial error model or the spatial cross-regressive model. Third, spatial autocorrelation allows accounting for variations in the dependent variable arising from latent or unobservable variables. Indeed, in the case of convergence models, the appropriate choice of these

explanatory variables may be problematic because it is not possible to be sure conceptually that all the variables differentiating steady states are included. Furthermore, in certain instances data on some of these explanatory variables may not be reliable.

The measurement of spatial autocorrelation is often based on the Moran's I statistic, which is one of the most widely known measure of spatial clustering (Gallo and Ertur, 2000). For each year of the period 1990-2009, this statistic is written in the following way:

$$I = \left(\frac{N}{S_0}\right) \left(\frac{z'Wz}{z'z}\right) \tag{11}$$

Where,

N is the number of countries

$S_0 = \sum_i \sum_j w_{ij}$, z_{it} is the log of per capita GDP in country i at time t

W is a row-standardized spatial weights matrix defined as;

$$w_{ij} = \frac{w_{ij}^*}{\sum_j w_{ij}^*} \tag{12}$$

Where,

$$w_{ij}^* = \frac{1}{d_{ij}}, \text{ and}$$

d_{ij} is the great circle distance between capitals of countries i and j .

White's Heteroskedasticity Test

The test for heteroskedasticity seeks to check whether the variance of the residuals is constant. To do this the White Heteroskedasticity Test will be used. White's test is a test of the null hypothesis of no heteroskedasticity against heteroskedasticity of some unknown general form. The test statistic is computed by an auxiliary regression, where we regress the squared residuals on all possible cross products of the regressors. The null hypothesis is that the errors are both

homoskedastic and independent of the regressors.

3.5 Data and data sources

This study uses secondary data on the GDP per capita covering the five EAC partner states of Burundi, Kenya, Rwanda, Tanzania and Uganda. While Burundi and Rwanda joined the EAC in 2007, we have incorporated them for the whole period on analysis mainly because they always remained significant trade partners with the rest of the members. In addition, doing so gives an opportunity to study any emerging indications of the impact when the two countries are not members of the Community and when they join it.

Although recent convergence studies analyse data for a longer time horizon, this study covers the period 1990-2008. The reasons for choosing this period is two-fold. First, comparing the two periods, before and after the establishment of EAC, gives an indication of the trends with or without the regional body. Second, is the fact that reliable data is available up to 2008.

Generally, data on GDP, population and therefore GDP per capita are available from the EAC Secretariat, the World Bank and the International Monetary Fund (IMF) as well as the national statistical institutions of the partner states. The data was sourced from the IMF World Economic Outlook Database. This is supplemented by comparable figures from the EAC publication (Economic Reports and statistical publications), the World Bank (World Development Indicators, World Economic Reports and country economic reports) as well as national governments publications (economic surveys and statistical abstracts). The need for supplementing the data from the various sources is due to the fact that the quality of reported data by these countries, particularly Burundi and Rwanda may have been affected by civil unrest in these countries during the period 1980s to early 1990s. The average values for the five countries are calculated before all of them are converted into log values.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

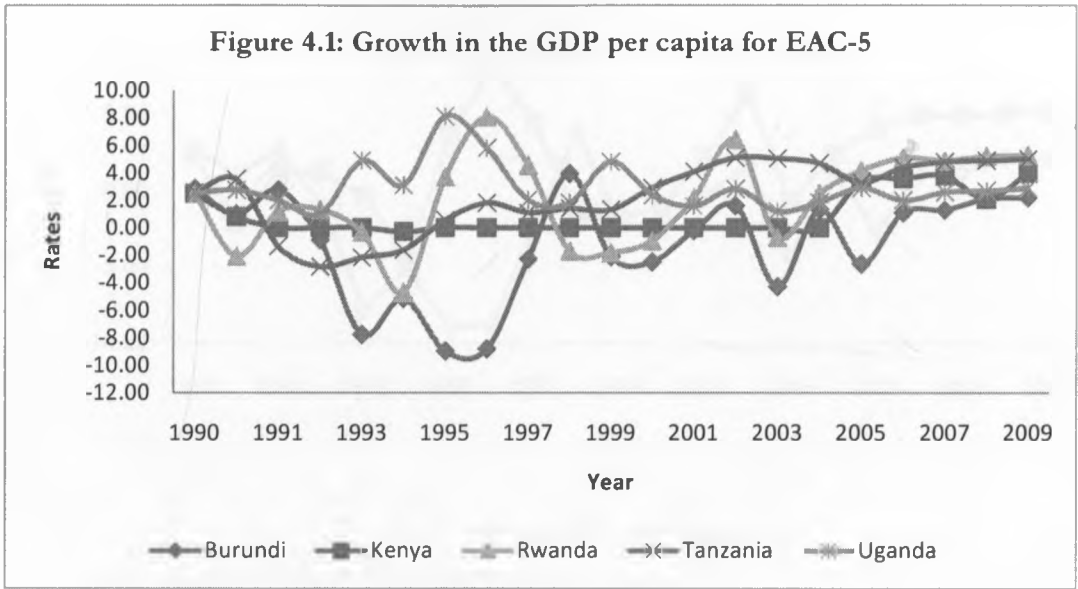
In this chapter we carry out a discussion of the data collected from the secondary sources on per capita GDP for the EAC during the period 1990 to 2009. This includes a presentation of the trend observed from the data, various tests carried on the data and regression analysis to determine the convergence of the per capita GDP. In the analysis we also controlled for country-specific variables in form of share of manufacturing sector to the GDP of each of the five countries. This is in an attempt to represent the environmental factors associated with economic structures in the EAC economy, where typically a larger share of contribution of manufacturing sector have a direct link to the GDP per capita. With this inclusion, we obtain estimates of conditional convergence in the region.

4.2 Data analysis

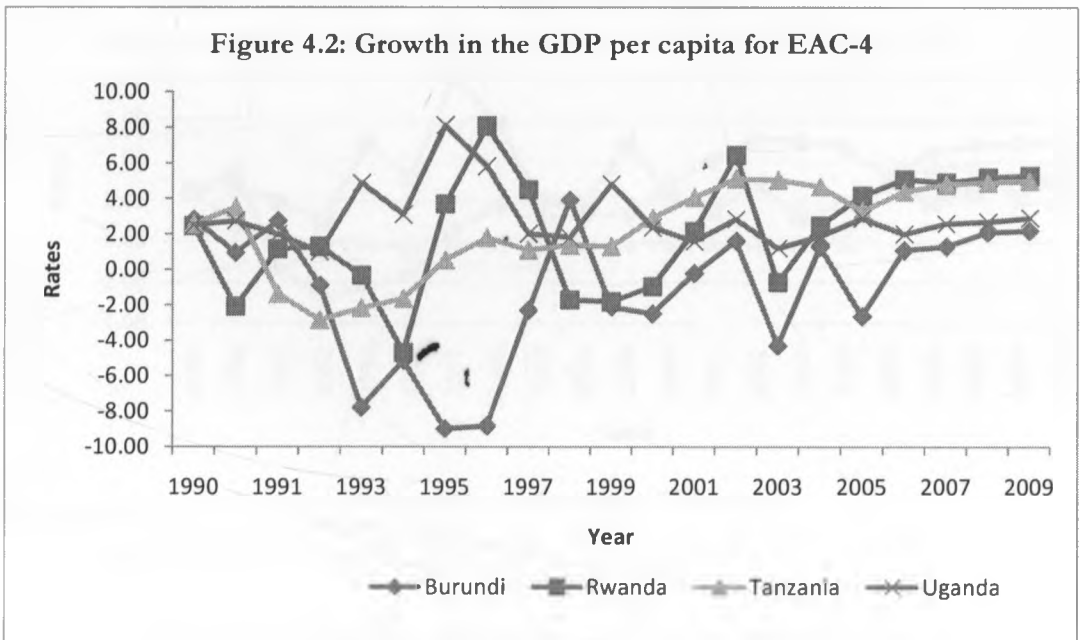
In this analysis we carried out a graphical investigation where we plot on line graphs the GDP growth rates for the period 1990 – 2009 for each of the four categories of EAC-5 (for all 5 EAC countries), EAC-4 (excluding Kenya), EAC-2 (for the two new members) and EAC-3 (the old three members). This investigation will be useful in corroborating the results of regression analysis to be carried out in this section.

Figure 4.1 gives the trend for EAC-5. From the graph we observe that prior to 2000 the rates of growth of the per capita GDP for the EAC-5 set of countries were fluctuating and growing at significantly different rates with Kenyan one growing at 2.49%, Uganda's at 2.51%, Tanzania's at 2.57%, Rwanda's at 2.82% and Burundi's at 2.82%. The trend however changes towards 2009. In Figure 4.2, Figure 4.3 and Figure 4.3 results for EAC-4, EAC-2 and EAC-3 respectively are presented whereby we equally observe similar trends in the GDP per capita growth

in the EAC-4, EAC-2 and EAC-3 sets of countries.

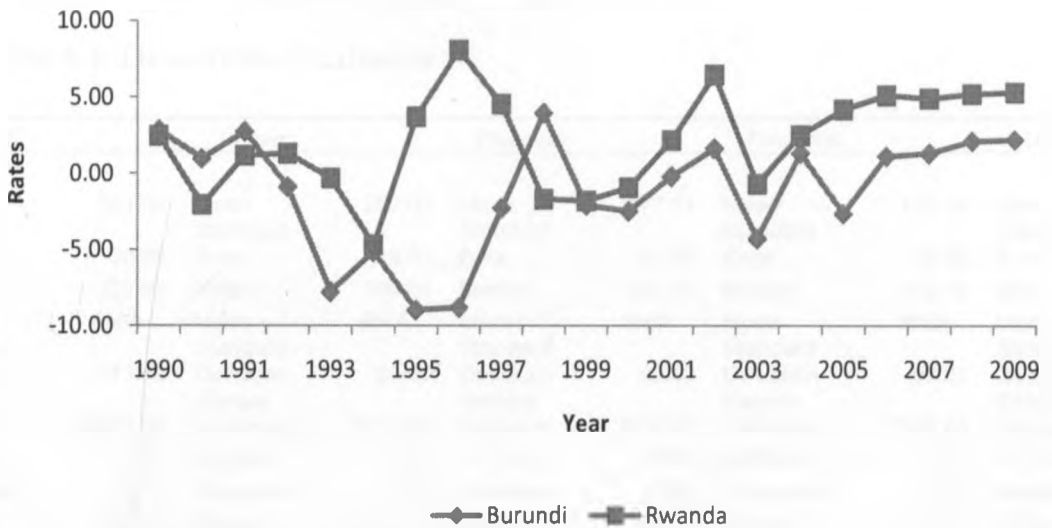


Source: Compiled from IMF, World Bank and EAC Data base



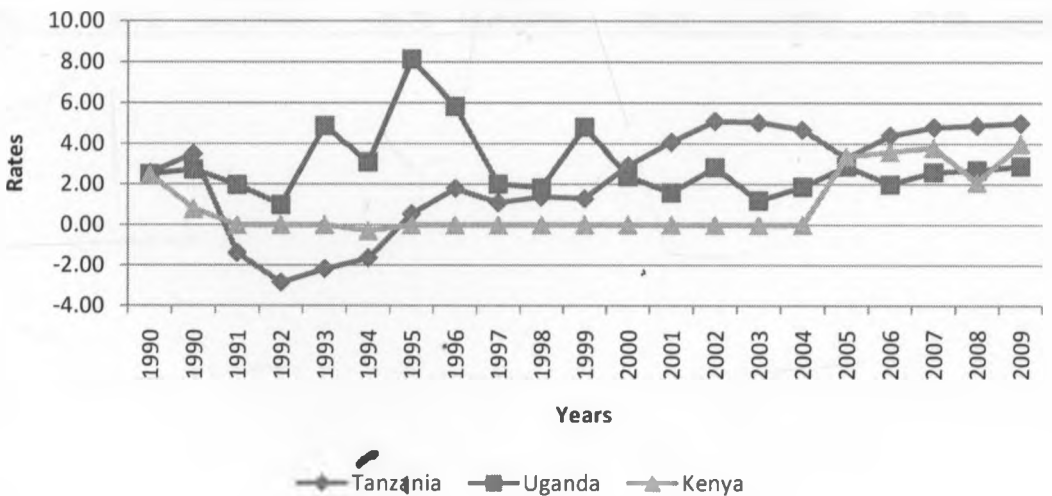
Source: Compiled from IMF, World Bank and EAC Data base

Figure 4.3: Growth in GDP per capita for EAC-2



Source: Compiled from IMF, World Bank and EAC Data base

Figure 4.4: Growth in GDP per capita for EAC-3



Source: Compiled from IMF, World Bank and EAC Data base

Table 4.1 gives the descriptive statistics for the data. It is observed that all the standard deviation results of the data are positive.

Table 4.1: Descriptive Statistics

<i>Burundi</i>		<i>Kenya</i>		<i>Rwanda</i>		<i>Tanzania</i>		<i>Uganda</i>	
Mean	331.34	Mean	207.02	Mean	177.11	Mean	183.19	Mean	179.73
Standard Error	38.39	Standard Error	19.01	Standard Error	13.98	Standard Error	19.42	Standard Error	17.00
Median	322.63	Median	199.01	Median	164.24	Median	172.76	Median	167.59
Mode	#N/A	Mode	#N/A	Mode	#N/A	Mode	#N/A	Mode	#N/A
Standard Deviation Sample	171.68	Standard Deviation Sample	85.01	Standard Deviation Sample	62.52	Standard Deviation Sample	86.87	Standard Deviation Sample	76.01
Variance	29472.90	Variance	7227.30	Variance	3908.40	Variance	7546.46	Variance	5777.08
Kurtosis	-0.53	Kurtosis	-0.73	Kurtosis	-0.88	Kurtosis	0.27	Kurtosis	-0.28
Skewness	0.41	Skewness	0.08	Skewness	0.28	Skewness	0.78	Skewness	0.49
Range	591.88	Range	301.32	Range	219.20	Range	311.14	Range	274.69
Minimum	67.17	Minimum	52.41	Minimum	72.21	Minimum	56.77	Minimum	50.24
Maximum	659.05	Maximum	353.72	Maximum	291.41	Maximum	367.91	Maximum	324.93
Sum	6626.76	Sum	4140.38	Sum	3542.25	Sum	3663.77	Sum	3594.63
Count	20.00	Count	20.00	Count	20.00	Count	20.00	Count	20
Confidence Level(95%)	80.35	Confidence Level(95%)	39.79	Confidence Level(95%)	29.26	Confidence Level(95%)	40.66	Confidence Level(95%)	35.57

4.3 Diagnostic tests

4.3.1 *White's Heteroscedasticity Test*

The White Heteroscedasticity was used to check whether the variance of the residuals is constant. The Null hypothesis holds that there is homoscedasticity. Now from Table 4.2, our p-value is 0.9826721 and is significant. We there accept the alternative hypothesis and conclude that there is heteroscedasticity.

Table 4.2 White's Heteroscedasticity Test

F-statistic	0.324397	Probability	0.9826721
Obs*R ²	0.621753	Probability	0.9422341

4.3.2 *Test of Spatial Autocorrelation of Variables*

In this section we investigate for spatial autocorrelation. In the middle of Table 4.4 various diagnostics on spatial dependence are listed. The Moran test and robust LM tests are carried out for the OLS residuals. There is insignificance of Moran's I indicating the no spatial effects at 1% and 5% level of significance. There are several possible reasons for lack spatial autocorrelation. We believe one of the most important of them to be that distance does not affect spill-over of technology and trade. As shown by Paci and Pigliaru (2001) these spillovers are strong enough to play a role in the EAC.

4.3.3 *ADF Unit root test for Stochastic Convergence*

The Augmented Dickey Fuller (ADF) tests are used to test for the stationarity presence in the logarithms of GDP per capita (LGDP) and thus the time dependence. The null hypothesis is that the variables are time invariant. The estimated t-statistics test results are reported in Table 4.3. Since the null hypothesis is not rejected for the series, they are non-stationary.

Table 4.3: Summary of ADF tests for Non-stationarity

Variable	t-value
TLGDP	-0.7035*
KLGDP	-1.7216**
RLGDP	-2.2673**
BLGDP	-2.5277**
ULGDP	-1.2599*

* indicates significance at the 5% level

** indicates significance at the 1% level

BLGDP is the log of average GDP for Burundi for 1999-2009

KLGDP is the log of average GDP for Kenya for 1999-2009

RLGDP is the log of average GDP for Rwanda for 1999-2009

TLGDP is the log of average GDP for Tanzania for 1999-2009

ULGDP is the log of average GDP for Uganda for 1999-2009

4.4 Convergence results

We now turn to the convergence regression analysis. Here we intended to find out whether there is convergence in the per capita GDP in the EAC where the figures for the poorer countries grow faster than those of countries with higher incomes and whether there were possible convergence clubs (or convergence regimes). For this reason, we divided the group into four sets: EAC-5 (for all 5 EAC countries), EAC-4 (excluding Kenya), EAC-3 (for the original three members) and EAC-2 (for the two new members). We test for absolute as well as for conditional convergence. The estimation of the convergence equations (7) and (8) serve as a point of departure.

The estimation results are indicated in Table 4.4. Results are presented both with and without country dummies using ordinary least square estimate. For each of the estimated values in the table we have two numbers. The first is the estimate value (eg “beta”). The number underneath in parentheses is its standard error. The equations have been estimated with constant term and its standard error is reported below it.

The main preliminary conclusions that can be drawn from the results is that there was slight absolute convergence in the EAC-5, meaning that on average, the countries with lower per capita GDP grew at a relatively higher speed during the period 1990–2009. The speed of regional income convergence was however higher for the EAC-4 and EAC-3 than for the EAC-5. The convergence coefficients for EAC-5 are 0.973 and 0.975 for absolute and conditional convergence respectively. The values indicate that in case of the whole EAC the coefficients of convergence are near 1 (one) which is the level of maintaining the status quo (i.e. where the differences in per capita incomes do not change over time). This could be interpreted to mean that although there some level of convergence, the difference between the growth in per capita GDP of the leading country (Kenya) and those

of the others is relatively small.

Table 4.4. Beta-convergence (absolute and conditional) in EAC-5 and EAC-4 and NMS countries in 1990-2009

	EAC-5		EAC-4		EAC-2		EAC-3	
Dependent variable	LGDP9009		LGDP9009		LGDP9009		LGDP9009	
Method	Least Squares		Least Squares		Least Squares		Least Squares	
Sample	1990 2009		1990 2009		1990 2009		1990 2009	
Included observations	20		20		20		20	
Country dummy (γ)	No	Yes	No	Yes	No	Yes	No	Yes
Intercept	2.11 (0.149)	3.214 (0.211)	2.491 (0.149) **	3.341 (0.132) *	2.278 (0.312) **	3.446 (0.326)	2.31 (0.159)	3.314 (0.232)
β	0.973 (0.016) **	0.975 (0.013)	0.969 (0.041)	0.971 (0.041) *	0.972 (0.041)	0.974 (0.041) *	0.964 (0.018) **	0.977 (0.023)
Country Dummy (γ)		0.214 (0.343)		-1.018** (0.329)		-1.186** (0.329)		0.242 (0.334)
R ²	0.393	0.855	0.213	0.811	0.312	0.838	0.214	0.812
Half-life	25.34	27.38	22.0	24.20	25.17	26.31	22.1	24.1
Speed of convergence	1.471	1.478	1.471	1.474	1.475	1.477	1.471	1.478
Tests for spatial error	+	+	+	+	+		+	+
Moran's I	3.635* (0.000)	2.929** (0.000)	1.541* (0.000)	1.210 (0.000)	1.678 (0.000)	-1.116* (0.000)	3.535* (0.000)	2.429** (0.000)
Lagrange multiplier	2.118 (0.000)	3.928 (0.002)	2.461 (0.000)	2.291 (0.001)	2.349 (0.000)	0.091 (0.763)	2.458 (0.000)	2.290 (0.002)
Tests for spatial lag		+	+	+		+		+
Lagrange multiplier	194.434 (0.000)	18.122 (0.000)	279.667 (0.000)	17.511 (0.000)	1.317 (0.251)	5.764 (0.016)	219.434 (0.000)	17.122 (0.000)

Robust standard errors in the parentheses under the estimated coefficients

p-values in the parentheses under test-statistics.

Significance levels: ** at 1%, * at 5%

Source: authors' estimations

A number of reasons may explain this finding. First it should be noted that conditional convergence considers that convergence in per capita GDP is related to differences in other factors such as industrial mix in form of share of manufacturing in the national GDP. In this case, and as can be observed from Table 1.1, the share of manufacturing in Kenya is more than those of the other EAC countries. In addition Kenya's exports to the EAC continue to grow especially following the establishment of the customs union in 2005. A closer look

at the composition of these exports reveals that they constitute manufactured products. On the other hand most of the exports by the other EAC countries constitute primary products. As Hammouda et al (2007) notes the value of manufactured products is exponentially higher than that of the primary products

The results of our analysis are also in accordance with the findings of several others especially Paas *et al* (2003) who carried out a study in European Union for the period 1995-2000. It is important to note that a decline of income disparities between the countries is often accompanied by increasing disparities within the countries in regional economic community, which underlines the need to improve conditions for economic growth at both national and local levels.

We also estimated the speed of convergence which measures how fast economies converge towards the steady state and we calculate as follows:

$$s = -\log(1+\beta)/T$$

Where: T is the number of periods

The first observation to make is that all the three categories of groupings show different steady-state per capita rates of growth. We observe that the set of the EAC-4 members (excluding Kenya) and the EAC-2 (new members) have similar catching-up rates of 1.471% and 1.476% respectively. We can therefore argue that the forces of convergence attributed to Rwanda are strong enough to push the speed of convergence for EAC-2.

Similar studies have used equation (8) for the same purpose. For example, Barro and Sala-i-Martin (1992) have estimated the model to study convergence in per capita income across 48 states of the USA during the period 1880-1988, and found evidence of "beta" convergence which runs at a rate of 2% per year. Likewise, Dewhurst J. H. and Mutis-Gaitan (1995) used the same approach to test the

convergence of GDP per capita among the EU countries, over the period 1981-1991. They found a conditional convergence across regions in the EU for the whole period at a slow rate of less than 1% per annum. The conditional variables they used include regional population, working-age population, participation rate, regional unemployment rate and the share of employment in agriculture and services. In most of such studies, a common finding is that the process of convergence is very slow or dramatically slow.

4.5 Testing for catching up

The data on Table 1.2 shows that Kenya is a dominant country in terms of the GDP size and Per capita GDP while Burundi is the poorest of all. It therefore becomes essential that we establish whether there is a tendency for catch-up among the four countries to the per capita GDP of Kenya. The Catch-up theory postulates that the per capita GDP of the poorer country grows faster than that of the richer country. Over time, as this trend is maintained, the per capita GDP of the countries in question tend to converge.

From the convergence results in this section, we found that $\beta < 1$ implying the need for testing for catch-up with expected results of either (i) $\alpha = 0$ indicating long-run convergence between the countries; or (ii) $\alpha \neq 0$ indicating catching up (or narrowing of the differences) between the countries. Thus the expected sign of the parameter is $\alpha < 0$ while the constant a can take either sign. A negative α parameter supports the catching up hypothesis that lagging countries have higher rates of per capita GDP growth, thereby narrowing the gap.

In this regard, the tendency for catching up between the EAC countries over the period 1990 – 2009 is conducted with equation (9). Table 4.5 gives the results of the test.

Table 4.5: Estimation results for the catching up hypothesis

	a	α	Half year
Burundi	-0.2272 (-1.6921)	0.0141 (1.4127)	(27.0)
Rwanda	-0.0037 (-0.1903)	-0.0151** (-2.2176)	22.5
Tanzania	0.0042 (0.1805)	-0.0152** (-1.9451)	22.4
Uganda	0.2009 (-0.1418)	-0.0145* (-2.1365)	25.0

Notes: t-values are given in parentheses
 * indicates significance at the 5% level
 ** indicates significance at the 1% level
 (...) indicates double year

For the basic catching up hypothesis, the estimated coefficients α are negative for all countries except Burundi. These results imply that the three countries have exhibited catching up to Kenya over the period. The rates of catching up for Rwanda and Tanzania are the highest at 1.51% and 1.52% respectively, followed by Uganda at 1.45%. In the case of Burundi, the coefficient is positive indicating that the per capita GDP gap is expanding at the rate of 1.41% and it will take 27 years to double.

Summing up, it is notable that some form of convergence is observable in the EAC per capita GDP over the period 1990-2009 albeit at lower level except for Burundi. In the next chapter we conclude the discussion with a recap on the salient issues emerging and put forward some policy packages for the EAC regional integration process.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The aim of this concluding chapter is to recap on the salient issues that have emerged in this study. The general objective of this study was to analyze the convergence in per capita GDP for the period 1990-2009 among the partner states of the East African Community (EAC) which is a regional integration body of Burundi, Kenya, Rwanda, Tanzania and Uganda. The study has analysed the economic status of the EAC countries, their per capita GDP and convergence trends.

The studies already done on convergence informed the analysis in this paper. Among them are the studies by Paas et al (2007a, 2007b); Ben-David (1993); and Quah (1993) which have discussed convergence in per capita GDP and the different approaches used in their estimation. Consequently, the paper uses the neo-classical model proposed by Ben-David (1993) which identifies the conditional, absolute and club convergence hypothesis using both “Beta” and “Sigma” approaches to convergence.

Borrowing from these studies, this paper has applied the model in the EAC and analysed convergence in GDP per capita, estimated the rate of convergence and the period at which the per capita gap between the countries will be reduced by half. It has further considered the policy implication of the findings that are relevant for the regional integration process in the EAC. The neo-classical approach, which guided our analysis suggests that if economies are similar, we should find some tendency for absolute and conditional convergence as well as identifying groupings that are converging using the time series approach. Likewise

conditional convergence would be found in economies that are not similar.

Based on the regression analysis, the key conclusions of this paper are, firstly, that there has indeed been evidence of both (absolute) unconditional and conditional convergence in per capita GDP for the EAC countries during the period 1990-2009. The conclusion is based on the results indicating that there is a significant negative relation between the growth of per capita income and the starting level of per capita income which confirms the neo-classical hypothesis of convergence. Secondly, among the new EAC members, Rwanda's growth and catching-up are faster than in the case of Burundi implying that "good" policies mattered. In this case, and as Sachs and Warners (1995) put it, poor policies seem to affect growth directly, by way of affecting the rate of accumulation of physical capital, and thus hindering the country in benefiting from the advantages of globalization.

These findings of convergence are useful for policy makers in designing programmes of economic integration and it shows that EAC represents a convergence club among themselves, albeit at the lower end of the convergence spectrum. However, while convergence has occurred, the speed at which the initially poor countries are catching up with the initially rich countries is low. We note the countries converge at a rate of less than 2% per year. It implies, for example, that it will take more than 40 years to eliminate the asymmetries between the EAC countries, a fact which calls for a more active regional policy in order to accelerate the catching up process of growth between the countries. With such findings this study collaborates what some of other studies have found in other regions. The result is consistent with findings of convergence within groups of countries displaying similar endowments.

This brings us to the issue of catching-up. The convergence hypothesis states that the EAC countries with relatively lower initial per capita incomes (or the poorer

countries), those, grow faster than richest ones so that over time income levels converge across the five countries. Generally speaking, one of the main reasons for expecting convergence of per capita incomes across the five countries is the assumption of diminishing marginal returns to physical capital in the neoclassical model. In this regard those with low incomes per capita have low ratios of capital to labour, hence a higher marginal product of capital. Capital would flow to areas with relatively higher rates of return, which is to areas where capital is relatively scarce. Therefore capital-labour ratios will move over time to equality and with them factor prices. This would imply that capital would flow from rich to poor countries and income in poor countries would grow faster than incomes in rich countries and that the two would eventually converge.

The data on GDP size and per capita GDP confirmed the dominance of Kenya in the EAC with Burundi being the poorest. This necessitated an investigation to the possibility of catching of the other four countries to the Kenya level. This study found relatively high rates of catching-up for Rwanda, Tanzania and Uganda in GDP per capita. This implies that the three economies which are at relatively low levels of industrialization and have high dominance of agriculture in their GDP experienced capital flows during the period under study. This resulted into increased factor prices and thus higher rates of per capita incomes. This finding, in the case of Rwanda, generates some interest. Despite having undergone political instability in early 1990 culminating in the genocide of 1994, its per capita GDP is converging with that of the lead country. This is observed at the backdrop of sound macro-economic policies coupled with embracing open-economy approach that has opted to adopt modern technology.

While grouped with the other four partner states, there was minimal and insignificant catching-up in the case of Burundi. As discussed in the Jones (2002), such a scenario where the predicted resource flows are not observed, and capital

does not flow from richer countries to poorer ones may be attributed to various factors. It is important to first note that the catch-up hypothesis asserts that being behind in the level of productivity carries a potential for rapid advancement. In this case, the growth rates of productivity in any long period tend to be inversely related to the initial levels of productivity. Being behind, therefore, carries an opportunity for modernization in technology where technological spill-over gives less developed countries the opportunity to catch up. However, their capacity to benefit from the advantages of being behind depends on the pattern of consumption and on the threshold level of infrastructural development. As Togo (2001) has argued, regional income inequality could be found in areas where factors are not allowed to move freely due to regulations or insufficient transportation or communications implying that markets do not function well. In addition, such divergence can be attributed to government policies. We can, therefore conclude that lack of catch-up in Burundi may be attributed to the state of poor infrastructure, inadequate institutional structures and government policies. The state of political instability experienced during the last two decades in the country could also have contributed to the observed trend.

One may argue that the finding strengthens views expressed elsewhere to the effect that a laggard country requires special remedial policies to provoke high-speed growth, lest they get trapped in a low-growth economy. However, a more parsimonious interpretation of the evidence is that convergent growth can be achieved by all or virtually all countries that follow a reasonable set of political and economic policies, including civil peace, basic adherence to political and civil rights, and an open economy. In fact this conclusion corroborates the findings of the New Growth Theories in the extent that initial economic development conditions determine the long-run economic growth processes.

Therefore, the necessary interventions for increasing the rate of up catching-up in the poorer EAC countries need to revolve around creating a climate of sustainable development and get the economies out of the poverty trap. Indeed, a poor country can not escape from poverty without the implementation of policy initiatives to change initial conditions in such a way that this country could jump from its low level to another stable one but characterized by a higher level of income. In addition, these results should be taken into account in the discussions about the means and orientations of regional policy approach in the EAC which are taking place in the framework of the establishment of an EAC monetary union and political federation. Deliberate support to the less developed countries, and more so Burundi, should not be reduced. On the contrary more efforts should be directed to them in order to facilitate their effort of catching up with the rest. At the same time, a particular attention should be given to the difficulties involved in the transition process from the intermediate level of poverty to higher levels of per capita income with aim of achieving sustainability.

A number of lessons have so far emerged from this study. Firstly, is the importance of cross-country interaction in regional integration arrangement. The traditional neo-classical model of growth, that provides the theoretical framework for much of the empirical work on convergence, has been developed starting from the assumption that the economies are fundamentally closed. However, in this study it can be noted that convergence in an open/liberalized economy can be faster, and possibly more complete, than in a closed economy, a case well demonstrated by Rwanda. Secondly, is that empirical methodologies which have been put forward for analysis of income convergence are limited in their informative content. They are therefore exposed to criticism by the development experts in terms of their qualitative information. This is the case, for example, in our study on EAC where the per capita figures give the averages rather than the actual distribution of the incomes. To address this drawback, a viable alternative is

represented by the 'distributional approach to convergence' that, using stochastic kernels to describe the law of motion of cross-sectional distributions of per capita income, puts emphasis on both shape and mobility dynamics and thus appears to be generally more informative on the actual patterns of cross-sectional growth than convergence empirics within the regression approach.

Similarly to the findings by Quah (1993), this study has shown that convergence clubs exist in the EAC. The fact that the catching-up rates by the other four countries to the Kenyan rate of capita GDP growth are relatively slow, this shows that there are forces that create the potential for explosive growth such as those witnessed in some countries in East Asia. Conversely, there are also strong factors for stagnation and decline.

5.2 Recommendations

Turning on to the policy implication, it may be noted that for low-income countries like EAC, big differences in per capita GDP across countries have to be regarded as undesirable for the economic integration process. The evidence of small rates convergence across EAC countries in our study explains that the cross-country income inequality is disappearing over a prolonged time horizon. This trend, therefore calls for application of a number of policy measures aimed at strengthening the convergence rate and countering any divergence tendency that may occur in the process of integration.

First and fore most, from the results obtained, we can infer that a more proactive economic policy coordination will be beneficial to the region and should be encouraged. We learn from the other more advanced regions such as European Union where policy discussion of economic integration has focused on the idea that convergence in productivity and income depends on convergence in certain macroeconomic characteristics (inflation, public sector deficit, external accounts,

etc). Hence the focus has largely been on the question of to what extent convergence in these factors can be achieved with the European Commission playing a pivotal role. This is a matter the EAC region needs to consider seriously. In this case there is need to consider strengthening the role of the EAC Secretariat as co-ordinating agency with significant legal framework to enable it have some enforcement capability. With this enhanced role the agency would ensure consistency in national policy framework that would lead to convergence tendency in the region.

Secondly, it is the time the region considers seriously the need for a development fund with the objective of stabilizing financial flows. With the establishment of the EAC Customs Union that provided for elimination of internal tariffs and application of a common external tariff structure this implied significant loss of customs revenue and sovereignty in adjusting the duty rates. It also meant more exposure to intra-regional competition in the supply of goods and services. To strengthen their competitiveness the countries therefore need some concessional source of funds that would finance policy implementation.

Thirdly, the speed at which countries converge and poor ones catch-up with the richer ones is positively related to the quality of infrastructure. This therefore calls for the region to invest more resources in the development of key infrastructure facilities. These would be aimed at opening up key production areas to the market, both internal and external. In this regard more resources need to be directed to the development of the prioritized projects in roads, railways, ports and ICT, among others that facilitate access to the market.

Fourthly, the speedy achievement of per capita GDP convergence in the EAC is dependent on appreciating the fact that the long term interests of each of the partner states rest on a resolute commitment to the provisions being made at the

regional level. In fact, through the ground already covered, there is now a fertile ground marked by numerous cross-border interconnections to promote integration in the Community. The last push now has to come from the partner states themselves in order to strengthen the region and its integration.

In conclusion it is hoped that the paper serves the role of being catalytic for further work in this topical issue in the EAC. Consequently, a study can be done on the convergence in the rates of inflation or even interest rates. In addition an empirical investigation on the costs-benefits analysis of having the EAC could give vital lessons on the importance of deepening and widening the Community.

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ANNEXES

ANNEX 1: Log EAC GDP per capita

	Burundi*	Kenya	Rwanda	Tanzania	Uganda	EAC
	y _{1t}	y _{2t}	y _{3t}	y _{4t}	y _{5t}	y _t
1990	2.30	2.56	2.27	2.22	2.38	2.37
1991	2.30	2.53	2.33	2.27	2.26	2.35
1992	2.26	2.52	2.28	2.23	2.18	2.31
1993	2.19	2.35	2.23	2.18	2.22	2.24
1994	2.18	2.43	2.25	2.19	2.29	2.28
1995	2.21	2.52	2.38	2.24	2.44	2.37
1996	2.15	2.63	2.39	2.33	2.45	2.42
1997	2.19	2.66	2.48	2.39	2.45	2.46
1998	2.15	2.68	2.46	2.41	2.46	2.47
1999	2.10	2.63	2.41	2.42	2.41	2.42
2000	2.02	2.63	2.32	2.49	2.43	2.42
2001	1.99	2.62	2.33	2.49	2.43	2.42
2002	1.95	2.62	2.31	2.50	2.44	2.41
2003	1.92	2.67	2.33	2.52	2.45	2.44
2004	1.96	2.69	2.36	2.55	2.51	2.47
2005	2.02	2.75	2.32	2.58	2.57	2.51
2006	2.10	2.79	2.52	2.57	2.52	2.55
2007	2.07	2.85	2.56	2.64	2.59	2.61
2008	2.21	2.90	2.69	2.72	2.65	2.69
2009	2.26	2.93	2.73	2.74	2.68	2.71

Source: Compiled from IMF World Economic Outlook Database, 2010

* Burundi (1), Kenya (2), Rwanda (3), Tanzania (4), Uganda (5)

ANNEX 2: Growth in the EAC GDP per capita

	Burundi	Rwanda	Tanzania	Uganda	Kenya
1990	2.82	2.46	2.57	2.51	2.49
1990	0.97	-2.08	3.51	2.74	0.79
1991	2.74	1.16	-1.38	1.98	-1.79
1992	-0.90	1.30	-2.85	1.00	-3.86
1993	-7.77	-0.32	-2.18	4.88	-2.63
1994	-5.15	-4.70	-1.64	3.10	-0.29
1995	-8.97	3.70	0.55	8.13	1.59
1996	-8.82	8.08	1.79	5.83	1.48
1997	-2.30	4.52	1.10	2.02	-1.98
1998	3.94	-1.71	1.38	1.83	0.87
1999	-2.11	-1.82	1.31	4.82	-0.03
2000	-2.49	-0.95	2.91	2.38	-1.62
2001	-0.21	2.16	4.08	1.59	1.57
2002	1.62	6.45	5.11	2.84	-1.57
2003	-4.29	-0.71	5.05	1.20	0.8
2004	1.30	2.49	4.69	1.88	2.55
2005	-2.64	4.17	3.30	2.89	3.38
2006	1.10	5.10	4.40	2.01	3.60
2007	1.30	4.90	4.80	2.60	3.80
2008	2.10	5.20	4.90	2.70	2.10
2009	2.20	5.30	5.00	2.90	4.00

Source: Compiled from MF World Economic Outlook Database, World Bank World Development reports; EAC data base