Ethnic Diversity and Economic Instability in Africa:
Policies for Harmonious Development

Regional Integration in East Africa
Diversity or Economic Conformity

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Abstract

The present paper examines the economic rationale for regional economic integration, such as a common market and currency union, in the East African Community (EAC). For that purpose, I examined the degree of regional economic interdependence in terms of trade, macroeconomic indicators, and real disturbances (IS shocks) in the EAC.

First, I used the trade intensity indices (TTI) to examine whether the degree of trade interdependence in East Africa is higher or lower than that in other regions (e.g., Asia), and whether the region's economic interdependence has deepened since the reformation of the EAC in 2000. Surprisingly, the interdependence in terms of trade in Africa is very strong, much stronger than that in Asian countries.

Second, I investigated whether the macroeconomic links among the East African economies are strong and whether they became tighter in the 1990s. Relying on the principal component analysis, I have found that the degree of confluence in macroeconomic variables, such as inflation, growth, and exchange rates, is high in East Africa, although I did not observe a clear trend of increases.

Third, relying on the theory of the optimum currency area, I examined the prospects for currency unification in the EAC. For that purpose, I examined the degree of synchronization of real disturbances (IS shocks) among EAC countries, and compared it with that among Asian countries. By applying the principal component analysis on IS shocks in each country, I found that the EAC countries face similar real disturbances. This suggests that the need for independent monetary policy is less than otherwise, and therefore the EAC is a good candidate for the optimal currency area.

All these findings suggest that there is a strong case for a common market and currency union in the EAC.

Keywords: African Community, regional economic integration, common market, currency union, principal component analysis, optimal currency area

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1. Introduction

Recently, partly due to the poor performance of the multilateral trade negotiations under the auspices of the WTO, regional integration is flourishing all over the world, e.g., the European Union, NAFTA, MERCOSUR, ASEAN, and many other bilateral preferential trading arrangements. Africa is no exception to such trends, where many regional integration arrangements, such as the East African Community (EAC), COMESA, SADC, ECOWAS, UEMOA, and others, are in effect.

There are pros and cons for regional economic integration. As for trading arrangements, some argue that preferential trading arrangements (PTAs) complement multilateral WTO trade liberalization, and that such PTAs are beneficial to the economic development of small developing countries such as most African nations. Others argue that PTAs sometimes constitute inefficient trading blocs, which are detrimental to economic growth. Some argue that currency unification encourages economic growth by eliminating instability due to exchange rate fluctuation. But others argue that by forming a currency union, member countries have to give up autonomy in monetary policy, which actually increases instability in the national economy.

In view of the above, the major purpose of this paper is to examine the economic rationale for taking a regional initiative to integrate real and money markets in Africa. In this paper, I will concentrate on the EAC initiatives to create a common market and currency union. In other words, I will examine whether the East African Community is a desirable grouping for the common market and the currency union, in view of the economic and social diversity among member countries (Burundi, Kenya, Rwanda, Tanzania, and Uganda). For that purpose, in this paper I will examine the degree of interdependence in East Africa in terms of trade, because the closer the region unites together in terms of real variables, the stronger the case for financial integration. After that, I will examine macroeconomic preconditions for currency unification in the East African Community, relying on the theory of the optimal currency area. I will examine

some criteria for the optimal currency area, e.g., the degree of confluence of real economic disturbances (IS shocks)

The paper is organized as follows. Section II briefly reviews the history of the East African Community and the basic economic and social indicators in EAC countries. In Section III, I will discuss the degree of interdependence in the flow of goods (trade) in East African Community. I attempt to determine whether the degree of interdependence in East Africa is higher or lower than that in other regions (e.g., Asia), and if the region's economic interdependence has deepened since the reformation of the EAC in 2000. Generally speaking, interdependence in terms of trade is very strong in East Africa, but there was no clear boost after the reformation of the EAC. Section IV investigates whether the macroeconomic links among the East African economies are strong and whether they have become stronger in the 1990s. Relying on the principal component analysis, I find that the degree of confluence in macroeconomic variables, such as inflation, growth, and exchange rate, is high. In Section V, relying on the theory of the optimum currency area, I examine the prospect for currency unification in the East African Community. More specifically, I look at the degree of synchronization of the real disturbances (IS shock) among EAC countries, and compare it with that in Asian countries. By applying the principal component analysis on IS shocks in each country, I find that the economic preconditions for currency union in EAC are satisfied, as is the case in ASEAN countries. Section VI summarizes the major findings of the paper, and provides some agenda for future research in this subject.

2. Salient features of East African community

East African Community (EAC) currently consists of five member countries in East Africa: Burundi, Kenya, Rwanda, Tanzania, and Uganda. The EAC was formed in 1967 by Kenya, Tanzania, and Uganda. The EAC was dissolved in 1977, mainly due to political reasons. In the tide of regionalism all over the world, the Treaty for the Establishment of the East African

Community was signed by Kenya, Tanzania, and Uganda in November 1999. The newly-created EAC entered into force on July 7, 2000. In 2007, Burundi and Rwanda were admitted as members of the EAC.

In November 2009, a historic document, the EAC Common Market Protocol, was signed by the five countries, which then established a common market allowing the free movements of goods, persons, and capital as an integral part of the East African Community. In addition to the creation of the common market, the establishment of a currency union is being seriously negotiated.

Table 1 summarizes the basic economic and social indicators of EAC countries (and those of Asian countries for comparison). We quickly note that, in comparison with Asian countries, the EAC is a fairly homogeneous group of countries in a pessimistic sense: (i) per capita income is lower: (ii) life expectancy is shorter; and (iii) the illiteracy rate is higher.

Table 1. Basic economic and demographic indicators

	Area	Population	GNI	GNI per capita	Fertility rate	Life expectancy	Illiteracy rate	
		2008	2006	2006	2006	2006	2007	
	thous. Km2	thous.	$100 mil.	$			male	female
Brundi	28	8,856	9	100	6.0	51.7	28.6	40.2
Kenya	580	38,549	236	580	5.0	53.5	22.3	29.8
Rwanda	26	10,008	23	250	6.0	51.7	28.6	40.2
Tanzaina	945	41,463	131	350	5.3	50.3	21.0	34.1
Uganda	241	31,902	97	300	6.6	49.6	18.2	34.5
Indonesia	1,905	234,342	3,090	1,420	2.2	67.7	5.1	12.0
Malaysia	330	27,026	1,418	5,490	2.7	71.6	5.8	10.4
Philippines	299	89,651	1,278	1,420	3.3	67.5	6.9	6.3
Singapore	0.7	4,490	1,280	29,320	1.3	80.5	2.7	8.4
Thailand	513	64,316	2,021	2,990	1.8	72.0	4.1	7.4
Viet Nam	332	88,537	566	690	2.2	71.9	6.1	13.1
Cambodia	181	14,697	62	480	3.3	62.0	14.2	32.3
Lao	237	5,962	33	500	3.3	60.3	20.0	33.4
Myanmar	677	49,220	136	220	2.1	59.6	6.1	13.6
Brunei	6	398	115	24,100	2.4	77.5	3.5	6.9
Japan	378	127,937	45,210	38,410	1.3	82.6	n.a.	n.a.

Source: Compiled from IMF and UN statistics.

Gross National Incomes per capita in the East African countries are in the range of $100-600, while those of most Asian countries are over $1,000 (in Japan, Singapore and Brunei, the figure is over $20,000). Life expectancy in the East African countries is around 50 years, while it reaches over 70 years in many Asian countries. The illiteracy rate in the East African nations are 20-30 percent for males and 30-40 percent for females, while the illiteracy rate is very low in Asia, with the exception of Cambodia and Laos.

In spite of the inflow of a huge amount of foreign aid, East African countries are suffering from stagnant economies and low living standards, and economic development urgently needs to be boosted. In addition to the efforts made by the individual countries, the concerted actions by several countries may well encourage economic development. Also, economic integration in terms of trade, finance, and migration could boost the economy because such measures will expand the market of member countries.

In view of the above, in the following discussions, I will examine whether or not economic preconditions for regional integration in trade, finance, and even currency in East African countries are met. I will compare the degree of economic preconditions in East Africa with those of selected Asian countries.

3. Interdependence in trade among EAC countries

First, let us examine the degree of interconnectedness in the real economy. In this section, I will examine how closely EAC countries are (or are not) connected with each other in terms of trade. First, let us examine EAC trade by major trading partner. Table 2 summarizes the share of EAC trade by partners since 1980.

Table 2. Share of EAC5 trade by destination (%)

	1980	1985	1990	1995	2000	2005	2008
WORLD	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AFRICA	11.4	9.7	15.3	22.9	22.6	22.9	19.6
EA5	7.1	6.6	10.7	13.6	13.1	11.6	9.4
EU	42.6	47.6	46.0	37.0	29.4	22.5	20.3
MIDDLE EAST	16.4	13.7	7.3	8.0	15.2	14.5	16.2
DEVELOPING ASIA	5.2	6.7	6.7	12.2	12.2	17.0	22.7
USA	5.4	6.1	5.1	3.7	3.4	6.6	3.5
JAPAN	6.7	6.5	6.9	6.0	4.9	3.4	4.0
OTHER	12.3	9.7	12.7	10.2	12.1	13.1	13.7

Source: Compiled from data in IMF Direction of Trade

From this table, we can observe several interesting trends. First, in the 1980s EAC countries were heavily dependent on trade with European countries. As the table shows, almost half of EAC trade was conducted with European countries (27 European Union countries). In contrast with this, the share of intra-African trade was small, at around ten percent. However, in the 1990s EAC trade with Africa doubled to over twenty percent. Similarly, the share of intra-EAC trade almost doubled from 6-7 percent to 10-13 percent in the same period. The increase in EAC trade with developing Asian countries is also remarkable. It increased from 5-6 percent to over fifteen percent, mainly due to the emergence of China as a major economic power in the world. As Table 2 shows, while European countries were by far the major trading partners in the 1980s, in the 1990s and onward intra-African trade and intra-EAC trade have become more important than before.

Note that the figures in Table 2 somewhat underestimate the degree of interconnectedness between the EAC countries in terms of trade. Since the economic size of European Union is far larger than that of the EAC, for any countries the share of trade with the (gigantic) EU becomes naturally far larger than the share of trade with the (tiny) EAC, and therefore the share in Table 2 does not necessarily show the *intensity* of trade. In order to avoid this bias and to correctly assess the degree of interconnectedness in trade, let us compare EAC

nations with Asian nations by using the trade intensity index that Yamazawa et al. (1991) develops extensively.

The trade intensity index between country i and country j ($TII_{i,j}$) is defined as:

$$TII_{i,j} = (T_{i,j} / T_i) / (T_{w,j} / T_w)$$

where $T_{i,j}$ = trade volume of country i with country j,

T_i = the total trade volume of country i,

$T_{w,j}$ = trade volume of the world with country j,

and T_w = the total trade volume of the world.

Accordingly, the index is the ratio of the share of the trade with j'th country in the total trade of country i to the share of the j'th country's trade in the total world trade. The index is normalized by dividing it by the relative share of the country in total world trade so that the effect of the mere size of the country is eliminated. If the degree of trade interaction between country i and country j is equal to that between the world and country j, then the index is equal to unification. The higher the index is, the more closely the two countries are interrelated by trade.

Table 3 depict the trade intensity indices among EAC countries in 2008. As is easily seen, those indexes that adjust for the size effect of trading partners show very high values among EAC countries. Out of 10 entries, seven entries are over one hundred. The trade intensity index between Rwanda and Uganda is as high as 517.78. Note that, if there is no bias, the value of trade intensity index is only unity.

A caveat is in order here. While the "trade intensity index" is powerful in that it eliminates the size effect, it sometimes overestimates the intensity among very small countries. Although theoretically speaking TTI eliminates the size effect and shows the degree of interconnectedness correctly, in reality in the case of small countries it could exaggerate a measurement error in trade statistics. Namely, when the amount of trade is very small, only a

small downward deviation in measurement errors could increase the TTI figure dramatically. However, with the above caveat, we may conclude that Table 2 shows that the trade intensity among EAC.

Table 3. Trade intensity index among EAC5 (2008)

	Burundi	Kenya	Rwanda	Tanzania	Uganda
Burundi					
Kenya	149.35				
Rwanda	243.36	225.57			
Tanzania	66.86	104.23	37.00		
Uganda	412.18	200.08	517.78	44.15	

Source: Compiled from data in IMF Direction of Trade

The high values of trade intensity indices in the EAC become clear when we compare the values with those in other regions. In what follows, I will compare the values of trade intensity indices of EAC with those of ASEAN and COMESA.

Table 4 depicts trade the intensity indices of ASEAN 10 countries. Note that ASEAN has achieved FTA in 2002, and that various attempts have been made to boost intra-regional trade. However, the values of trade intensity indices of EAC countries are far larger than those of ASEAN countries. As Table 4 shows, most TIIs (trade intensity indices) of ASEAN countries are in the single digits. The highest value in Table 4 is the TII between Lao and Thailand (50.09), and the second highest is that between Myanmar and Thailand (35.09). But these figures are far smaller than those of East Africa, where in many cases the figures exceed two hundred.

Table 4. Trade intensity index among ASEAN10 (2008)

	Burnei	Cambodia	Indonesia	Lao	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
Burnei										
Cambodia	0.04									
Indonesia	24.03	1.76								
Lao	n.a.	1.00	0.13							
Malaysia	3.64	1.16	4.55	0.97						
Myanmar	0.07	0.04	2.79	n.a.	2.68					
Philippines	0.21	0.16	2.74	0.04	2.91	0.27				
Singapore	4.14	2.56	9.95	0.30	9.67	5.12	4.72			
Thailand	1.52	15.95	4.03	50.09	4.49	35.69	3.99	2.40		
Vietnam	n.a.	24.99	2.11	18.18	2.42	1.88	2.68	4.04	4.30	

Source: Compiled from data in IMF Direction of Trade

Table 5. Trade intensity index among COMESA (2008)

	Burundi	Comoros	Congo(D.R)	Djibouti	Egypt	Ethiopia	Kenya	Libya	Madagascar	Malawi	Mauritius	Rwanda	Seychelles	Sudan	Swaziland	Uganda	Zambia
Comoros	n.a.																
Congo(D.R)	18.65	n.a.															
Djibouti	0.61	n.a.	0.00														
Egypt	2.31	n.a.	0.26	0.00													
Ethiopia	n.a.	n.a.	n.a.	68.10	4.45												
Kenya	149.35	64.03	55.02	8.95	6.68	6.57											
Libya	n.a.	n.a.	n.a.	n.a.	0.84	0.86	0.00										
Madagascar	n.a.	143.75	0.48	0.14	1.61	0.00	2.87	0.02									
Malawi	n.a.	n.a.	8.12	0.69	14.06	0.00	41.42	0.00	18.23								
Mauritius	2.24	119.10	0.00	0.00	0.02	0.00	6.68	0.00	161.86	2.15							
Rwanda	243.36	n.a.	94.79	n.a.	n.a.	0.05	225.57	0.00	0.00	0.78	7.26						
Seychelles	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	7.78	n.a.	2.93	0.49	192.03	n.a.					
Sudan	10.74	0.31	0.15	0.18	9.21	33.86	5.09	0.60	0.12	0.00	0.07	0.01	1.16				
Swaziland	0.23	0.08	0.06	0.03	0.55	0.42	0.37	3.62	0.20	0.38	0.95	0.12	0.33	0.18			
Uganda	412.18	n.a.	94.59	7.42	2.27	0.80	200.08	0.03	0.03	5.87	2.54	517.78	15.43	54.29	0.35		
Zambia	15.49	n.a.	259.27	0.00	12.56	0.03	29.67	0.01	0.03	102.23	6.14	8.61	2.34	0.02	0.15	0.65	
Zimbabwe	3.42	n.a.	224.32	n.a.	0.08	0.00	1.23	0.00	0.26	269.96	5.19	0.20	8.41	n.a.	0.07	0.99	158.70

Source: Compiled from data in IMF Direction of Trade

A similar story holds true when we compare the TIIs of the EAC with those of COMESA countries. Note that four of the EAC countries (Burundi, Kenya, Rwanda, and Uganda) are also members of COMESA, and most of the high values in Table 5 are TIIs among EAC countries. With a few exceptions such as Malawi-Zimbabwe (269.96) and Congo-Zambia (259.27), the TIIs among (non-EAC) COMESA countries are not as high as those of EAC countries. The above comparisons with ASEAN and with COMESA reveal that the East African Community is closely interconnected in terms of trade.

Let us now turn to the changes in the trade intensity indices in the East African Community in the 1990s and 2000s. As discussed above, the EAC broke down in 1977 and was put in force again in 2000. In view of this, it is interesting to know whether or not the EAC newly-created in 2000 boosted intra-EAC trade. Table 6, which summarizes TIIs of EAC countries in 1995, is provided for that purpose.

Table 6. Trade intensity index among EAC5 (1995)

	Burundi	Kenya	Rwanda	Tanzania	Uganda
Burundi					
Kenya	81.68				
Rwanda	232.34	218.18			
Tanzania	126.28	204.40	417.35		
Uganda	22.53	442.78	22.28	30.92	

Source: Compiled from data in IMF Direction of Trade

When we compare Table 6 (TII in 1995) with Table 3 (TII in 2000), the results are mixed, although we can observe slight increase in the simple average of TIIs from 179.9 in 1995 to 200.1 in 2008. Some TIIs (e.g., Kenya-Burundi, Uganda-Burundi, and Uganda-Rwanda) have increased, and others (e.g., Tanzania-Burundi, Tanzania-Kenya, Tanzania-Rwanda, and Uganda-Kenya) have decreased. It is difficult to say whether or not the trade intensity among EAC countries increased due to the reformation of the EAC in 2000.

In short, I found that the level of trade intensity among East African nations is higher than in other regions, although we could not necessarily detect a distinct increasing trend. However, the very high degree of interconnectedness in trade suggests that EAC countries are "natural trading partners,[1]" and that a political push, such as the formal creation of common market in 2009, may boost intra-EAC trade.

4. Macroeconomic confluence

4.1 Methodology: principal component analysis

In the previous section, I have discussed the confluence among East African economies in terms of trade. In what follows, I will investigate whether the macroeconomic variables of the East African economies have been closely related with each other and whether the macroeconomic confluence has been strengthened or weakened in the region as a result of the reformation of the EAC. More specifically, I examine how synchronized and interdependent macroeconomic variables are in the East African Community. To measure the degree of confluence between a pair of countries, a natural approach would be to examine the correlation coefficient between them. To measure the degree of confluence for a group of nations, however, pair-wise correlation coefficients may not be satisfactory and well-defined criterion need to be developed.

In this paper, as in Goto and Hamada (1994, 2001), I apply the analysis of principal component to measure the degree of confluence in macroeconomic time series data in the East African countries. The principal components of a set of m variables (or a particular variable from m countries) are a set of m artificially constructed variables that are mutually orthogonal linear

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1. Needless to say, the amount of trade here is limited to "official" trade. It is often pointed out that a substantial amount of "informal" trade exists in the region. If such informal trade is included, the degree of interdependence in trade becomes even higher.

combinations of the original variables. The first component explains as much as possible the variance of the original variables, the second explains as much as possible the variance that is left unexplained by the first, and so forth. The first of the *m*-th components explains the entire variation of the original variables. Goto and Hamada have proposed measuring the degree of confluence in variables mostly by the ratio of the variance explained by the *first* principal component to the total variance.

The rationale for this approach is as follows: If a set of variables are perfectly correlated, the first component explains all the variance. If they are mutually independent and have an identical variance, the first and any other components explain $1/m$ of the total variance. The higher the correlation between a set of variables, the higher the ratio of the variance explained by the first principal component to the total variance. Thus, this ratio can be regarded as a multi-variable (or multi-country) version of correlation coefficient.

In this section, I apply the principal component analysis to four key macroeconomic variables in the EAC countries, i.e., inflation rate, real economic growth rate, interest rate, and exchange rate in order to evaluate the degree of confluence of macroeconomic performances in the East African Community. I solve the characteristic equation of the correlation matrix of these macroeconomic variables. The principal components are normalized in such a way that they have zero mean and unitary variance. Applying the principal component analysis, I try to find : (i) whether the macroeconomic variables in the EAC are synchronized to a high degree; (ii) whether the macroeconomic variables are more synchronized after the late 1990s, when attempts to recreate EAC became realistic, than before. Furthermore, in order to grasp the degree of confluence more correctly, I will compare the EAC results with ASEAN countries because ASEAN is a successful case of a regional bloc.

4.2 Confluence in macroeconomic variables

(1)   Inflation rate

Table 7 summarizes the proportion of the total variation in the rate of increase of consumer price index, for five EAC countries (Burundi, Kenya, Rwanda, Tanzania, and Uganda), that is accounted for by the five principal components.

Table 7. Principal component analyais: inflation

	(1982-2007)		(1982-1994)		(1995-2007)	
	EAC5	ASEAN5	EAC5	ASEAN5	EAC5	ASEAN5
P1	35.508	43.626	51.348	51.108	49.308	62.514
P2	67.238	72.012	78.289	79.329	75.870	88.538
P3	85.450	90.715	88.362	94.004	90.771	94.703
P4	95.936	97.009	95.020	98.852	97.246	97.979
P5	100.000	100.000	100.000	100.000	100.000	100.000

Source: Author's estimate. See main text for detail.

For example, the table should be read as follows: For the situation in 1982-2007, the first principal component accounts for 35.508 percent of the total variation of the inflation rate in East African Community, the second for 31.730 percent (or 67.238 percent cumulatively), and the third for an additional 18.212 percent (85.450 percent cumulatively), and so forth. For the situation in 1982-1994 in EAC, the first principal component accounts for 51.348 percent of the total variation, the second for 26.941 percent (or 78.289 percent cumulatively), and the third for additional 10.073 percent (88.362 percent cumulatively), and so forth. As mentioned above, we measure the degree of confluence in variables, i.e., the inflation rate (or any other variable) of EAC countries, largely by the ratio of the variance explained by the first component to the total variance.

The table shows that the percentage of variation in EAC inflation rate that is explained by the first principal component is around 50 percent for both 1982-1994 (pre-EAC) and

1995-2007 (post-EAC). Note that, if there were no confluence, the figure should have been 20 percent (one divided by the number of countries, which would be 5 in this case). Thus, we may well say that the degree of confluence in inflation is substantial for the EAC but there has been no increasing trend after the reformation of the EAC.

On the other hand, when we look at the figures for ASEAN, we observe a substantial increase in the degree of confluence of inflation rates of member countries of the ASEAN. While in 1982-1994 the percentage of variation explained by the first component was 51.108 (very similar to 51.348 of EAC), it increased dramatically to 62.514 (49.308 for EAC) in 1995-2007. The increase is probably due to various political pushes toward the economic integration of ASEAN after the late 1990s.

(2)   Real economic growth rate

Table 8 summarizes the proportion of the total variation in the rate of change in the real GDP for five EAC countries that is accounted for by the five principal components.

Table 8. Principal component analyais: economic growth

	(1982-2005)		(1982-1994)		(1995-2005)	
	EAC5	ASEAN5	EAC5	ASEAN5	EAC5	ASEAN5
P1	39.668	67.441	37.090	67.544	49.087	83.333
P2	63.272	85.324	73.676	84.504	77.740	94.599
P3	80.559	94.988	92.115	93.687	92.439	98.493
P4	93.712	98.885	97.003	98.546	98.548	99.520
P5	100.000	100.000	100.000	100.000	100.000	100.000

Source: Author's estimate. See main text for detail.

The table shows that the percentage of variation in the EAC growth rate that is explained by the first principal component was around 37 percent in 1982-1994 (pre-EAC), but it increased to 49 percent. Thus, we can say that, for the EAC, the degree of confluence in economic growth

is substantial and increased a lot after the reformation of the EAC. The reasons for this increase would be twofold: (i) a genuine increase in the degree of macroeconomic interdependence among EAC; (ii) a simultaneous deepening of dependence on growing demands from emerging economies such as China. Whether it is an endogenous reason or exogenous reason, the confluence of the macro economy among EAC has dramatically increased. (And therefore, the need for independent monetary policy has become lower than otherwise.)

On the other hand, when we look at the figures for ASEAN, we observe a high and increasing trend in the degree of confluence in the real economic growth rate. While in 1982-1994 the percentage of variation explained by the first component was 67.544 (thirty percentage point higher than 37.090 of EAC), it even increased to 83.333 (49.087 for EAC).

(3)   **Interest rate**

Table 9 summarizes the proportion of the total variation in interest rates for five EAC countries that is accounted for by the five principal components.

Table 9. Principal component analyais: interest rate

	(1982-2007)		(1982-1994)		(1995-2007)	
	EAC5	ASEAN5	EAC5	ASEAN5	EAC5	ASEAN5
P1	50.601	67.051	54.657	56.105	49.358	82.575
P2	74.087	84.141	80.144	79.663	79.040	91.200
P3	90.566	92.685	90.317	92.535	90.141	96.389
P4	97.133	98.195	95.447	98.833	98.359	99.409
P5	100.000	100.000	100.000	100.000	100.000	100.000

Source: Author's estimate. See main text for detail.

The table shows phenomena similar to the inflation rate. The percentage of variation in the EAC interest rate that is explained by the first principal component is around 55 percent in 1982-1994 (pre-EAC), which slightly decreased to 49 percent in 1995-2007 (post-EAC). Note

that, if there were no confluence, the figure should have been 20 percent (one divided by five, the number of countries). Thus, we can say that, for EAC, the degree of confluence in interest rates is substantial, but there is no increasing trend after the reformation of the EAC. On the other hand, when we look at the figures for ASEAN, we observe a substantial increase in the degree of confluence in the interest rate. While in 1982-1994 the percentage of variation explained by the first component was 56.105 (similar to 54.657 of EAC), it increased dramatically to 82.575 (49.358 for EAC). The increase is probably due to various political pushes for economic coordination (such as the Manila Framework and Cheng-Mai Initiative) among ASEAN after the Asian Financial Crisis.

(4)   Exchange rate

Table 10 summarizes the proportion of the total variation in the rate of change in exchange rate (against U.S. dollar) for five EAC countries, accounted for by the five principal components.

Table 10. Principal component analyais: exchange rate

	(1982-2007)		(1982-1994)		(1995-2007)	
	EAC5	ASEAN5	EAC5	ASEAN5	EAC5	ASEAN5
P1	39.875	76.156	45.773	44.628	51.277	89.346
P2	64.369	87.307	69.063	73.437	80.885	95.054
P3	81.750	94.830	85.432	86.206	91.945	97.764
P4	96.148	98.431	95.328	95.929	98.522	99.517
P5	100.000	0.000	100.000	100.000	100.000	100.000

 Source: Author's estimate. See main text for detail.

The table also shows a phenomena similar to real economic growth. The table shows that the percentage of variation in the exchange rate against the U.S. dollar in EAC that is explained by the first principal component was around 46 percent in 1982-1994 (pre-EAC), but it increased

slightly to 51 percent. Thus, we can say that, for the EAC, the degree of confluence in the fluctuation of the exchange rate is substantial and increased only slightly after the reformation of the EAC. On the other hand, when we look at the figures for ASEAN, we observe a dramatic increasing trend in the degree of confluence in exchange rate variation. While in 1982-1994 the percentage of variation explained by the first component was 44.628 (very similar to 45.773 of EAC), it rapidly increased to 89.346 (51.277 for EAC).

In short, the degree of confluence in macroeconomic variables in EAC is substantial, but in contrast to ASEAN we cannot observe a conspicuous increasing trend yet.

5. Prospect for currency union

5.1 Theory of the optimum currency area

In addition to the creation of a common market, a currency union is also being seriously discussed in the program of the EAC economic integration. So, in this section, let us ask whether or not the EAC is an adequate group of economies in which a single currency can be used (as Euro in Europe), or in which exchange rates should at least be pegged among their currencies. It seems appropriate here to recall how Mundell (1961) started to analyze the question. If there is neither wage-price rigidity nor transaction costs, the exchange rate regime may not make a substantial difference because money would be neutral. This seems to be the main message of the cash-in-advance model applied to the problem of the exchange-rate regime choice (e.g. Helpman and Razin (1979) and Lucas (1982)). However, if there is price rigidity or transaction costs, regions that have *different real exogenous shocks* should be under different currency areas because prices do not adjust enough if they are closely linked by fixed exchange rates. For example, as Mundell argued, if eastern North America and western North America are under

different real shocks and wages are rigid, then it is better for the two regions to have different monetary policies and different currencies.

McKinnon (1963) emphasized the role of the degree of openness as a criterion for the floating regime to work. Autonomy in conducting independent monetary policy is the main merit of floating exchange rates. If a country is too open and the role of non-traded goods is minimal, then the merit of an autonomous monetary policy will be small because the wage level will be immediately adjusted to the international level.

Mundell and others (e.g. Ingram 1973) also emphasized the role of factor movements. If labor can move quickly, say, from Kenya to Uganda, then one does not need to worry about the unemployment of Kenya so much because unemployed workers in Kenya can easily move to Uganda for new employment. If funds are easy to move from one place to other, there would be little problem with the balance of payments constraints that could be a limiting factor for macroeconomic stabilization between regions with sticky wages and prices.

In this section, I will concentrate on the first criterion, i.e., the importance of the *synchronization of real disturbances (IS shock)* on the choice of a currency area.   In the following, I will measure the degree of synchronization of real disturbances among EAC countries and compare the degree of synchronization with that among ASEAN countries. Here again, I rely on the principal component methods.

A brief explanation of our method is as follows. As for the real disturbances, I concentrated on disturbances in investment behavior because we believed that consumption behavior is much more stable than investment. I estimated the following investment function first.

$$INV_t = \alpha + \beta_1 \, INT_t + \beta_2 \, Y_{t-1} + \beta_3 \, T + \varepsilon_t$$

where INV_t = investment (in real terms) at time t,

            INT_t = interest rate at time t,

            Y_{t-1} = real GDP at time t-1,

            T = time trend,

            ε = error term.

I obtained fairly satisfactory results for most countries, with expected signs of coefficients (i.e., $\beta_1 < 0$ and $\beta_2 > 0$) and statistical significance. Then, I used the obtained error term (ε) as a proxy variable for real disturbances in each country.

Then, I performed a principal component analysis for the above residuals as proxies for real disturbances (IS shocks). For the purpose of comparison, I made similar estimates for the original five members of ASEAN (Indonesia, Malaysia, Philippines, Singapore, and Thailand).

Table 11 summarizes the proportion of the total variation in the real disturbances (IS shock), for five EAC countries (Burundi, Kenya, Rwanda, Tanzania, and Uganda), that is accounted for by the five principal components.

Table 11. Principal component analyais: IS shock

	(1982-2005)		(1982-1994)		(1995-2005)	
	EAC5	ASEAN5	EAC5	ASEAN5	EAC5	ASEAN5
P1	40.119	40.893	38.458	47.275	45.348	50.992
P2	62.275	66.560	61.820	80.834	71.176	78.110
P3	80.871	87.655	81.200	92.028	86.337	88.218
P4	92.216	95.967	93.668	97.816	96.696	98.090
P5	100.000	100.000	100.000	100.000	100.000	100.000

Source: Author's estimate. See main text for detail.

The table shows that the percentage of variation in real disturbances in EAC was 38.458 percent (substantially below 47.275 percent of ASEAN 5) in 1982-1994 (pre-EAC), but it increased to 45.348 in 1995-2007 (post-EAC), when the synchronization in EAC is not very different from that of ASEAN 5 (50.992).

It is also interesting to consider the different degree of confluence in IS shocks for each EAC member countries. This is done by comparing the contribution of each original variable to the principal components by examining the "factor loading." The factor loading is the correlation coefficient between a principal component and the original variable. The sum of the squares of the loading factor of a component equals its characteristic root. Table 12 summarizes the factor loading for the first principal component for five EAC countries.

Table 12. Factor loading: EAC5

	(1982-2005)	(1982-1994)	(1995-2005)
Brundi	0.860	0.715	0.930
Kenya	0.545	-0.523	0.634
Rwanda	0.825	0.550	0.798
Tanzaina	0.533	0.688	0.535
Uganda	0.069	-0.602	0.278

Source: Author's estimate. See main text for detail.

Table 12 shows that in 1982-1994, Kenya and Uganda experienced different IS shocks from those of Burundi, Rwanda, and Tanzania. However, in 1995-2005 (post-EAC reformation), all of the five countries are under similar IS shocks because the first principal component is positively correlated with the IS shocks of all the member countries. In other words, the EAC countries have more reason to create a currency union now than before.

Table 13 summarizes the results of principal component analysis in this section.

Table 13. Principal component analysis: summary table

	(1982-latest)		(1982-1994)		(1995-latest)	
	EAC5	ASEAN5	EAC5	ASEAN5	EAC5	ASEAN5
interest rate	50.601	67.051	54.657	56.105	49.358	82.575
change in CPI	35.508	43.626	51.348	51.108	49.308	62.514
Real Growth Rate	39.668	67.441	37.090	67.544	49.087	83.333
Change in exchange rate	39.875	76.156	45.773	44.628	51.277	89.346
IS shock	40.119	40.893	38.458	47.275	45.348	50.992

Source: Author's estimate. See main text for detail.

Table 13 shows that, although the big strides made by the ASEAN in the 2000s is not observed in the EAC, the degree of confluence in macroeconomic indicators in the EAC is substantial. Also, real disturbances are fairly synchronized in the EAC, especially after the reformation of the EAC. These observations suggest that, according to the theory of optimum currency union, a stronger case can be made for creating a currency union in East African Community.

6. Concluding remarks

This paper has investigated the economic rationale for the regional economic integration, such as common market and currency union, in East African Community. For that purpose, I have examined the degree of regional economic interdependence in terms of trade, macroeconomic indicators, and IS shocks in the EAC.

First, I have discussed the degree of interdependence in the flow of goods (trade) in the East African Community. Relying on the trade intensity indices, I examined whether the degree of interdependence in East Africa is higher or lower than that in other regions (e.g., Asia), and whether the region's economic interdependence has deepened since the reformation of the EAC

in 2000. Surprisingly, the interdependence in terms of trade in Africa is very strong, much stronger than that in Asian countries. Also, I found that there has been no clear boost since the reformation of the EAC yet. Recent political initiatives, however, seem to have a favorable impact on the degree of economic interdependence in the East African Community.

Second, I examined the macroeconomic confluence in the East African Community. More specifically, I investigated whether the macroeconomic links among the East African economies are strong and whether they became tighter in the 1990s. Relying on the principal component analysis, I have found that the degree of confluence in macroeconomic variables, such as inflation, growth, and exchange rates, is high, although a clear trend of increases was not observed. In contrast to the EAC, the degree of financial integration in Asian countries has dramatically increased since the 1990s.

Third, relying on the theory of the optimum currency area, I examined the prospects for currency unification in the East African Community. For that purpose, I examined the degree of synchronization in real disturbances (IS shocks) among EAC countries, and compared it with that among Asian countries. By applying the principal component analysis on IS shocks in each country, I find that the EAC countries, as well as Asian countries, face similar real disturbances. This suggests that the need for independent monetary policy is lower than otherwise, and therefore the EAC and ASEAN are good candidates for the optimal currency area. In other words, I have found that the economic preconditions for currency union in EAC are satisfied, as is the case in ASEAN countries.

All these findings suggest that a strong case can be made for a common market and currency union in the East African Community. We can extend the present research in various directions. First, although I concentrated on the EAC (a group of only five countries) in this paper, we can extend the analysis to other combinations, such as COMESA, SDIC, and so forth. Second, although I examined *economic* preconditions for regional integration, it is equally

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important to consider *political* preconditions, such as ethnic conflict, political instability, and so forth.

Third, while I examined whether or not the EAC is a suitable grouping for a common market and a currency union and determined that the answer seems to be "yes", the next and probably more important question is *how to realize* this in such a diversified group in terms of the economic, political, and social environments.

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Abstract (in Japanese)

要約

本論文の目的は、東アフリカ共同体（EAC）において関税同盟や通貨同盟などの地域経済統合を進めることの妥当性を検証しようとするものである。そのため論文では、貿易結合度、各種のマクロ経済指標、ISショックの同期性などを検討した。まず第1に、EAC諸国においては貿易結合の程度が非常に強く、アジア諸国のそれよりも強い場合があるという注目すべき結果が得られた。第2に、主成分分析の結果、EAC諸国においてはマクロ経済指標の同期性が非常に強いという結果が得られた。第3に、マンデルの最適通貨圏の理論に基づき、ISショック（実物経済に対する外的ショック）の同期性を検討し、EAC諸国においてはその同期性が非常に強く、この意味で最適通貨圏の基準を満たしているということがわかった。これらの結果から、EACはCommon Market および Currency Union を形成していく単位として好ましいものであると言えそうである。

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