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## Spatial impacts of economic crisis. Scenarios for the Portuguese Regions

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# Saint Petersburg 26-30 August 2014

Spatial impacts of economic crisis. Scenarios for the Portuguese Regions

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## Abstract

Unemployment and migration are known effects of financial and economic crisis. This paper tries to understand the spatial patterns of those effects in a city and its surroundings considering the direct and induced impacts, the migration flows between the city, the surroundings and the outside and the multiplier effects that come from the changing rents of the economic landscape. We use a spatial interaction model with rent calibration and the cyclical results of the distribution of rents and unemployment subsidies. We apply the model to Portuguese NUTS 3 regions where the reduction of some basic economic activities is producing direct and induced impacts on unemployment, reduction of active population and migration.

## 1- Introduction

Globalization involves the general mobilization and transportation of resources, goods and services: natural, technological, financial and human. Generally flowing from where they are abundant and available to where they are in much need and demand, molding channels and adapted spaces, impacting ecosystems and institutions, generating and distributing wages, rents, profits and interests across space and time. Migration flows and the desertification and urbanization they encompass are eventually the more pervasive effects of globalization. Largest movements will occur between South and West Asia, from Latin to North America, and within Africa (Abel and Sander, 2014). Bravest migrants suffer in the outside borders of Europe, America, Japan and Australia (Baldwin-Edwards and Arango (eds), 1999) or struggle to be recognized in their cities working in informal and formal jobs in construction, agriculture, domestics, tourism, factory work and street hawking, remotely controlled by the authorities, filling the gaps of labor market inefficiencies and hoping to get amnesties and family reunion (Carella and Pace, 2002), but many times unable to build relationships and coherent communities (Dayaratne and Samarawickrama, 2003); a

few others migrate to where their skills better fit (Young, 2013) and from the places that global warming hindered livelihoods (McLeman, 2011).

Others, in countries with loose controls in Africa and South America, migrants agglomerate in the slumps of major towns which, some argue, are the landscape of poverty reproduction (Gugler, 1997; Davis, 2006) while others hope that the formation of slums is just a phase of the urbanization and development process that can be controlled and, in the end solved, by appropriate planning tools; either by a wiser deployment of housing in urban areas (Antrop, 2004; Ooi and Phua, 2007) or through the spatial redistribution of public investment to ensure that income disparities remain politically tolerable (Scott and Storper, 2003). There are also those that are unable to migrate remaining detached in their poor landlocked places or suffering from border wars for the conquest of natural resources.

Nevertheless, even in very well planned rich cities, there are empty new houses where there are no jobs and signs of slum resilience and developments in unplanned locations (Ooi and Phua, 2007) The main economic drivers of major towns in Africa are actually royalties of oil and mineral exports and the public spending they allow (Dentinho, 2011); the issue is where the money goes and what are the effects of that allocation on urban and rural sustainability?

To answer this question for the Zambezi Basin in Mozambique we first develop a methodological tool suitable to assess the impacts on population and employment distribution of different political-economic scenarios associated with the spatial distribution of private investment on the exploitation of natural resources and the public investment that uses the rents coming from the exploitation of natural resources (point 2). In point 3 we describe the region summarily, calibrate the model developed in the point 2 and present the results. Point 4 is to discuss the results. Finally, in the last section, some conclusions and recommendations are highlighted.

## **2- Migration Model**

Migration is the result of many drivers: policies and public investments, source and destination institutions, urbanization policies and the geographic concentration investments and growth (Seto, 2011) very much related to regional development. The conceptual migration model proposed is very much related to a regional development model that highlights by two geographical attributes: scale and accessibility (Krugman,

1991). Scale, associated with productive capacity and access, associated with the expenditure possibility, can be different and define, not just two, but four types of development processes somehow stimulated by geography: developed, underdeveloped, dependent and exploited (Dentinho, 2012).

Developed regions are the ones that have productive and consumptive capacity; in these regions virtuous circles of development work as expected, with increasing productivity sustaining growing consumption and investment, allowing innovation and snowballing productivity. Underdeveloped places are those that suffer from vicious circles of poverty (Furtado, 1983) many times because they lack of scale and accessibility, observed in many poor regions with reduced productivity constrained consumption and limited investment, that discourages innovation and keeps income at subsistence levels. Exploited regions have productive capacity but part of the income generated is drawn outside; in this case the virtuous cycle of development runs outside the region that receives investment. Finally dependent regions receive systematically unilateral transferences from outside which strengthen the consumptive capacity without reinforcing the productive capacity. Migration flows from poor to exploited regions and from these to development regions; but it can also flow to dependent regions that have consumptive capacity without productive capacity. (Figure 1).

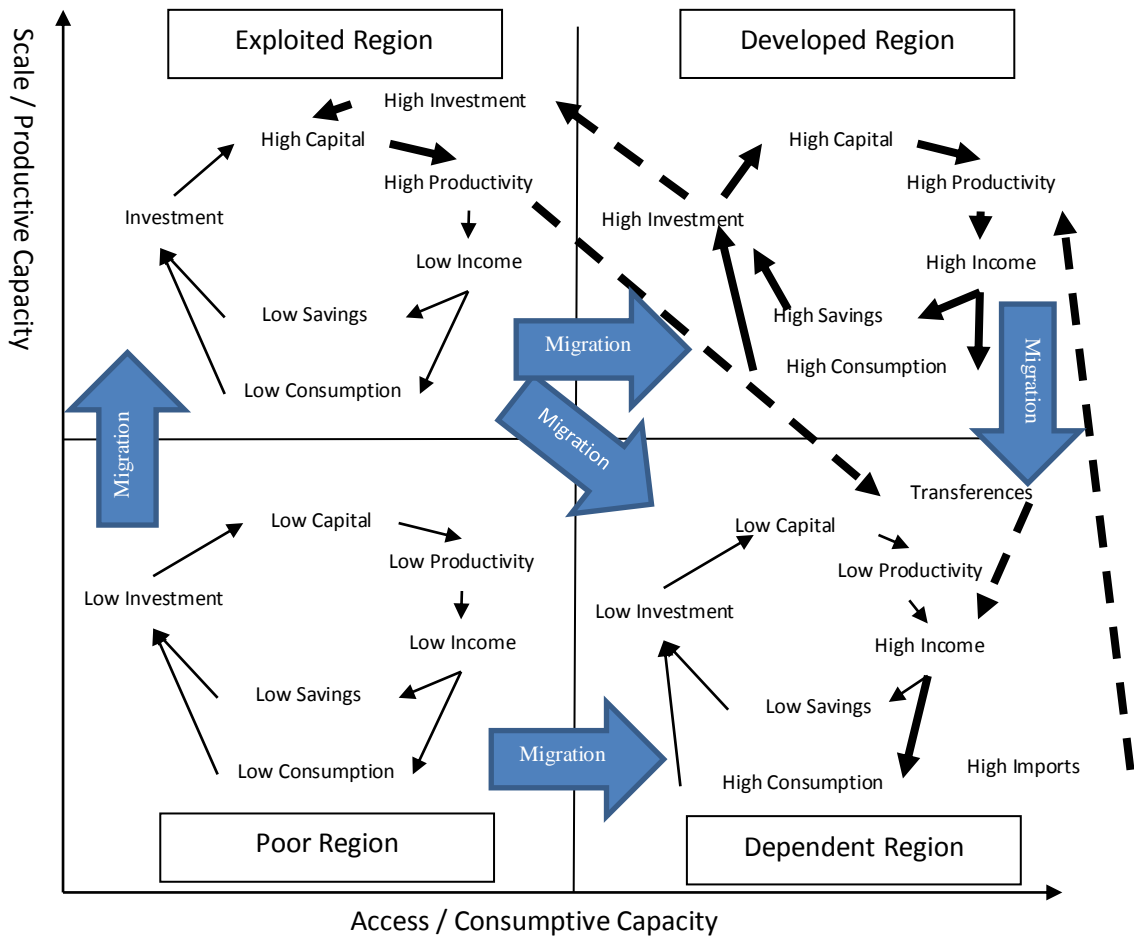


Figure 1: Typology of Regional Development

The analytical formulation of the model starts with a simple Solow type growth model for each one of the four regions with a single production function:

$$(1) Y_{ti} = A_i (N_{it} X_t)^a K_{it}^{(1-a)} L_i^p$$

Where  $Y_{ti}$  = product of region (i) in time (t);  $N_{it}$  = labor of region (i) in time(t);  $X_t$  = technological progress associated with labor in time t;  $K_{it}$  = capital of region (i) in time (t);  $1-a$  = product/capital elasticity;  $a$  = product / labor with technical progress elasticity;  $L_i$  = land of region (i); and  $A_i = \sum_j \exp(-\beta d_{ij}) / \text{Max}_i (\sum_j \exp(-\beta d_{ij}))$  is economic potential that depends on the relative accessibility of each region, being  $\beta$  = parameter for attrition and  $d_{ij}$  = distance between region (i) and region (j). Technological progress grows at a constant rate (g):  $X_{t+1} = g X_t$ . Capital evolves with the investment net from capital depreciation (d):  $K_{t+1} = I_t + (1-d) K_t$ . And investment is equal to savings that are a portion  $s$  of the product:  $I_t = s Y_t$ .

Nevertheless land rents ( $L'_{ti}$ )(2) can be distributed through distribution matrix  $[V]$  and the same can happen with wages ( $N'_{ti}$ )(3) through  $[W]$  – associated with remittances – creating redistribution effects if those matrices differ from identity matrices while keeping the sum of each line equal to the unity.

$$(2) L'_{ti} = (\rho A_i (N_{it} X_t)^\alpha K_{it}^{(1-\alpha)} L_i^{(\rho-1)}) L_{ti}$$

$$(3) N'_{ti} = (\alpha A_i (N_{it}^{(\alpha-1)} X_t)^\alpha K_{it}^{(1-\alpha)} L_i^\rho) N_{ti}$$

$$(4) K'_{ti} = ((1-\alpha) A_i (N_{it}^\alpha X_t)^\alpha K_{it}^{(-\alpha)} L_i^\rho) K_{ti}$$

$$V = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix} \quad W = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

Being so the Disposable Income  $Yd_{ti}$  of each region (i) at time (t) is equal to the product of the region (i)  $Y_{ti}$  plus the net land rent transferences and net wage transferences.

$$(5) Yd_{ti} = Y_{ti} + [L'_{ti}]V - L'_{ti}V_i + [N'_{ti}]W - N'_{ti}W_i$$

Each disposable income generates savings (5) that are targeted to investment in the different regions according to the weight of the capital productivity of the region in the total capital productivity (6).

$$(6) S = \sum_i s_i Yd_{ti}$$

$$(7) I_{ti} = S (K'_{ti} / \sum_i K'_{ti})$$

Finally, each year, a proportion ( $\mu$ ) of labor can migrate been attracted to the various regions according to the weight of the Disposable Income per capita of the region in the total Disposable Incomes per capita (

$$(8) N_{(t+1)i} = N_{ti} (1-\mu) + (\mu \sum_i N_{ti}) [(Yd_{ti}/N_{ti}) / (\sum_i Yd_{ti}/N_{ti})]$$

What is interesting to see is that different accessibilities and spatial income redistributions leads to completely different development and migration paths in each one of the regions even assuming similar technologies. This is shown in four numerical derived scenarios.

***Scenario 1: Similar geographical conditions and no transferences***

In this scenario each region is detached from each other by 1 unity of distance (see matrix [D]) and all land rents and wages are retained in the same region where they are generated (see matrices [V] and [W]). With constant returns on scale, without technological progress and without population growth population will be constant in all the regions and all the variables will converge to a steady state dynamic equilibrium in all the regions (Figure 2).

$$D = \begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{vmatrix} \quad V = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix} \quad W = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

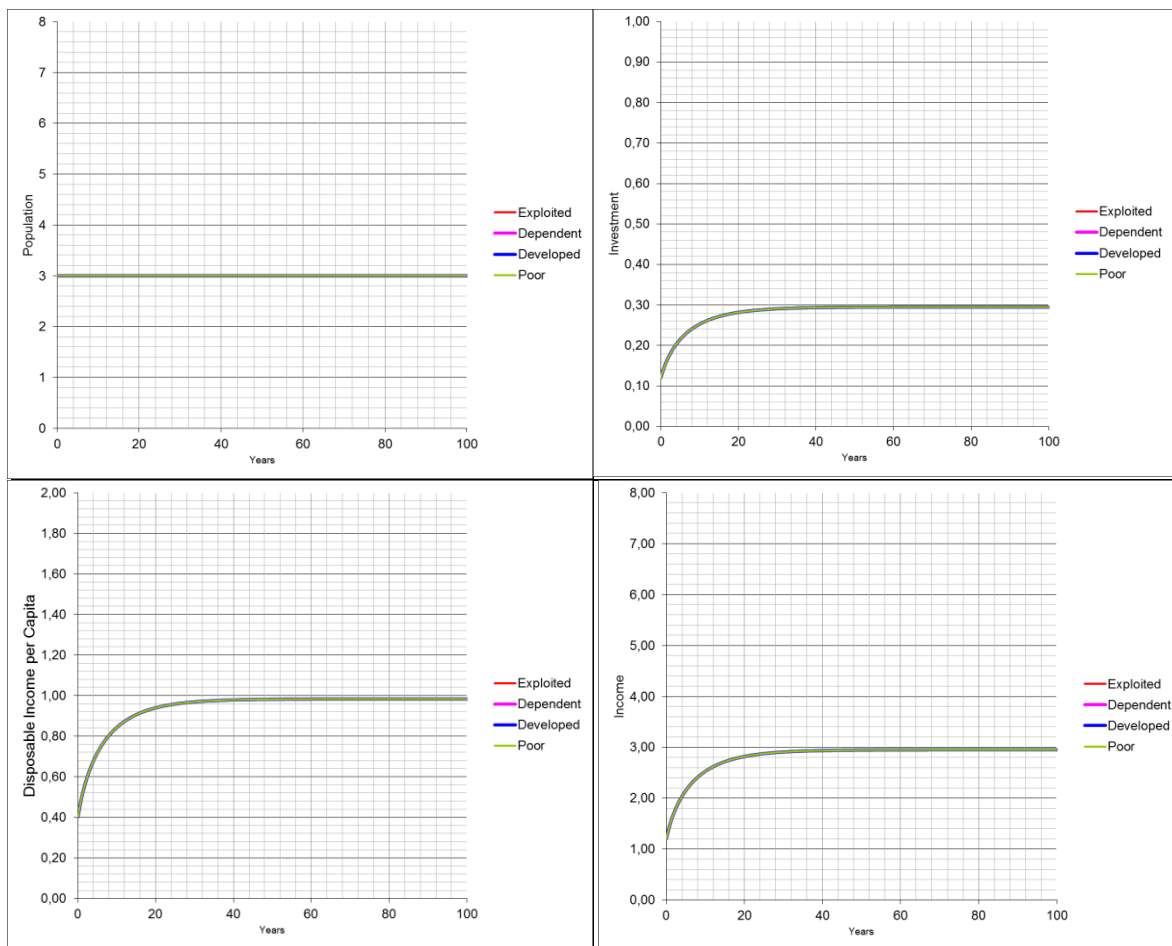


Figure 2: Scenario 1 – Similar geographical conditions and no transferences

**Scenario 2: Similar geographical conditions and transferences**

In Scenario 2 each region is also detached from each other by 1 unity of distance (see matrix [D]) but all land rents are transferred to the Dependent Region (Region III) and part of the wages from all regions are reassigned to the Developed Region (Region IV)

(see matrices [V] and [W]. Maintaining constant returns on scale, no technological progress and no population growth, in this case population will grow in the developed and dependent regions and will decrease in the exploited and poor regions, and the same happens with investment, income per capita and income, leading to a steady-state of non-convergence (Figure 3).

$$D = \begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{vmatrix} \quad V = \begin{vmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \end{vmatrix} \quad W = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0,5 & 0,5 & 0 & 0 \\ 0,5 & 0 & 0,5 & 0 \\ 0,5 & 0 & 0 & 0,5 \end{vmatrix}$$

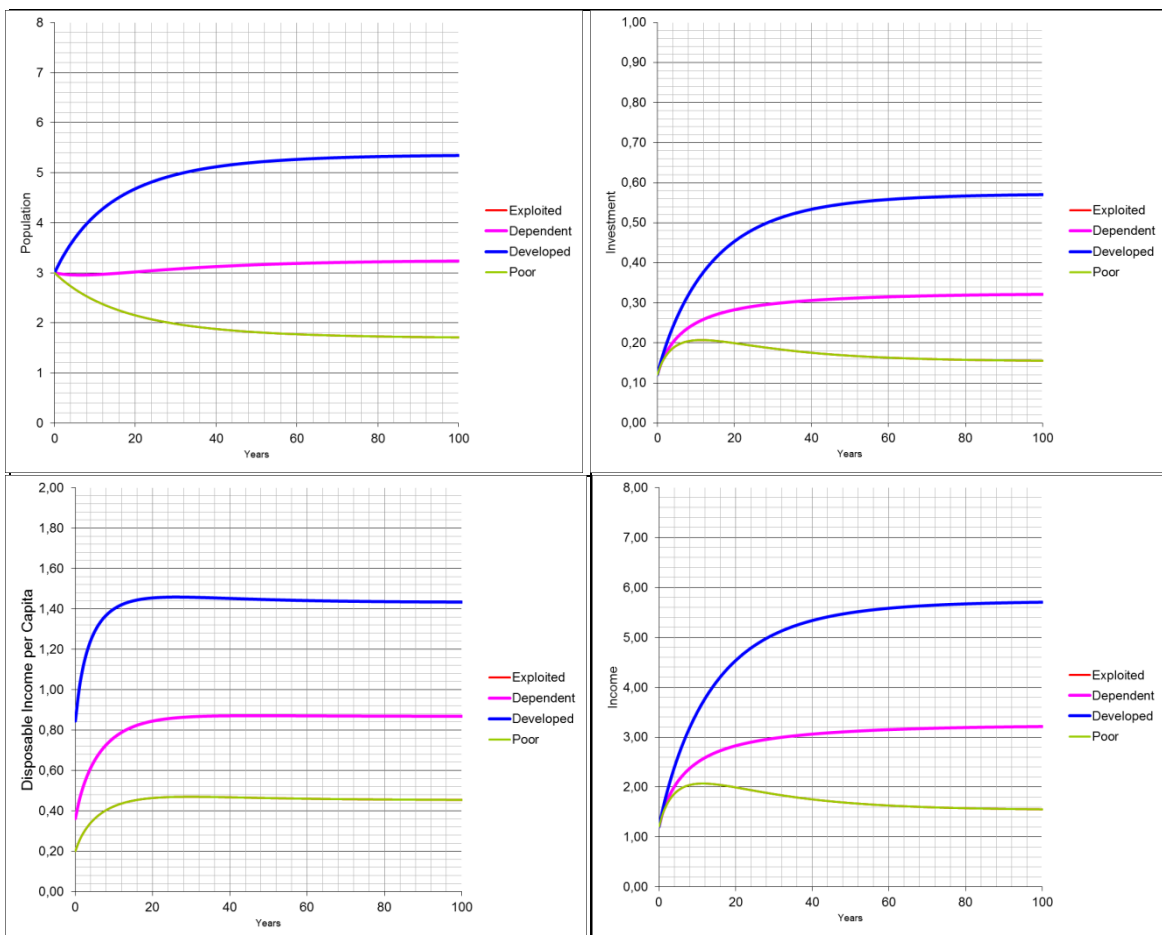


Figure 3: Scenario 2 – Similar geographical conditions and transferences

**Scenario 3: Different geographical conditions and no transferences**

For Scenario 3 distances between regions are different (see matrix [D]) changing therefore the economic potential  $[A_i]$  of each one of them, nevertheless all land rents are wages are retained in the same region where they are generated (see matrices [V] and [W]). Maintaining constant returns on scale, no technological progress and no



population growth, population will grow in more central regions and will decrease in more peripheral regions, and the same happens with investment, income per capita and income, leading to a steady-state of non-convergence (Figure 4).

$$D = \begin{vmatrix} 0 & 1 & 1 & 1 \\ 2 & 0 & 2 & 2 \\ 3 & 3 & 0 & 3 \\ 4 & 4 & 4 & 0 \end{vmatrix} \quad V = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix} \quad W = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

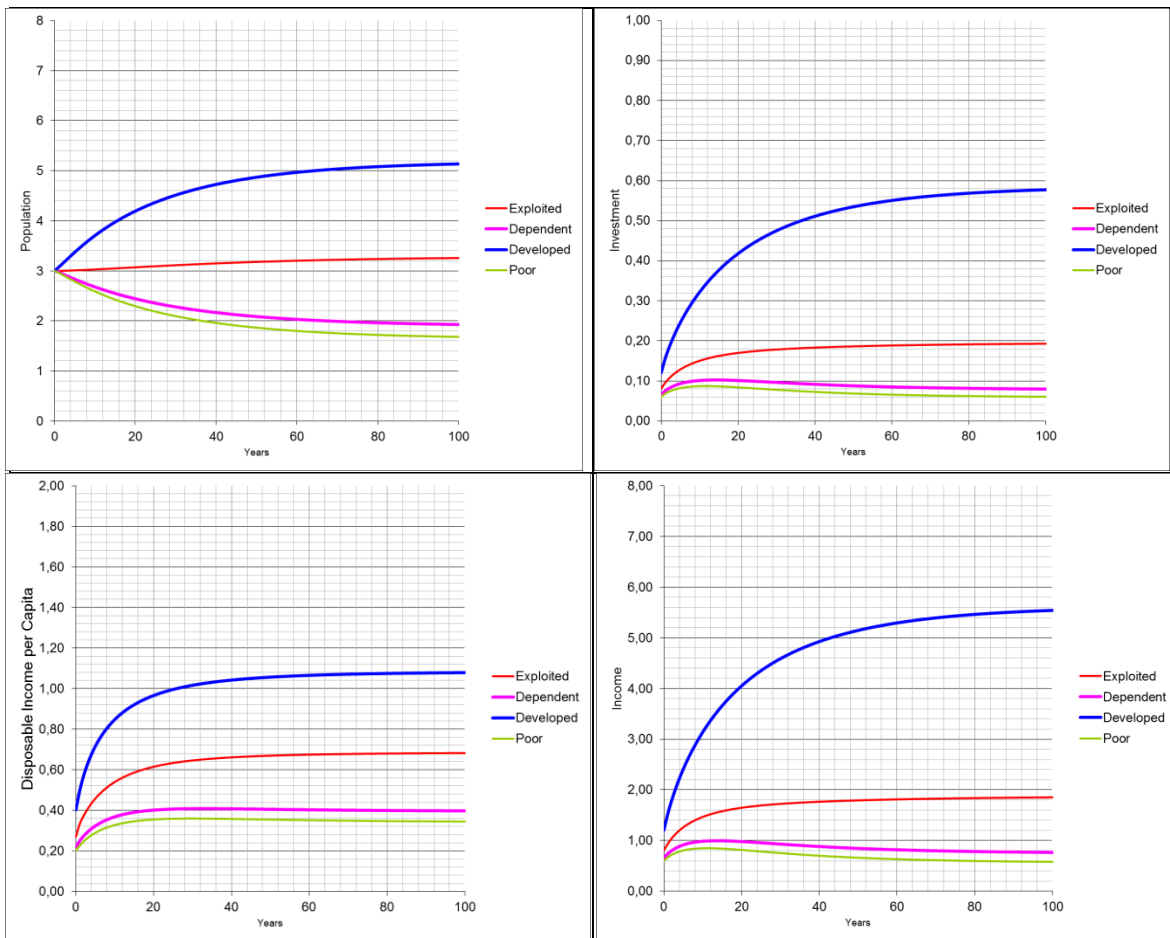


Figure 4: Scenario 3 – Different geographical conditions and no transferences

**Scenario 4: Different geographical conditions and transferences**

In Scenario 4 distances between regions are different (see matrix [D]) influencing the economic potential [A<sub>i</sub>] but all land rents are transferred to the Dependent Region (Region III) and part of the wages from all regions are reassigned to the Developed Region (Region IV) see matrices [V] and [W]. Maintaining constant returns on scale, no technological progress and no population growth, population will grow in developed

and dependent regions and will in exploited regions, and will collapse in the poor region (Figure 5).

$$D = \begin{vmatrix} 0 & 1 & 1 & 1 \\ 2 & 0 & 2 & 2 \\ 3 & 3 & 0 & 3 \\ 4 & 4 & 4 & 0 \end{vmatrix} \quad V = \begin{vmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \end{vmatrix} \quad W = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0,5 & 0,5 & 0 & 0 \\ 0,5 & 0 & 0,5 & 0 \\ 0,5 & 0 & 0 & 0,5 \end{vmatrix}$$

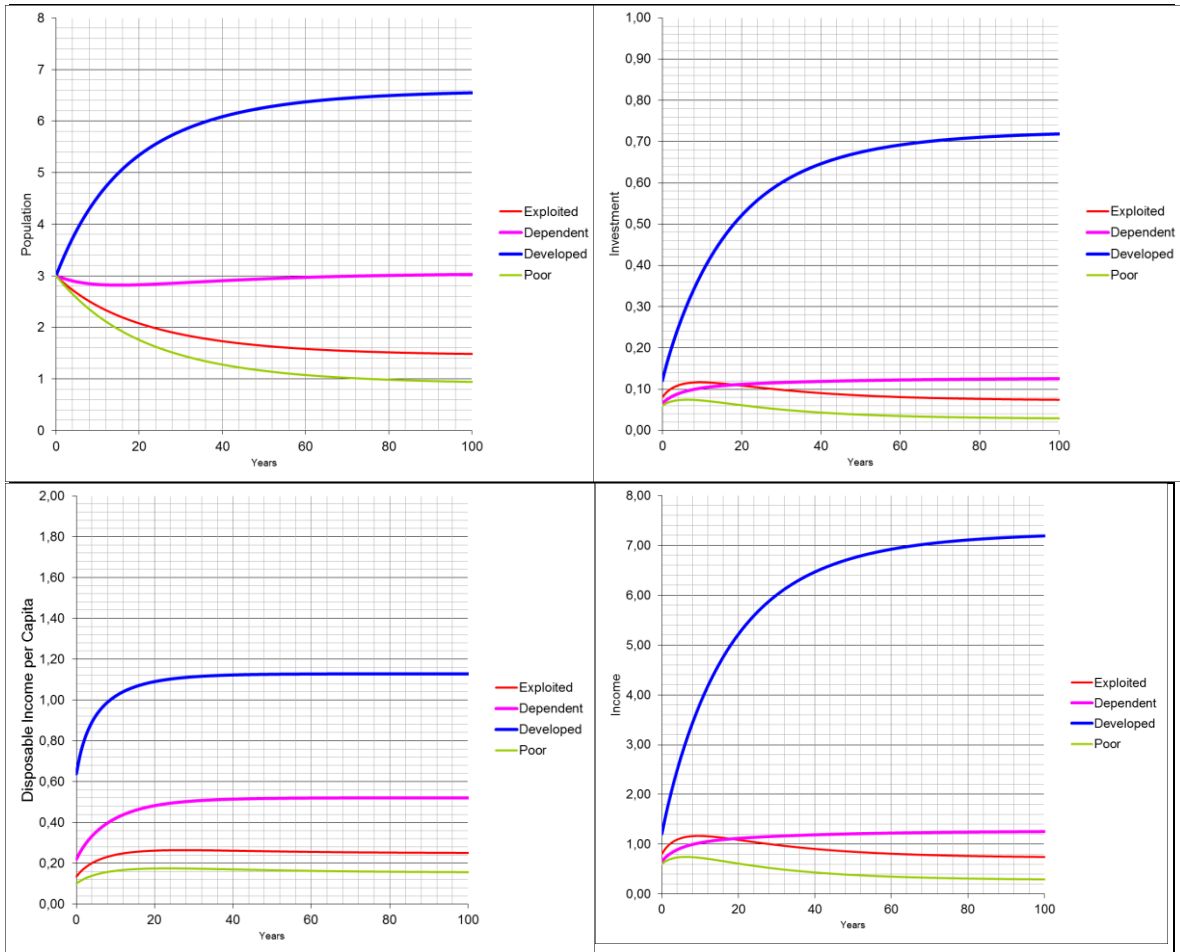


Figure 5: Scenario 4 – Different geographical conditions and transferences

The model explained above identify three main causes for non-convergence: a) lack of scale and accessibility that isolate regions from the market resulting in vicious circles of poverty; b) dependency on external transferences that guarantees some level of growth but constrains the possibility to fully increase the productive capacity; and c) productive capacity but reduced income due outgoing transferences of land rents and remittances. The purpose is to use this conceptual framework to analyze the situation of the Zambezi Basin in Mozambique.

### 3- Migration Flows and Urbanization in Portugal

#### **4- Final Note**

This is an exploratory work not only regarding the conceptual model but also in which concerns the analysis of the development process in the Portuguese Regions. In the near future we will try to operationalize the conceptual model proposed here and apply it to the data available for the Portuguese Regions. The objective is to support the design of consistent scenarios for the regional development strategy.

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