CAPITAL ACCUMULATION AS A FUNDAMENTAL DETERMINANT OF STRUCTURAL CHANGES IN SSA

SEJKORA JIRI, SANKOT ONDREJ

1,2University of Economics, Prague, Czech Republic.
E-mail: 1jiri.sejkora@vse.cz, 2ondrej.sankot@vse.cz

Abstract- The aim of this paper is to verify the importance of capital accumulation in structural development of sub-Saharan economies. We employ cluster analysis to group sub-Saharan economies into clusters based on the similarity of their structural development. We then examine the structural development of these clusters in the light of empirical stylized facts. Theoretically, successful clusters (in terms of their structural development) should exhibit the fastest pace of capital accumulation which is the fundamental determinant of structural changes. In general, our results support this argument, albeit with some reservations.

Index terms- Structural change, Economic structure, Sub-Saharan Africa, Capital accumulation.

I. INTRODUCTION

Poor developing economies are characterized by a relatively large sectoral heterogeneity. Such heterogeneity is considered as an important potential source of economic growth. Various authors point out that Africa has the largest productivity gaps across sectors (Martins 2017), or as Page (2012) puts it, the largest structural deficit. This means that African (especially sub-Saharan) economies could benefit substantially from structural changes.

Capital accumulation, both physical and human, is considered as a fundamental determinant of structural changes (Lewis 1954, Hu and Mino 2014, Teixeira and Queirós 2016, Martins 2017). The aim of this paper is to verify the importance of capital accumulation in structural development of sub-Saharan economies. Existing quantitative studies dealing with poor developing countries suffer from a lack of data. Therefore, we decided to carry out our analysis using the 10-Sector Database of Groningen Growth and Development Centre (Timmer et al. 2015), which is the most detailed database regarding structural changes. Most importantly, this database allows for analyzing development of sectoral employment shares of sub-Saharan economies. On the other hand, a drawback of this database is that there are data for only 11 sub-Saharan countries. Since small sample size limits our options regarding the methodology, we decided for a more qualitative approach. We put 11 sub-Saharan economies into clusters based on similarity of their structural development. Analysis and comparison of these clusters in relation to capital accumulation should allow us to draw some conclusions about the importance of capital accumulation in structural development of sub-Saharan economies.

The next section of this paper deals with the methodology and literature review. Section III presents results of the cluster analysis and examines structural development of each cluster. Section IV discusses capital accumulation in relation to structural development of each cluster. The final section concludes.

II. METHODOLOGY AND LITERATURE REVIEW

We employ cluster analysis to group sub-Saharan economies based on the similarity of their structural development. More specifically, we compare average values of sectoral employment shares and sectoral value-added shares for each country before and after the year 1990. Most sub-Saharan economies underwent deep structural transformation under the auspices of the World Bank in the 1980s and 1990s. Therefore, we consider the year 1990 as a suitable dividing year for our analysis. Once we obtain clusters, we proceed with the assessment of their structural development. Historically, countries shifted from agriculture to industry and then to services. Carmignani and Mandeville (2014) note that these shifts were accompanied by a productive base diversification (as income level rises). Unfortunately, this does not apply to Africa. Moreover, recent history associated with the knowledge-based economy shows that some countries (e.g. India) pursue ‘structural shortcut’ and virtually bypass the industrialization stage (Mandeville and Kardoyo 2009). Our assessment builds on the following stylized facts. The relative importance of agriculture should gradually decline. This is a common pattern. Indeed, value added and employment shares of agriculture in developed economies are negligible.

Carmignani and Mandeville (2014, p. 127) argue that this is also Africa’s story: “The decline in agriculture has occurred progressively since independence and it has been matched by a corresponding increase in industry and services”. Furthermore, they claim that the value-added share of declining agriculture has transformed primarily to services. More importantly, they also provide evidence that declining agricultural shares across Africa are associated with positive economic growth (Ibid.). Industrialization (i.e.
growth of the manufacturing value-added and employment shares) is a desired structural change because manufacturing serves as an engine of growth in developing countries (Kaldor 1966, 1967, Szirmai and Verspagen 2011, Ibbih and Gaiya 2013). Unfortunately, Africa has failed to industrialize (Page 2012). African industrial expansion in recent decades can be attributed to non-manufacturing industry (mining, construction, and public utilities). The problem is that, as Carmignani and Mandeville (2014) found out, reallocation from agriculture to non-manufacturing industry (mostly mining) seems to retard economic growth in Africa. Their arguments thus point to the ‘natural resources curse’ hypothesis. Even though this ‘curse’ manifests itself in low rates of long-run economic growth, Martins (2017, p.21) also adds that “abundance of mineral resources in some African countries acts as a deterrent to structural change”. Special attention should be paid to services sector (especially tradable services) because, as Carmignani and Mandeville (2014, p. 126) point out, “tertiarization is not bad for African growth”. Indeed, African countries that managed to expand services sector have achieved the highest average growth rates (Ibid.). Furthermore, Szirmai (2012) argues that some progressive industries in services sector (e.g. ICT) may even replace manufacturing as an engine of growth. Since capital accumulation represents the fundamental determinant of structural changes, we suppose that successful clusters (in terms of their structural development) should exhibit the fastest pace of capital accumulation. We focus on physical capital accumulation measured by gross fixed capital formation rate (World Bank 2018) and human capital accumulation measured by human capital index (Timmer et al. 2015).

III. CLUSTER ANALYSIS OF STRUCTURAL DEVELOPMENT

Figure 1 shows results of our cluster analysis. We can distinguish four clusters, each consisting of two economies: cluster 1 (Ghana – GHA, Nigeria – NGA); cluster 2 (Mauritius – MUS, South Africa – ZAF); cluster 3 (Kenya – KEN, Senegal – SEN); cluster 4 (Malawi – MWI, Tanzania – TZA). The remaining countries (Botswana – BWA, Ethiopia – ETH, Zambia – ZMB) are too specific in terms of their structural development. For this reason, they will not be included in our analysis.

Source: Timmer et al. 2015, authors’ calculations using Statgraphics.

Figure 1 also reveals close similarities in the structural development of countries in cluster 2. Both Mauritius and South Africa are relatively rich, industrialized and diversified upper-middle-income economies. More importantly, from the structural development point of view, they clearly represent an African success story. On average, agriculture’s share in employment has declined significantly from 49% to 12% (see Figure 3). Furthermore, services (most notably Finance, insurance, real estate and business services & Transport, storage and communication) have expanded not only as a share of total value-added but also as a share of total employment (see Figures 2 and 3). It is also noteworthy that the relative importance of mining has gradually declined over time (especially in South Africa).
On the other hand, cluster 4 consisting of low-income economies (Malawi and Tanzania) has failed to achieve any significant progress in terms of the structural development. This is particularly apparent from figure 5 showing only small shifts in sectoral employment shares until new millennium. The employment shares of both countries have been dominated by agriculture. A simple comparison of the agricultural value-added share (see Figure 4) and the agricultural employment share (see Figure 5) clearly points to a very low productivity of this sector. Figure 4 also reveals stagnating value-added shares of manufacturing and services. It should be also added that the structural development of cluster 4 clearly illustrates some impacts of Structural Adjustment Programs adopted by both countries during the 1980s (most notably the relative decline of Government services value-added). See for example the case-study of Tanzania by Meertens (2000).

Cluster 1 consisting of lower-middle-income economies (Ghana and Nigeria) has also recorded little structural progress (see Figures 6 and 7). However, the interesting thing about this cluster is that its structural development has been hindered by Dutch disease, one of the principal causes of the resource curse. Nigeria, Africa’s top oil exporter, is a textbook example of an economy suffering from the Dutch disease and the resource curse (Edo 2013, Perkins et al. 2013). As far as Ghana is concerned, its mining sector is small compared to Nigerian. Interestingly though, there is evidence suggesting that Ghana also experienced severe Dutch disease effects caused by development aid influx (Younger 1992). In this light, it is not surprising that the desired structural changes like, for example, deep tertiariization or industrialization have not been recorded.

Finally, cluster 3 consisting of relatively less similar Senegal (low-income economy) and Kenya (lower-
middle-income economy) has made some progress. The sectoral value-added and employment shares of manufacturing and services (most notably Trade, restaurants and hotels & Transport, storage and communication), have expanded – mostly at the expense of agriculture (see Figures 8 and 9). Indeed, both countries have managed to reallocate substantial proportion of their labor force from agriculture to other sectors. On average, agricultural employment share has declined from 81% to 47% (see Figure 9).

Figure 8: Structural development – cluster 3 (KEN, SEN); sectoral value-added shares (%)

Figure 9: Structural development – cluster 3 (KEN, SEN); sectoral employment shares (%)

IV. CAPITAL ACCUMULATION

Given the structural development of each cluster, we can assume that the most successful cluster 2 (MUS, ZAF) should exhibit the highest rate of capital accumulation for a long period of time. Furthermore, we can assume that it should be followed by also relatively successful cluster 3 (KEN, SEN). On the other hand, clusters 1 (GHA, NGA) and 4 (MWI, TZA) have been struggling which leads us to the final assumption that these clusters must have been lagging in terms of capital accumulation.

In general, existing data support these assumptions, albeit with some reservations. Figures 10 and 11 depict gross fixed capital formation rate and human capital index, respectively. It is apparent that, on average, clusters 2 and 3 performed relatively well. As expected, cluster 2 has made the most progress: on average, gross fixed capital formation rate between 1968 and 2016 was 22.87% and an average value of first difference of human capital index between 1950 and 2014 was 0.0176. In comparison, cluster 3 accumulated physical capital at an average rate of 19.02% and an average value of first difference of human capital index was 0.0116.

On the other hand, clusters 1 and 4 recorded mixed progress. Cluster 1, despite of its capital-intensive mining sector, exhibited the lowest average rate of gross fixed capital formation (only 14.20%). Similarly, cluster 4 performed very poorly in terms of human capital accumulation. An average value of first difference of human capital index between 1950 and 2014 was 0.0173. Furthermore, cluster 4 managed to accumulate physical capital at a relatively high average rate of 19.64%, albeit with low persistence (see Figure 10).

Figure 10: Gross fixed capital formation (% of GDP)
Source: World Bank 2018

Figure 11: Human capital index
Source: Timmer et al. 2015
Nevertheless, if we consider the accumulation rate of physical and human capital together, we can conclude that clusters 2 and 3 are relatively successful. This conclusion corresponds with the assumptions based on stylized facts about structural development.

**CONCLUSION**

The aim of this paper was to verify the importance of capital accumulation in structural development of sub-Saharan economies. Using cluster analysis, we grouped eight economies into four clusters, each consisting of two economies: cluster 1 (GHA, NGA); cluster 2 (MUS, ZAF); cluster 3 (KEN, SEN); cluster 4 (MWI, TZA). From the structural development point of view, we argue that clusters 2 and 3 may be considered as relatively successful. Basically, they managed to expand their sectoral value-added and employment shares of manufacturing and services. Furthermore, they reallocated significant proportion of their labor force from agriculture to other sectors. Our results indicate that, in general, these relatively successful clusters (in terms of their structural development) exhibit relatively better results in terms of capital accumulation. The results are in accordance with theoretical predictions. It seems that capital accumulation is a fundamental determinant of structural changes in sub-Saharan Africa.

There are, however, some reservations concerning the surprisingly fast pace of human and physical capital accumulation in cluster 1 and cluster 4, respectively. These reservations could be possibly explained by other non-fundamental determinants of structural changes. However, this is beyond the scope of this paper. Further research could therefore focus on deep case studies of the analyzed countries.

**REFERENCES**


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