From Primary Commodity Dependence to Diversification and Growth
Absorptive Capacity and technological catch up in Botswana and Mauritius

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Thesis summary

The continuous capital accumulation process in East Asian countries between the 1960s and 1990s has gone hand in hand with a spectacular economic growth, an equally impressive poverty reduction and a significant technological catch up. Over the same period, Sub-Saharan Africa (SSA) has been falling further behind the rest of the world in terms of both technology adoption and per capita income. Parallel to this difference between Asia's economic take-off and Africa's stagnation, an astounding difference could be observed between the dramatic change in the export composition of Asian countries and the constant reliance on the export of raw materials for most African countries. The author attributes this difference to the absorptive capacity, which enabled Asian countries to adopt, apply and disseminate foreign technologies in their domestic production processes. Indeed, various dimensions of absorptive capacity above some threshold levels are indispensable for a country to diversify its productive activities and achieve a pervasive development.

The present thesis examines the mechanisms by which absorptive capacity, as a prerequisite for change in export composition, can explain the transition from the reliance on primary commodity to a diversified export. To further illustrate the pertinence of this analysis, a capacity-based comparison of the two most economically successful African countries is used, contrasting the development experience of Botswana, whose economy remains heavily dominated by its abundant diamond resources, with that of Mauritius, whose strong absorptive capacity has allowed it to free itself from dependence on sugar export and gain a noticeable competitive position in the global textile market. This thesis argues that foreign technology adoption by technological backward countries (such as those in SSA), can positively affect their productivity and income growth by enabling them to widen the range of productive activities they can engage in, provided they have sufficient levels of absorptive capacity to emulate technologically advanced countries.

In the first chapter, we provide the background for the persistent problem of extreme poverty in SSA and its association with trade and international investment marginalisation, primary commodity dependence and technological backwardness. Growth in SSA has been impeded in general by the marginalisation of Africa in the world trade, by dependence on a few primary commodities and by the decline of its terms of trade since the mid-1980s. The combined effects of these factors have been devastating for the African population, whose poor living conditions have turned into poverty traps characterised by too low saving rates, too low capital stocks and a too low level of human
capital to spur growth. This thesis explores how this seemingly inextricable situation of poverty traps can be overcome by shifting the attention on the utilisation of imported technologies to reduce the dependence on primary commodities. These technologies, however, can only be successfully acquired, utilised and diffused if the acquiring country has developed sufficient absorptive capacity in the form of human capital, physical infrastructure and institutions organised in systems of innovation for development. We hypothesise the lack of diversification to be related to the absence of critical masses of absorptive capacity needed to acquire assimilate and internalise foreign technologies.

In chapter II, we review the main economic theories that help understand the reliance on primary commodity dependence and evaluate why catch-up did not work for SSA. The chapter covers the classical, the neoclassical and the new growth theories as well as various trade models with the view to enquire how primary commodity dependence is explained by them. For trade theories the underlying idea is the role played by technology and relative factor endowment in explaining trade patterns, and thus in understanding why African countries continue to depend on primary commodities in their trade. The review of growth and trade literature has brings to the fore the quasi unanimous recognition of the primordial importance of technological knowledge generation and diffusion in determining the capital accumulation and growth pace. Although theories may differ in the explanations of incentives and costs for technological innovation and diffusion, the main lesson derived from their analysis is that developing countries seeking to reduce their dependence on primary commodities and increase their levels of productivity must find means to acquire and master technologies developed in advanced countries.

Subsequently, catch-up theories are reviewed to gain insights in factor affecting productivity differences and to understand the obstacles to technology transmission across countries that could help close the productivity gap and change the trade pattern between advanced and backward countries. The review of the catch-up theories unveils the limitations in the ability of backward countries to automatically converge to high levels of productivity as predicted by the neoclassical growth and trade frameworks. The limiting factor for this ability being the absorptive capacity (see e.g. Verspagen, 1991 or Rogers, 2004), this dissertation endeavours out to analyse its relationship to economic diversification and its critical masses that enable backward countries to adopt foreign technologies. In this chapter, we then apply the OECD taxonomy of technological capabilities for development to gain insights in the creation and expansion of favourable conditions for fostering the acquisition and use of foreign technologies. To that end, we use the SID approach, a developing country version of the National Innovation System approach, which emphasises capabilities, incentives and institutions as the essential ingredients for a successful acquisition and assimilation of foreign technologies necessary for productivity and income convergence.

In order to achieve this, we have conceptualised absorptive capacity in terms of its indicators of physical infrastructure, human capital and capital investments, in order to test our hypothesis of threshold levels of absorptive capacity for diversification in chapter III. We analyse the components
of absorptive capacity and link them to the adoption of foreign technologies and economic diversification to reduce commodity dependence. In this chapter, we also explore the role of agriculture and financial markets in supporting the structural transformation and expansion of other sectors within the SID framework. We then propose an analytical model that allows to empirically test the link between various indicators of absorptive capacity and the level of diversification.

To that estimate the effects of absorptive capacity on diversification, we use an econometric framework developed from the production function perspective. Our estimation produced the following results:

- Human capital stocks, infrastructure and population size significantly explain part of the cross-country differences in export diversification, while the endowment in natural resources constitutes a strong impediment to diversification across all countries. Overall, the rate of investment in physical capital accumulation does not seem to significantly explain the observed differences: if anything, capital accumulation seems to go in hand with the exploitation of primary commodities in Sub-Saharan Africa.

- Comparing SSA countries with the rest of the world, we found that for human capital and infrastructure to lead to more diversification, some threshold levels in their indicators must be in place. Many SSA countries have levels of infrastructure and human capital stock that are below or around these thresholds, implying that their absorptive capacity is still too low to materially influence export diversification.

- Although the density of infrastructure matters in explaining diversification differences among SSA countries, infrastructure and investments are often associated with the exploitation of primary commodities, therefore sometimes barely benefiting the other sectors of the economy.

The low level of basic infrastructure and human capital stock seems thus to be one of the reasons why SSA has continuously been falling behind the rest of world by all standards of economic, social and technological development.

Chapter IV builds on the results and insights obtained from the analysis of chapter three and examines in more detail how the obtained relationship hold in diamond-rich Botswana. It analyses Botswana’s capabilities incentives and institutions for fostering technology acquisition and examines the corresponding evolution with respect to natural resource dependence. It also analyses to what extent embodied technology acquisition through capital goods import has contributed to increasing productivity and expanding the manufacturing sector, thereby reducing the dominance of diamond.

Based on these results, we have analysed the reduction of primary commodity dependence in two of the most economically successful African countries: Diamond rich Botswana and textile newcomer, Mauritius. Chapter IV builds on the results and insights obtained from the analysis of chapter three and examines in more detail how the obtained relationship hold in diamond-rich Botswana. It analyses Botswana’s capabilities incentives and institutions for fostering technology acquisition and
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First, we analysed the technological capabilities, the incentive system and institutional framework of
Botswana, a successful diamond exporter with high records of economic growth. Technology
adoption and diversification in Botswana are analysed with firm level data collected during the field
research. This analysis was articulated on the matching between the imported capital equipment and
the manufacturing industries using them in order to estimate the effects of capital goods import on
productivity growth and on the manufacturing sector expansion. Our results in this analysis show
that for Botswana’s manufacturing industry, the importation of capital that embody foreign
technologies and the growth in proportion of skilled labour are the most important factors associated
with productivity increase and industry expansion. Moreover, we assessed the effects of the change in
export composition on growth. Paradoxically, the growth of manufactured export was found to be
driven by draining resources from other sectors of the economy, as also evidenced by strong tax
incentives offered for the development of the manufacturing industry.

Chapter V similarly looks at the absorptive capacity and diversification experience of Mauritius, from
sugar cane dependence to competitiveness in the textile and ICT sectors. It maps Mauritian
capabilities and incentive systems to relate them to the rise of textile industry with an impressive
export performance. It finally examines how Mauritius export partners’ income growth and demand
change for Mauritian export products can be used to explain capital accumulation and growth
performance through income and price elasticity.

For Mauritius, whose growth has mainly been fuelled by its preferential access to developed
countries’ markets, we mainly pay attention to the rate at which the export partners’ income growth
has been translated into domestic growth. This is done by estimating the price and income elasticity
of export demand in a growth model, which also allowed us to simultaneously estimate export driven
productivity growth and dynamic gains from trade. We found that the accumulation of imported
capital goods has helped Mauritius to convert the growth of its export partners’ income into
domestic productivity growth.

Then, chapter VI compares the two countries that are often cited in one and the same breath as
Africa’s success stories, but whose growth experiences are far from being similar. The comparison of
the growth and development experiences of the two countries on the basis of their incentive systems
and institutional factors has revealed the sharp contrasts between them and has unveiled the relative
advantage of hard work over high intrinsic value of the natural resources. In chapter VI we review
the major factors explaining their institutional differences between the two countries and assess the
role these factors play in the differences of outcomes in capability building and diversification.
Productivity-based performance indeed has a higher developmental pervasiveness as compared to mineral-based growth, because the share of value added by humans in the total value of the exported product is relatively higher in the former case. While both countries have been lauded for their institutional qualities, the analysis of their developmental records brought to light important differences. The elitist, mineral-based and government-dominated accumulation path of Botswana resulted in a dualistic society in which Lucullan opulence coexists with poverty and high unemployment rates, while the effort-based, business-dominated labour intensive industrialisation resulted in a more egalitarian society, with relatively high levels of life expectancy human capital, low infant mortality and good scores on other indicators of human development.

If development is also measured by the ability of a nation to provide decent living conditions to all of its members, the comparison between Botswana and Mauritius shows that the small sugar crystal produced with a lot of human effort can outperform the much coveted diamond crystal in effecting pervasive development (rents from the sugar industry have also been at the basis of the emergence of the EPZ-based textile industries). The institutional implication of the observed difference between Botswana and Mauritius is that optimal rent-sharing agreement between political elites and economic elites is more likely to lead to a more dynamic and pervasive development outcomes as compared to the concentration of political and economic powers in the hands of the same elites, although counter-examples like Singapore can be found to object to that.

The final chapter concludes the thesis by drawing some useful policy implications for technology acquisition and industrialisation strategies in other SSA countries. We acknowledge that since the policy targets cannot be achieved at once as a result of resources constraints, what is important is to choose priorities and establish targets, and then design performance measures and incentive systems capable of mobilising the sub-optimally used human and physical resources to gradually put in place critical masses of each of the pillars of the strategy to win the war against the ignorance of what others produce with African natural resources, and against the insidious illusions of static comparative advantage in what Kuznets has called “selling the fortuitous gifts of nature to others”. Such pillars comprise imperatively at least three components: human capital with the required skills to identify access, negotiate, adopt and assimilate foreign technologies, infrastructure to reduce the transaction cots and facilitate the functioning of firms that eventually have the ultimate responsibility of internalising technologies, and the mobilisation of financial resources to make all this happen.