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Regional development and internal migration aspects of structural transformation: A Case Study of Senegal

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Askar Mukashov and James Thurlow

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ABSTRACT

REGIONAL DEVELOPMENT AND INTERNAL MIGRATION ASPECTS OF STRUCTURAL TRANSFORMATION: A CASE STUDY OF SENEGAL

Askar Mukashov and James Thurlow

This study investigates regional development and internal migration dynamics within the context of modern structural transformation in Sub-Saharan Africa. We develop a regionalized Computable General Equilibrium model that incorporates regionalized production, endogenous interregional migration, and distinct migrant households. Using this model, we simulate the structural transformation of Senegal as a case study. Our findings demonstrate that agricultural stagnation, exacerbated by global climate change, underlies the economic underperformance of rural regions and amplifies regional income disparities. Furthermore, our analysis shows that outmigration from stagnating rural provinces to a more developed capital region positively influences overall economic growth and mitigates regional income inequality. Nevertheless, these effects are limited, and a proactive approach to addressing income inequality across the nation's regions would require supporting agriculture, as it represents a more equitable policy than promoting nonagricultural sectors in both rural and capital regions.

Keywords: structural transformation; CGE modeling; deagrarianization; internal migration; regional development

JEL classification: D58, C68, Q54, O18

Askar Mukashov
Kiel Institute for the World Economy
Corresponding Author, International Food Policy Research Institute,
Washington DC, USA
Email: a.mukashov@cgiar.org

James Thurlow
International Food Policy Research Institute
Washington DC, USA
Email: j.thurlow@cgiar.org

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1. Introduction

Sub-Saharan Africa (SSA) countries are undergoing a unique structural transformation, becoming less agrarian despite failing industrialization, which puzzles development economists. Many use a macro-level sectoral lens to investigate this transformation, arguing that a significant share of deagrarianized labor ends up in low-productivity informal urban services, meaning that structural transformation fails to boost the economy and, at times, may even be growth-reducing (e.g., McMillan et al., 2014). Moreover, due to persistent institutional problems and an uncertain external environment, many expect SSA countries to face difficulties in transforming their economies through classic industrialization and express uncertainty regarding the success of SSA's development model (e.g., McMillan et al., 2014; Rodrik, 2016, 2018). Concurrently, as people continue to migrate from agrarian regions to urban centers despite cities' failure to integrate all internal migrants, significant efforts have been made to investigate the migration aspect of structural transformation, with many finding a positive impact for rural-urban migrants (e.g., Brockerhoff, 1990; Beegle et al., 2011; de Brauw et al., 2018). Additionally, in recent years, in light of growing concerns about Global Climate Change (GCC), considerable efforts have been made to estimate the economywide impact of GCC (e.g., Arndt et al., 2015; Siddig et al., 2020), investigate the link between past climate change and urbanization (e.g., Henderson et al., 2017), and predict large-scale climate migration flows (e.g., Rigaud et al., 2021). While extensive research has been conducted in the fields of economic transformation, internal migration, and climate change in SSA, each area of research has been explored in isolation, with little attention given to the intersection between these dimensions. This has created a gap in understanding how these dimensions interplay, particularly from a critical regional development and internal migration perspective.

The aspect of regional development and rural outmigration in response to worsening economic conditions has become particularly topical in recent years. International organizations often emphasize that many SSA countries retain significant regional developmental disparities, with wealthier and more developed urbanized centers around national capitals and a poorer agrarian periphery. At the same time, job creation in urban areas remains too slow to absorb growing rural migration, leading to rising city slums whose population primarily lives off informal services. In light of higher demographic pressure in rural areas and land scarcity, push migration from the underdeveloped agrarian periphery is expected to amplify, especially in the context of GCC. In this context, besides achieving long-term economic growth, many SSA countries are encouraged to focus on reducing regional developmental disparities and promoting pro-poor growth orientation in their economic development strategies (see examples of Systematic Country Diagnostics of Tanzania, Senegal, and Kenya in World Bank, 2017, 2018, 2020).

In this context, unpacking the structural transformation from a regional development and internal migration perspective becomes particularly topical, and a set of questions remains to be answered. What is the role of national structural transformation in driving regional developmental disparities? What role can GCC play in these processes? Is it practical to support poorer agricultural regions and reduce their outmigration? Or is it better to promote urban economic growth and hasten rural outmigration and structural transformation? What are the tradeoffs of these options? To shed light on these questions, we develop a country-level economywide Computable General Equilibrium (CGE) model with regionalized production, endogenous interregional migration, and distinguished migrant households. As a case study, we apply the model to investigate the economic development of Senegal.

Senegal, like many other SSA countries, faces significant economic and social disparities across its regions, with the capital city Dakar being more developed and much wealthier than other

regions (ANSD, 2013). As a result, the country has seen a rural exodus since the 1960s, with most rural migrants joining the labor force in urban sectors of the Dakar area in search of better job opportunities and income (Goldsmith et al., 2004; World Bank, 2018). Although rural migration decisions are complex and not solely driven by income factors (e.g., Brockerhoff, 1990), income remains the primary motivation for rural outmigration (FAO, 2018, 2020). In this context, because GCC usually disproportionately affects agriculture - the most climate-sensitive economic sector (Bellon and Massetti, 2022), it can exacerbate regional income disparities, amplify outmigration, and influence the overall structural transformation of Senegal.

To analyze the growing divergence between the country's regions, we divide it into four climate-economic zones: Dakar and its neighboring region Thies (DT), the desert-hot North (NO), the steppe-hot Center (CE), and the tropical savannah South (SO). Then we calibrate the model to replicate historical migration patterns in the Baseline scenario and use region-specific estimates of the GCC-associated agricultural productivity losses.

Our results show that under the Baseline scenario, the DT region continues to grow in economic importance, with the service and industrial sectors absorbing labor pushed from agrarian regions. Although this migration increases the already high economic weight of the DT region, it mainly benefits poorer residents of NO, CE, and SO and, in the absence of other government interventions, helps to reduce regional income inequality. Migrants, even if they do not escape poverty (upon migration to DT, the average consumption of migrants is approximately only one-third of the consumption of DT natives and below the DT poverty line), increase their welfare (by about a third) and their outmigration eases labor wage pressure and slightly improves the welfare of those who remain in the rural region of origin (by about 6.5-7.8%). In the simulated GCC

scenario[1], the national economic impact is expected to be moderate, but losses are unevenly distributed. As the least agricultural region, DT is the least affected by GCC and becomes even more attractive to agrarian residents. The effect is particularly pronounced for the region Center, where outmigration increases the most because of its highest GCC-associated losses.

In this context, our growth intensification scenarios focus on influencing the externalities arising from Baseline-GCC structural transformation. We analyze the welfare and migration effects of faster growth of nonagricultural capital in DT and compare its impact with faster growth in both agricultural and nonagricultural capital in rural provinces. We find that promoting nonagricultural capital in DT, although beneficial for internal migrants and other rural residents who benefit from increased production and cheaper prices, primarily benefits the wealthiest DT native households (who gain from both income and price effects). In this context, this policy, although the most effective in boosting structural transformation and income generation, exacerbates the income disparity between native DT and other households. Supporting rural economies is generally a more equitable policy, as it directly increases the incomes of rural households. At the same time, we also find that the impact of agricultural and nonagricultural growth on the households within regions varies significantly. In particular, capital investment in agricultural sectors increases demand for complementary labor and, thus, benefits poorer households and decreases their outmigration to DT. On the other hand, increased capital of nonagricultural sectors substitutes labor, resulting in lower wages in the region and increased outmigration to DT. In the context of GCC, capital investment in agricultural sectors thus can be considered an effective counterbalancing policy that can counteract growing existing regional disparities.

[1] We select one of the more severe scenarios that has uneven impact of GCC on the country's regional agriculture (see section 3.3 for details).

These tradeoffs are a prime example of why a regional development and migration perspective is important when analyzing a country's structural transformation scenarios. We hope that the insights gained from our paper can inform economic transformation, climate change adaptation, and migration management, all of which are critical for achieving national development goals in many SSA countries.

The rest of this paper proceeds as follows. Section 2 provides a contextual overview of the methods used to analyze SSA countries' structural transformation and development, specifically focusing on positioning our paper in the literature and its value for policy planning. Section 3 describes our model and its application for the case study of Senegal. It starts by describing historical developments and the status quo of Senegal's economy and follows with a description of the country's structural transformation scenarios and an explanation of the modeling framework. Section 4 analyzes simulation results and provides insights into the national and regional economies, migration flows, and household welfare. Finally, Section 5 concludes.

2. An overview of methods used to analyze the structural transformation of SSA

The structural transformation of SSA countries has been the focus of numerous modern studies, which can be broadly classified into two main categories: 1) macro-level studies examining economic sectors, and 2) micro-level studies investigating migration aspects of structural transformation.

Macro-level studies primarily explore the structural transformation of economic sectors at a national level, delving into long-term macroeconomic growth prospects and productivity spillovers. Bryceson (1996) is among the first researchers to provide statistical evidence that despite weak industrialization, SSA is becoming less rural. She highlights that the industrial sector in SSA, overshadowed by imports from developed countries, is not the leading driver of rural

exodus and urbanization. In this context, she proposes the unique concept of 'deagrarianization' for SSA and advocates for a sectoral perspective to examine off-farm activity diversification of rural households. McMillan et al. (2014) analyze historical country-level data, discovering that as agricultural labor shifted towards primarily informal urban services, SSA's structural change from 1990 to 2000 was growth-reducing. However, the authors identify potential post-2000 improvements and express cautious optimism about SSA's growth prospects through industry-led structural change. Similarly, Rodrik (2018) employs historical country-level data and growth models, highlighting that unproductive and informal urban services are significant destinations for rural-urban migration in SSA. He anticipates the region will experience moderate long-term growth rates of 2% per capita per annum and argues that achieving substantially higher growth rates would necessitate an entirely new and unprecedented transformation strategy.

Micro-level studies, on the other hand, tend to focus on the migration aspect of structural transformation. For instance, Beegle et al. (2011) use individual-level panels in Tanzania and find a substantial increase in the consumption of deagrarianized rural migrants. Likewise, de Brauw et al. (2018) use individual-level panels in Ethiopia and find substantial improvements in nonfood consumption and better diets among migrants relative to non-migrants. Henderson et al. (2017) use district and city-level historical data and investigate the link between past climate change and rural-urban migration. The authors find that climate change has an additional increase of urbanization only in those cities that have developed manufacturing that exports goods outside local markets.

Both literature strands rely on empirical methods to explore sectoral and migration aspects of the structural transformation of SSA. However, in some cases, classic empirical methods are inadequate or infeasible for thoroughly investigating critical aspects of development, and researchers occasionally turn to complex simulation models and methods. In particular, simulation models are often used to produce hypothetical 'what if' or 'what if not' reference scenarios and

estimate otherwise unmeasurable aspects of economic development and structural transformation. For example, Alix-Garcia et al. (2017) use labor mobility simulation models developed by Artuc et al. (2008) and Artuc et al. (2010) and investigate the consequences of South Sudanese refugees' presence in Kenyan Turkana County for the economy and welfare of native Kenyans at county and national levels. Arndt et al. (2015) and Siddig et al. (2020) use a combination of biophysical global-level simulation models and country-level CGE models to measure the economywide repercussions of potential GCC-associated agricultural productivity losses for Ghana and Sudan, respectively. Rigaud et al. (2021) employ a historically calibrated population gravity model to simulate internal migration scenarios related to potential climate change in West African countries.

The primary goal of our study is to investigate the regional development and internal migration aspects of structural transformation, and we use a CGE simulation modeling approach. Being one of the well-known modeling methods in policy planning (see, e.g., Dixon and Rimmer, 2016; Taylor, 2016), CGE models allow for a macroeconomically consistent representation of economic linkages between activities, households, and the rest of the world. As prices for product and factor (land, labor, capital) markets are completely endogenized in CGE models, they reflect resource competition on all levels and, therefore, are an excellent tool for modeling the structural adjustment of the economy both on the activities (supply) and households (demand) side. Our choice of CGE modeling is not unique, and some authors have already used them to investigate certain regional development aspects of structural transformation in several SSA countries. For instance, Dorosh and Thurlow (2012, 2014) construct regionalized CGE models of Uganda and Ethiopia and integrate the elements of New Economic Geography into them. The authors model the agglomeration effect in which all urban sectors get an additional TFP productivity boost due to rural-urban migration and higher population density and compare tradeoffs associated with various urban and rural policies for generating national and regional growth and income.

Recent studies suggest that, rather than cities' pull effects of agglomeration and productivity spillovers, the primary driver of migration to cities is stagnation in agricultural provinces, exacerbated by GCC. In this context, our paper's critical distinction lies in its explicit focus on stagnating rural economies and forced outmigration. In contrast to Dorosh and Thurlow (2012, 2014), we explicitly model the migration of rural households to urban centers, differentiating them from households in both hosting and sending regions. Since rural-urban migration is sometimes considered a remedy to solve a country's poverty problem (see, e.g., discussion in de Brauw and Mueller 2012), this distinction enables us to analyze three interdependent aspects of internal migration arising from noninclusive structural transformation. First, we model the impact of migration on rural migrants themselves (by comparing their income levels if they remain in their origin region versus their new income levels in the hosting urban region). Second, we model the impact of outmigration on rural regions by comparing their development with migrants staying and leaving. Lastly, we model the impact of migration on a host region, comparing its development with and without the presence of migrants. In this context, by modeling structural transformation's threefold impact on households and changes in migration flows, our approach introduces a regional development and migration angle to the classic dilemma of the importance of agriculture versus non-agriculture-led growth in SSA (e.g., Valdes and Foster, 2010; Diao et al., 2010).

3. Modeling the Structural Transformation of the Senegalese Economy

3.1 Country context

Our case study, Senegal, is a typical SSA country characterized by an ongoing structural transformation that can amplify its existing substantial regional disparities and forced migration flows.

To define Senegal's possible future development, we first briefly overview its most recent structural transformation patterns. Over the last 20 years, Senegal has continued its shift away from agriculture, and its urban sectors have gained importance (Table 1). The services sector has gained the most weight in terms of GDP and employment shares, while the industrial sector shares did not change significantly (Table 1, Col. 4-5). Combined with the dynamics of rural and urban populations, this factor signals that, at the macro-level, Senegal follows the typical structural transformation patterns of other SSA countries, where a significant share of deagrarianized rural-urban migrants cannot be absorbed by underperforming industrial sectors and ends up working in service sectors.

Table 1. Macro-level overview of past structural transformation, 2000-2019.

Category	Subcategory	Avg. yearly growth	% of total 2000	% of total 2019
(1)	(2)	(3)	(4)	(5)
GDP	Total	4.20	100.00	100.00
	• Agriculture, forestry, and fishing	3.27	19.28	16.27
	• Industry	3.94	27.46	26.18
	• Services	4.63	53.26	57.55
Employment	Total	2.43	100.00	100.00
	• Agriculture	0.13	46.32	30.10
	• Industry	2.76	12.33	13.12
	• Services	4.15	41.35	56.78
Population	Total	2.67	100.00	100.00
	• Rural	1.96	59.68	52.35
	• Urban	3.57	40.32	47.65

Source: Own calculations based on data from the World Bank (2022).

A closer look at the country's income characteristics across its administrative regions and past internal migration flows reveals further essential details of its structural transformation. In particular, the capital Dakar and its adjacent region Thies are the wealthiest in the country (Table 2, col. 3). At the same time, poorer rural regions are characterized by higher natural population growth (Table 2, Col. 4). These two factors explain the internal migration flows, where people from poorer peripheral regions, especially those with higher natural population growth, migrate mostly to Dakar and Thies (Figure 1). In general, internal migration in Senegal already represents

a significant developmental factor, as it concerns 14.6% of its population (ANSD, 2014). According to the most recent study by FAO (2020), the most important self-declared reason for migration is the search for better job and income opportunities, and it is primarily rural youth who migrate without any resources. As urban centers cannot fully integrate these already vulnerable people, it is unsurprising that migrants constitute almost two-thirds of the people experiencing poverty in Dakar (World Bank, 2018).

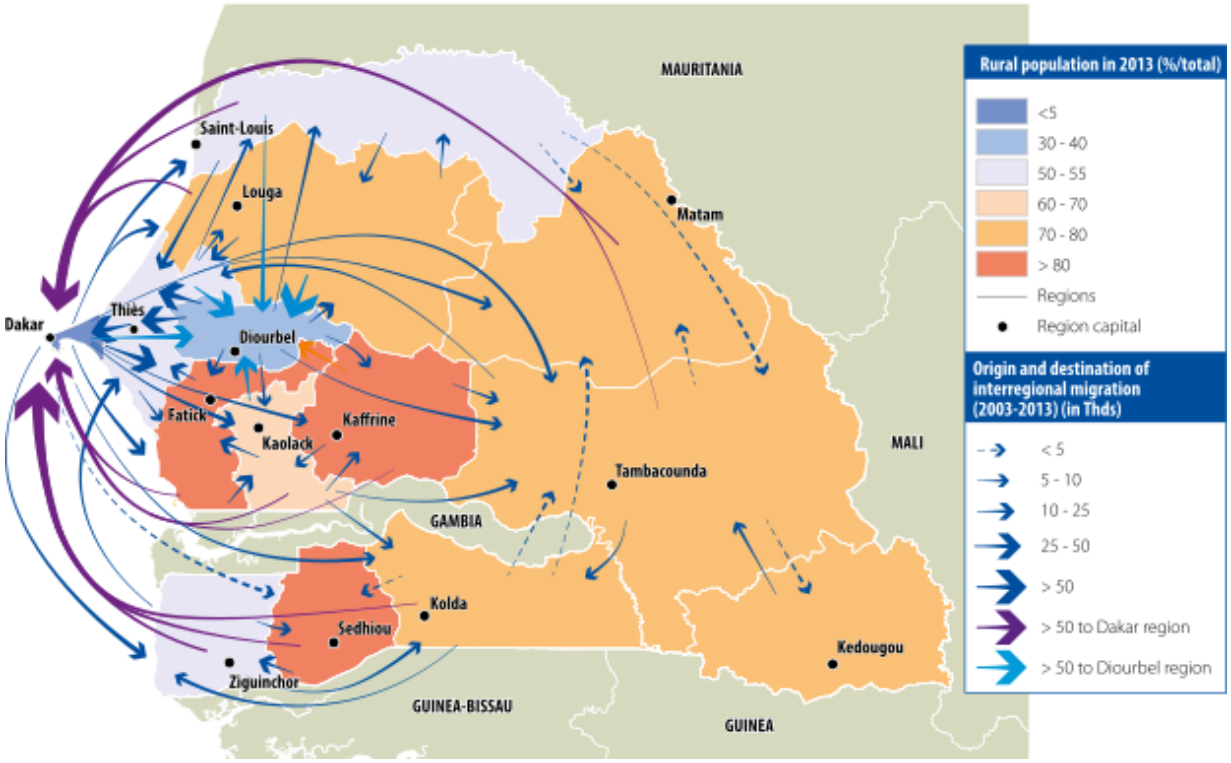
Table 2. Population's income characteristics across administrative regions.

Administrative region	Population share, %	Per capita consumption, mil CFA francs.	p.a. natural population growth 2015-25, %
(1)	(2)	(3)	(4)
Dakar	23.68	630.82	2.61
Thies	12.60	340.11	2.66
Diourbel	12.06	261.41	3.22
Kaolack	6.58	261.18	3.10
Saint-Louis	6.79	335.12	2.62
Louga	5.75	319.98	2.77
Fatick	5.19	214.50	3.58
Tambacounda	4.24	233.75	3.67
Kolda	5.05	183.79	3.22
Matam	3.99	285.24	3.75
Kaffrine	3.84	225.69	3.59
Ziguinchor	5.88	259.34	3.30
Sedhiou	3.35	205.75	3.50
Kedougou	1.01	215.52	3.43
National	100.0	362.06	3.06

Sources:

- map: Wikimedia Commons
- table: own calculations based on ANSD (2013) and ANSD (2022).

Figure 1. Interregional migration, 2003 - 2013.



Note: Migration to Diourbel is primarily for religious reasons (one of its cities - Touba, is a stronghold of the Mouride brotherhood).
Sources: FAO and CIRAD (2017).

Despite achieving the status of a lower-middle-income country only in 2019 (World Bank, 2020), Senegal already has an ambitious goal to reach the status of an emerging market economy[2] by 2035. The Plan for an Emerging Senegal (PES) strategy explicitly prioritizes structural transformation as the nation's number one goal and provides a general reference framework for economic and social policy over the mid- and long-term (Presidency of Senegal, 2022). For the most part, PES focuses on institutions/governance, infrastructural projects, human development, and other qualitative improvements that should pave the way for the country's sustainable and inclusive growth. In terms of economic policy, the government outlines national projects in all economic sectors (from primary agriculture to services). However, as the primary driver of

[2] An emerging market economy lacks a standardized definition, but distinctions are typically made based on factors like per capita income, global integration, and export diversity. See, e.g. Statistical Appendix in IMF (2022).

economic growth and transformation, the government seems to give implicit priority to its trade-intensive industrial and service sectors, intending to become a hub for the whole of West Africa (e.g., see IMF, 2015).

Nonetheless, Senegal faces several challenges that could be severe obstacles to realizing its ambitions. The World Bank, in its Systematic Country Diagnostic (SCD) of Senegal, expressed caution about the success of the PES target and identified several fundamental constraints (World Bank, 2018). Like PES, SCD devotes significant attention to institutional reforms and infrastructure improvement and, in the context of mediocre growth rates over the last decades, emphasizes uncertainty over the country's economic growth rates necessary to achieve the PES target. At the same time, SCD puts special emphasis on the country's most fragile areas, primarily on inclusiveness and sustainability. In particular, SCD highlights insufficient pro-poor growth and rising regional income disparities. As most people experiencing poverty are subsistence farmers in agricultural regions of the country, job creation in urban areas remains too slow to absorb rising demographic pressures, leading to the rising slums in the outskirts of Dakar, whose population lives off informal and largely unproductive services. In this line, SCD also emphasizes a particular vulnerability of agrarian regions to GCC, where most of the population relies on rain-fed agriculture and the consequent risks of unintended intensification of rural-urban migration and unplanned urbanization. All in all, SCD emphasizes that to achieve an emerging market status, Senegal must not only maintain robust growth but also make it inclusive.

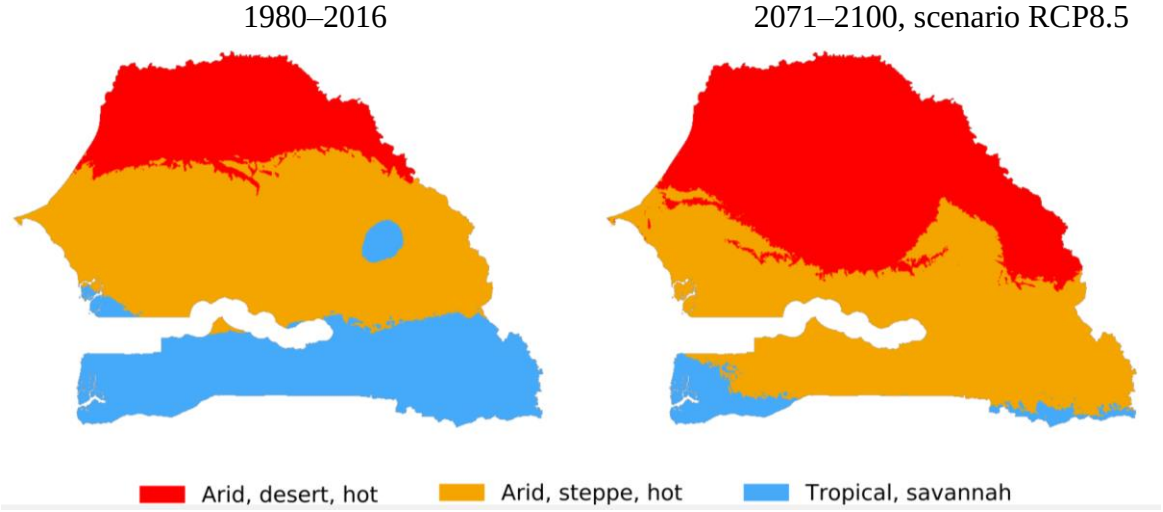
In conclusion, the past and potential future difficulties of the country's structural transformation to provide broad-based inclusive growth for its population reaffirm that adopting a regional development and migration perspective is essential for analyzing its structural transformation pathways. By focusing on regional disparities, migration patterns, and the need for inclusive growth, policymakers and researchers can better understand the complex dynamics of

Senegal's development and identify targeted interventions that promote more sustainable and equitable progress.

3.2 Data preparation for model implementation

Considering the significant population size disparities between existing administrative regions (e.g., the Kedougou region accounts for 1% of the population vs. 23.7% in Dakar, see Table 2, Col. 2), we consolidate certain neighboring regions with similar characteristics. We base this on the criteria of income homogeneity within the population (Table 2, Col. 3-4) and the country's climate zones (Figure 2). We distinguish the more developed and urbanized Dakar & Thies region and separate agricultural regions into the desert-hot North (Saint-Louis & Matam), the steppe-hot Center (Louga, Diourbel, Kaolack, Kaffrine, Fatick), and the tropical savannah South (Ziguinchor, Tambacounda, Kedougou, Sedhiou, Kolda).

Figure 2. Köppen-Geiger climate classification map.



Sources: Beck et al., 2018
Note: RCP8.5 is a high-emissions scenario. See Beck et al. (2018) for details.

Next, we construct a database representing key transactions for the base year of 2015 within and between the defined regions in the form of a Social Accounting Matrix (SAM)[3].

[3] SAM represents a detailed snapshot of all transactions between key economic agents (e.g., activities, households, the rest of the world). For a detailed explanation, see Pyatt and Round (1985) and Breisinger et al. (2009).

Table 3. Characteristics of regionalized activities and households.

	Activities						Households			
	% of total GDP	of which					% of the total population	Per capita consumption, mil CFA francs	Poverty level* % of population	p.a. natural population growth, 2013-25
		crops	oagr	agpr	oind	serv				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
DT	55.29	0.76	0.42	6.05	23.51	69.26	36.28	533.55	31.38	2.75
NO	9.27	17.28	12.73	17.37	11.34	41.28	10.78	317.01	41.60	3.10
CE	23.20	20.86	13.07	13.41	8.47	44.19	33.42	260.42	52.30	3.19
SO	12.24	19.53	14.33	10.71	10.17	45.27	19.53	223.58	68.45	3.37
National	100.00	9.26	6.20	9.38	17.26	57.91	100	362.06	46.71	3.06

Notes:

- DT=Dakar & Thies; NO=North; CE = Center; SO = South.
- oagr = other agriculture (livestock, fishery, forestry); agpr = agroprocessing; oind = (other) industry; serv = services
- * - weighted average national poverty lines in regions: 330 (DT), 249 (NO), 242 (CE), 234 (SO) constant 2015 CFA francs (per capita per year, in millions).

Source: own calculations based on constructed SAM (2015) and ANSD (2013).

Crucially, the constructed SAM reflects fundamental structural differences across the regions. Specifically, it highlights a significant gap between the more developed DT, which has the highest shares of industrial and services sectors, and the agriculture-dependent NO, CE, and SO (Table 3, Col. 3-7). These developmental disparities, in turn, correspond with regional income and demographic characteristics (Table 3, col. 9-11) and migration flows (Table 4). In particular, agrarian NO, CE, and SO regions are characterized by lower income, higher poverty, natural population growth, and significant migration to the DT region. At the same time, the connection to the DT economic center is a critical factor in explaining developmental differences within the rural periphery. Specifically, the North region (desert-hot) hosts the former capital Saint-Louis and maintains better connections to the DT region, with the highest income level and the lowest

To construct regionalized Senegalese SAM, first, we use the latest available national Supply and Use tables, household survey, and national accounts to construct a nationally consistent SAM. In the next step, we use other supplementary data, such as regional economic reports, and disaggregate activities, households, and factors to the four economic-climate zones defined above. As a result, the SAM has 74 production activities, 24 factors, 4 households, and 4 enterprises represented on a regional level. Commodities (and other accounts such as government) are on a national level. It should be emphasized that when we regionally disaggregated the SAM accounts, we prioritized the 2013 household survey as the most recent and reliable representation of regional development disparities. The full regionalized SAM is available upon request.

importance of primary agriculture among the three regions. Conversely, the tropical savannah region South, separated from the rest of the country by the Gambia, is the poorest region.

In turn, the interplay between location and development defines migration flow differences. The more developed NO has the lowest migration to DT, followed by the most remote and poorest SO; the Center region, being less developed than NO but not as isolated as SO, has the highest migration to DT.

Table 4. Interregional Lifetime Migration Matrix (2013).

Thousands

		place of birth				
		DT	NO	CE	SO	total
current residency	DT	4,017.49	124.75	460.95	226.89	4,830.08
	NO	39.23	1,341.28	36.14	18.24	1,434.89
	CE	74.33	16.96	4,219.92	30.89	4,342.10
	SO	50.11	13.24	54.54	2,309.71	2,427.60
	Total	4,181.16	1,496.22	4,771.55	2,585.73	

Outmigration

		% of place of birth			
		DT	NO	CE	SO
current residency	DT	96.1	8.3	9.7	8.8
	NO	0.9	89.6	0.8	0.7
	CE	1.8	1.1	88.4	1.2
	SO	1.2	0.9	1.1	89.3
	Total	100.0	100.0	100.0	100.0

Immigration

		place of birth				
		DT	NO	CE	SO	total
% of current residency	DT	83.2	2.6	9.5	4.7	100.0
	NO	2.7	93.5	2.5	1.3	100.0
	CE	1.7	0.4	97.2	0.7	100.0
	SO	2.1	0.5	2.2	95.1	100.0

Source: own calculations based on ANSD (2014).
Notes: henceforth, excluding religious migration to Diorbel.

3.3 Model and simulation scenarios

As a modeling basis, we use the standard recursive-dynamic CGE model of the International Food Policy Research Institute (IFPRI). Given the space constraints of this paper, we focus on the most important adjustments made to the model to investigate the scope of Senegal's structural transformation scenarios[4].

[4] The detailed statements of the model equations can be found in Lofgren et al. (2002), Diao and Thurlow (2012) and

Most importantly, our CGE model distinguishes activities and households on a regional level (see Figure 3 and Table 5). This regionalization enables us to account for varying economic structures across regions, forming the foundation for modeling the centrifugal forces of a national structural transformation. Central to this mechanism is the differentiation between region-specific production factors and their varying growth rates. Specifically, for agricultural land, we assume, based on historical data from the last 20 years (FAO 2022), that it has exhausted extensive expansion capacity and assign zero growth across all regions and scenarios. For labor, we use the latest estimates of expected natural population growth (Table 3, Col. 11) and set yearly growth rates at 2.75% (DT), 3.10% (NO), 3.19% (CE), and 3.37% (SO)[5]. Lastly, for capital, we assign an initial 3% yearly growth rate for all types of capital across all regions and employ the "putty clay" rule by Diao and Thurlow (2012), according to which the distribution of new capital (generated by the total investment of the previous year) depends on relative rents (sectors in the regions with higher rents receive more increase).

This specification of regional factor growth enables us to model the impact of national structural transformation on regional development and interregional migration. In particular, in line with implicitly formulated PES priorities, the relatively high value of capital growth should benefit capital-intensive industrial and service sectors. At the same time, the absence of agricultural land expansion essentially means that ceteris paribus primary agriculture will lag behind. In turn, for the regional dimension, this implies that the economic growth of regions more dependent on agriculture (NO, CE, and SO) is set to be slower than that of industry and service-dependent DT. This regional economic divergence should, in turn, affect regional income disparities and household migration. Specifically, high demographic pressure in NO, CE, and SO and slower

Mukashov (2023).

[5] Given the absence of projections, we assume labor dependency ratios and labor force participation rates stay constant (as in the base year 2015).

growth mean that the local economies cannot absorb abundant labor. As a result, these regions are set to experience negative wage dynamics and outmigration pressure. In turn, the better-off economy of DT should be the primary destination for labor pushed from NO, CE, and SO.

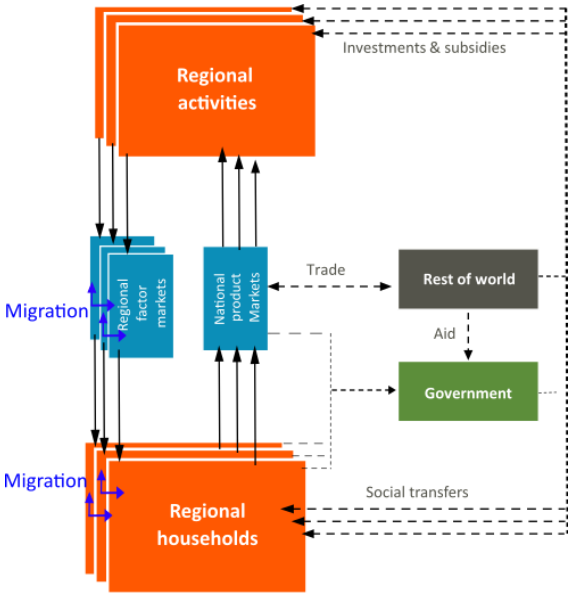
Table 5. Specification of the CGE model (Baseline scenario).

Block	Category	Form/closure (endogenous variables)
Production (regions)	Value-added	Constant Elasticity of Substitution (CES). Elasticities: crops=0.24; oagr=0.24; agpr= 1.12; oind=1.26; serv =1.68. Source: Aguiar et al. (2016).
	Intermediate	Leontief
	Top of technology	Leontief
National market	Output by each region	CES aggregation of output by each region
Trade	Import	CES
	Export	Constant Elasticity of Transformation (CET)
Households	Consumption	Linear Expenditure System (LES)
Closures	Numeraire	The exchange rate is the model numeraire[6]; Consumer Price Index and domestic producers' price levels are flexible;
	Rest of the World	the current account balance and world market prices are given exogenously;
	Government	Fixed government tax rates; (dis)savings adjust to available net revenues;
	Savings/Investment	Neoclassical: fixed savings rate, endogenous investment
	Factors	Capital: 'putty clay'; Land: fully employed; Labor: fully employed and mobile (within regions); interregional labor transformation via additive CET. Yearly growth rates: Land: 0 (all types & regions); capital (all types & regions, 1st year): 3%; labor: 2.75 % (DT), 3.10 % (NO), 3.19 % (CE), 3.37 % (SO).

Note: In line with the PES planning horizon, our simulation period is 2015-2035.

[6] The exchange rate of the CFA franc to the French franc (and later Euro) is fixed since 1994.

Figure 3. Flows of the regionalized CGE model.



Source: own elaborations.

At the same time, modeling interregional migration in response to diverging regional wages is a more complex task. To thoroughly analyze the multifaceted nature of the process, we aim to concurrently examine three dimensions: 1) the welfare changes experienced by migrants, 2) the effects of outmigration on the economy and welfare of non-migrants, and 3) the impact of migration on the host economy and the welfare of local residents. Our model differentiates between regional labor and households, and moving labor across regions does not equate to relocating households (see Figure 3). Consequently, integrating the migration module into our primary CGE model requires multiple steps and a set of assumptions.

Firstly, due to our emphasis on structural transformation, we focus on major migration flows, modeling the movement of NO, CE, and SO residents to the DT region. We choose to omit less significant migration flows, including those involving native DT residents, as they have limited importance (see Table 6, Col 2-5).

Table 6. Migration Matrix – historical and model Baseline.

		Historical (% of people born in the region)				Model (Baseline)			
		place of birth				place of birth			
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		DT	NO	CE	SO	DT	NO	CE	SO
residency	DT	96.09	8.34	9.66	8.77	100	8.12	9.69	8.91
	NO	0.94	89.64	0.76	0.71	X	91.88	X	X
	CE	1.78	1.13	88.44	1.19	X	X	90.31	X
	SO	1.20	0.88	1.14	89.33	X	X	X	91.09
Total		100	100	100	100	100	100	100	100

Source: own calculations based on ANSD (2014).

We differentiate migrant communities from the original households and assume that upon relocating to the DT region, NO, CE, and SO households become separate migrant households. Building upon recent findings from a study by FAO (2020), we assume that the backbone of this migration is poorer residents of NO, CE, and SO regions who migrate to DT without any resources. Consequently, we presume that NO, CE, and SO households decide to move to DT based solely on labor wage dynamics, and after relocating, labor remains their only source of income. Additionally, we assume that migrants adopt the LES consumption function and other characteristics of native DT residents (taxation, population/labor growth, etc.).

To define interregional labor reallocation, we employ a straightforward additive Constant Elasticity of Transformation (CET) function[7]:

$$\max[\sum_{i=1}^{n} g_i (P_i X_i)^{\nu}]^{\frac{1}{\nu}} \text{ subject to } V = \sum_{i=1}^{n} X_i \text{ where} \quad (1)$$

- $i = \{1 \dots n\}$ are regions DT, NO, CE, and SO
- g_i is the CET share parameter of region *i*
- P_i is the labor wage of region *i*
- X_i is the supply of labor to region *i*
- ν is the CET exponent (= 1 + 1/ω, ω is CET elasticity)
- *V* is the total available labor.

[7] For details, see Dixon and Rimmer (2003, 2006) and van der Mensbrugghe and Peters (2016).

The underlying assumption behind using the CET function to allocate labor is simple: regions, where economic development provides better wages, should get more labor. In this context, we use the estimate by Goldsmith et al. (2004) that in Senegal, for each 1% increase in the urban-rural wage ratio, rural-urban migration increases by 0.65%, and assigns CET elasticity ω = 0.65. Essentially this means that for each 1% of a region's relative labor wage increase (to a total weighted average), labor supply to this region should increase by 0.65% (as ω <1, this is an inelastic response that reflects mobility rigidity).

At the same time, the specification of CET share parameters g_i is not trivial and involves the consideration of two interdependent factors. First, we intend to approximate historical shares of the population remaining in NO, CE, and SO and migrating to DT under the Baseline scenario (Table 6, Col. 6-9). Second, we need to account for the possibility of varying labor productivity across regions, which may partially explain existing regional income disparities.

We consider three options for labor productivity differentials:

1. Equal labor productivity across regions.
2. Lower labor productivity in NO, CE, and SO, is proportional to the income ratio to DT. When NO, CE, and SO residents migrate to DT, DT receives less productive labor than native DT, and NO, CE, and SO migrants earn proportionately lower wages than native DT.
3. Lower labor productivity in NO, CE, and SO, is proportional to the income ratio to DT, but only the most productive residents of NO, CE, and SO can migrate to DT and earn the same wages as DT natives. The total labor productivity remaining in NO, CE, and SO declines proportionately due to the outmigration of the productive labor force.

We find that, aside from the welfare improvements of migrants themselves, the differences between the three options are negligible in all other aspects. Therefore, we use the rule of thumb

and assume that under the Baseline, welfare gains for migrants who move to DT should be relatively uniform, regardless of their origin region (NO, CE, or SO). As a reference, we use an empirical estimation of a 36% average consumption increase by rural migrants in Tanzania by Beegle et al. (2011). We use this ad-hoc rule given the absence of Senegalese data and the relative developmental similarity between the two countries (according to the World Bank (2020, 2021), Senegal and Tanzania reached lower-middle-income status almost simultaneously - in 2019 and 2020, respectively). Under this setup, wealthier NO follows option 1 (its population as productive as DT), while poorer CE and SO follow option 3 (the most productive migrate to DT and earn the same wages as DT natives, but the sending region loses its productive labor). We use this labor productivity specification and calibrate the remaining CET share parameters g_i (DT: 0.14; NO: 0.60; CE: 0.08; SO: 0.18) to approximate historical shares of the population remaining in NO, CE, and SO and migrating to DT under the Baseline scenario (Table 6, Col 6-9 and Table 9, Col. 3-6).

The primary aim of our alternative scenarios is to identify factors that can either exacerbate or alleviate the regional inequality and migration problems arising under the baseline scenario. Therefore, in addition to the Baseline, we explore two scenarios: 1) the Baseline burdened by GCC and 2) Growth Intensification scenarios that can counteract Baseline-GCC regional divergence and forced migration (Table 7).

Table 7: Alternative scenarios.

GCC HADGEM scenario (change of agricultural productivity versus Baseline)

	DT	CE	NO	SO
Yearly	-1.06	-1.06	-1.21	-0.32
by 2035	-19.20	-19.20	-21.61	-6.21

Note: IMPACT HADGEM (Hadley Centre Global Environment Model) scenario. Source: own calculations based on IMPACT model.

Growth Intensifcation scenarios

Value-added shares (2015)

Sector	Total	of which			
		DT	NO	CE	SO
agriculture	15.96	4.22	18.01	50.93	26.84
non-agriculture	84.04	55.33	9.40	23.28	11.99

Average yearly productivity growth scenarios (2015-35)

	DT	NO	CE	SO
agriculture	-	1.50	0.58	1.05
non-agriculture	0.09	0.72	0.32	0.61

Note: Productivity increase is proportional to the factors' value-added share.

Source: own calculations.

To examine the impact of GCC on the Baseline transformation, we utilize the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) developed by IFPRI (see Robinson et al., 2015 for details). According to all scenarios generated by IMPACT, GCC is expected to reduce agricultural productivity across all regions of the country. However, the North (desert) and Center (Steppe) regions are predicted to be more severely affected than the tropical savannah South. Therefore, rather than analyzing the full spectrum of GCC scenarios, we aim to determine the vector of GCC's influence on regional divergence and its consequences for migration flows. Therefore, we select one of the more severe scenarios and use it to simulate the uneven impact of GCC on the country's regional agriculture (see Table 7, 'GCC HADGEM scenario').

In the Growth Intensification scenarios, we draw from the PES plan's prioritization of industrial and service sectors and contrast it with agriculture-led development. Specifically, we compare scenarios of faster growth achieved through increased productivity in agricultural versus nonagricultural capital. As a reference, we use +1% of economywide growth attained by productivity growth in respective regions by 2035 and analyze each scenario's impact on overall household welfare and migration flows.

4. Simulation results

Following implicit PES priorities, we expect the industrial and service sectors to experience more dynamic development than agriculture under the Baseline structural transformation (Table 8). This suggests that the NO, CE, and SO regional economies will continue to stagnate, while the already more developed DT economy will benefit from the structural transformation. Consequently, we anticipate continued outmigration from the NO, CE, and SO regions to DT, in line with historical migration patterns (the highest outmigration is from CE, followed by the poorest SO and wealthiest rural NO).

By comparing the Baseline with a hypothetical no-migration scenario (Table 8, Col. 3-5, and Table 9, Col. 3-5), we identify two critical migration aspects of the structural transformation. First, the opportunity to migrate to DT accelerates the pace of deagrarianization. Specifically, residents of NO, CE, and SO who could deagrarianize but remain in their regions, leave and join the nonagricultural sectors of the much larger DT economy. This DT pull factor results in more people leaving agriculture in NO, CE, and SO and joining DT industrial and service sectors. Second, even without imposing additional agglomeration effects and productivity spillovers, labor reallocation toward the urban DT sectors provides a small but positive overall impact on the economy (+1.61% increase by 2035). This pattern of structural transformation aligns with McMillan et al. (2014) and Rodrik (2018), who expect a modest but positive contribution of labor deagrarianization to economic growth in SSA countries.

Table 8. Baseline structural transformation.

Group	Sector	Average yearly growth		% diff. by 2035	Baseline	
		No migration	Baseline		Share, 2015	Share, 2035
(1)	(2)	(3)	(4)	(5)	(6)	(7)
National GDP	Total	3.92	4.00	1.61	100.00	100.00
	Agriculture	2.52	2.49	-0.61	15.45	11.53
	Industry	5.15	5.27	2.32	26.64	33.95
	Manufacturing	4.94	5.06	2.30	19.14	23.46
	Services	3.60	3.69	1.66	57.91	54.51
Regional GDP	DT	4.14	4.39	4.90	55.29	59.61
	NO	3.64	3.55	-1.67	9.27	8.50
	CE	3.60	3.43	-3.14	23.20	20.80
	SO	3.66	3.48	-3.27	12.24	11.08
Population	Total	3.06	3.06	0.00	100.00	100.00
	DT	2.75	3.59	17.68	36.36	40.28
	NO	3.10	2.66	-8.12	10.90	10.09
	CE	3.19	2.67	-9.69	34.19	31.68
	SO	3.37	2.89	-8.91	18.55	17.95

Source: own calculations based on CGE simulations.

These total gains of +1.61% real GDP increase translate into +1.92% of real households' overall consumption by 2035 (Table 9, Col. 6). At the same time, analyzing the distribution of these gains, we see that outmigration from stagnating rural regions to DT helps reduce rising regional income inequalities and mainly benefits poorer residents of NO, CE, and SO. First, rural migrants,

even if they do not escape poverty (upon migration to DT, the average consumption of migrants is approximately three times less than DT natives and is lower than the DT poverty line, see Table 9, Col. 5), significantly increase their welfare (compared to when they stay in native regions, their consumption increases under the Baseline by 26-30%, see Table 9, Col. 4-6). Second, baseline outmigration from underdeveloped NO, CE, and SO eases labor wage pressure and slightly improves the income of those who remain (Table 9, Col. 6). Third, an additional inflow of labor reduces labor wages in DT, leading to a slight reduction in DT natives' income (compared to a scenario when only they could offer labor, by 2035, they lose 3% of real consumption). However, DT natives remain significantly wealthier than households in other regions (see Table 9, Col. 5).

Table 9. The importance of migration for households.

Region	Household	Baseline, 2035				GCC, 2035			
		Population share, %	no migration, consumption*	migration, consumption*	Migration gain/ loss, %	Population share, %	no migration, consumption*	migration, consumption*	Migration gain/ loss, %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Total national		100.00	590.56	601.92	1.92	100.00	574.83	586.84	2.09
DT	Hosts	34.23	975.25	946.33	-2.97	34.23	959.51	930.25	-3.05
NO	Migrants	0.89	254.17	320.38	26.05	0.90	234.18	310.70	32.68
	Remaining	10.09	501.65	534.01	6.45	10.09	492.14	519.01	5.46
CE	Migrants	3.40	244.84	317.59	29.71	3.82	221.32	307.73	39.05
	Remaining	31.68	399.97	429.27	7.33	31.26	381.55	412.15	8.02
SO	Migrants	1.76	242.95	306.23	26.05	1.69	225.80	296.81	31.45
	Remaining	17.95	357.31	384.91	7.72	18.02	350.37	375.70	7.23

Note: * consumption levels are represented in 2015 constant CFA francs (per capita per year, in millions).
Weighted average per capita national poverty lines in regions: 330 (DT), 249 (NO), 242 (CE), 234 (SO).
Source: own calculations based on CGE simulations.

Climate change can exacerbate the economic disparity between DT and rural provinces. Although the overall national economic impact is expected to be moderate (GDP reduced by only 1.24% by 2035, see Table 10, Col. 7), the distribution of losses is uneven across regions. Agriculture, directly affected by reduced productivity, experiences the most severe losses. Similar to a model by Henderson et al. (2017), our model predicts that the significance of agriculture in the local economy is the most critical factor determining regions' overall losses and migration flows.

Specifically, DT and CE regions are assigned the same shocks (both - steppe-hot, see Table 7). However, the least agriculture-dependent DT is the most resilient, and the most agrarian CE experiences the most severe economic losses (Table 10, Col. 7). Despite having the biggest GCC shocks, more developed NO experiences milder GDP losses (due to its lower reliance on agriculture), and the poorest SO, with its tropical savannah experiencing less severe GCC-associated productivity loss, ranks second-best after DT.

The distribution of economic losses across rural regions determines outmigration to DT (Table 10, Col. 7). Given higher linkages between agricultural and nonagricultural sectors in provinces, local deagrarianization becomes even less attractive than migration to DT. Compared to the no-migration scenario, the benefits of migrating to DT under GCC increase significantly across all rural regions, especially for the most affected CE residents (Table 9, Col. 7-10). As a result, compared to the Baseline, migration from CE to DT increases by 110.8 thousand, or +12.5%, and CE will lose an additional 1.33% of its population by 2035 (Table 10, Col. 7). At the same time, our model also predicts that given the restricted capacity of the DT economy to absorb additional labor, GCC-associated pushed migration from CE to DT can saturate labor markets in DT and dampen migration from other regions. In particular, despite increased migration gains (Table 9, Col 10), migration from NO remains almost the same (Table 10, Col. 7), while outmigration from the poorest but least affected South is reduced (-18.2 thousand, or -4% compared to Baseline). As a result, a net +0.88% increase in the total DT population (93 thousand) is mainly attributed to migrants from CE.

Table 10. Impact of Climate Change on Baseline Structural Transformation.

Group	Sector	diff. vs. no migration counterpart % by 2035		Average yearly growth		GCC vs. Baseline, % by. 2035
		Baseline	GCC	Baseline	GCC	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
National GDP	Total	1.61	1.75	4.00	3.93	-1.24
	Agriculture	-0.61	-0.52	2.49	1.95	-10.02
	Industry	2.32	2.49	5.27	5.32	0.98
	Manufacturing	2.30	2.50	5.06	5.09	0.53
	Services	1.66	1.73	3.69	3.65	-0.77
Regional GDP	DT	4.9	5.16	4.39	4.39	-0.04
	NO	-1.67	-1.64	3.55	3.47	-1.58
	CE	-3.14	-3.58	3.43	3.18	-4.84
	SO	-3.27	-3.07	3.48	3.45	-0.71
Population	Total	0	0	3.06	3.06	0.00
	DT	17.68	18.72	3.59	3.63	0.88
	NO	-8.12	-8.15	2.66	2.66	-0.03
	CE	-9.69	-10.90	2.67	2.60	-1.33
	SO	-8.91	-8.56	2.89	2.91	0.39

Source: own calculations based on CGE simulations.

Despite the equalization effect of migration, if we compare households' income levels in the base year of 2015 (Table 3, Col. 9) and the PES target year of 2035 (Table 11, Col. 9), we see that the income disparity between the wealthy natives of DT and other households tends to widen (e.g., in 2015, the consumption level of DT households was 2.4 times higher than that of the poorest South; by 2035, under no specific policy to support South, this ratio reaches 2.5). In this context, the primary goal of our growth intensification scenarios is to identify a strategy that can counteract Baseline-GCC income divergence and forced migration.

Table 11: Impact of Growth Intensifcation scenarios on households' consumption, %.

Region	Household	Intensive growth of non-agriculture				Intensive growth of agriculture		
		in DT*	in NO**	in CE**	in SO**	in NO**	in CE**	in SO**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total national		0.93	0.78	0.81	0.78	0.80	0.82	0.86
DT	Hosts	1.08	0.86	0.86	0.88	0.30	0.31	0.34
NO	(Potential) migrants	0.83	0.26	0.48	0.36	5.50	1.60	1.78
	Remaining	0.76	1.59	0.56	0.42	3.23	0.66	0.76
CE	(Potential) migrants	0.81	0.49	0.35	0.42	1.70	2.80	1.87
	Remaining	0.72	0.54	1.05	0.45	0.77	2.12	0.85
SO	(Potential) migrants	0.82	0.38	0.38	0.44	1.36	1.34	4.50
	Remaining	0.77	0.51	0.54	1.34	0.51	0.51	3.11

Note: For migrants: Column DT (*): consumption change versus GCC by 2035 assuming migration.
Other regions (**): consumption change versus GCC by 2035 assuming no migration.
Source: own calculations based on CGE simulations.

To compare the income equitability strength of reducing push factors in provinces versus the income-generating power of pull factors in DT, we use different references. First, we use the GCC scenario with interregional migration as a reference to measure the effectiveness of supporting DT development. On the other hand, to measure the effectiveness of promoting rural regions, as a counterfactual, we use the GCC scenario without interregional migration.

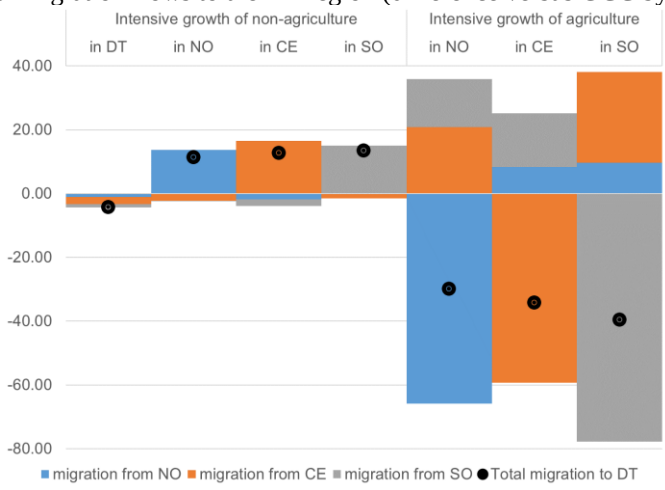
According to our model, intensifying structural transformation by fostering urban sectors in DT is the most effective strategy for generating overall income growth (Table 11, row 'Total national'). This is primarily because DT's economic sectors have the most developed industry sectors with deeper downstream linkages for the entire economy, ensuring that all regional sectors and households benefit more from increased production and lower prices. However, while boosting capital in urban sectors in DT benefits all households (including migrants from rural provinces), it is most advantageous for the wealthiest native households in the DT region (Table 11, Col. 3). In this context, supporting provincial sectors (Table 11, Col. 4-9) is generally a more equitable strategy, as it favors income increases for significantly poorer rural residents. However, the impact of agricultural and nonagricultural growth on households within regions varies considerably. Specifically, capital investment in agricultural sectors better supports all rural households, with potential internal migrant households benefiting the most (Table 11, Col. 7-9).

The primary mechanism explaining this result is as follows. First, nonagricultural sectors are more flexible[8], meaning their increased capital substitutes labor in NO, CE, and SO, leading to lower local labor demand and increased push pressure. Meanwhile, as factors in agriculture are net complements, investing in agricultural capital increases labor demand and promotes more inclusive growth. Consequently, push pressure decreases, and the relative attractiveness of outmigration decreases.

Finally, if comparing rural regions among themselves, it should be noted that pulling up CE households' incomes looks the least advantageous (Table 11, Col. 7-9). This is because CE is expected to have the most severe GCC-associated losses, meaning that ceteris paribus, undoing its impact requires more capital investment than in other rural regions. In this context, this challenging problem requires a thorough analysis of national priorities and regional development preferences, and we omit this discussion for now.

Figure 4: Impact of Growth Intensifcation scenarios on households' migration.

Change of migration flows to the DT region (difference versus GCC by 2035, thousands).



Source: own calculations based on CGE simulations.

As a result of the push and pull factors' interplay, total outmigration from rural regions to DT decreases significantly only under scenarios of increased agricultural capital growth (Figure

[8] Production elasticity of substitution of nonagrculure is >1, while that of agricultural sectors is <1 (see Table 5).

4). These findings align with Goldsmith et al. (2004), who concluded that agricultural investments (infrastructure, fertilizers, and livestock) could reduce rural-urban migration in Senegal. At the same time, our model enables us to recognize additional critical nuances of internal migration management. First, we observe that scenarios of increased nonagricultural capital in NO, CE, and SO lead to increased push migration to DT (due to the labor substitution effect). At the same time, increasing capital in DT also results in the same labor substitution effect as in rural provinces (labor demand and migration inflows to DT decline, see Figure 1, Col. 1). However, the change in DT's pull factor strength is not as significant as the increased push pressure in NO, CE, and SO, and migration to DT under a capital increase in DT changes only slightly. Furthermore, as seen in the GCC scenario, we observe that idiosyncratic regional policies to raise local incomes might affect other regions. Specifically, supporting agriculture in one region means that other regions might attempt to partially substitute reduced labor supply to DT and increase outmigration. In other words, the principle might resemble Pascal's law of communicating vessels, and regional policies should be synchronized to reduce the unintended side effect of increased outmigration pressure in other regions.

5. Conclusion

This paper fills a gap in the literature by exploring the relationship between structural transformation, climate change, and internal migration in SSA. We use Senegal as a case study country and build a CGE model with regionalized production, endogenous interregional migration, and distinct migrant households. We then apply the model to simulate the effects of national structural transformation on regional development, households, and migration flows.

Our findings indicate that agricultural stagnation, intensified by GCC, drives a developmental disparity between the capital area and rural regions. In this scenario, migration from

agrarian regions to a dynamically developing Dakar area reduces regional income inequality. Specifically, rural migrants, while not entirely overcoming poverty, enhance their welfare and that of the remaining rural communities as their departure eases rising wage pressures. Yet, this redistributive effect remains inadequate, and the income gap between affluent capital area natives and all other residents seems to expand. In light of this, bolstering agricultural sectors in regions emerges as the most equitable approach, as it not only boosts overall rural income but also benefits the poorer households of potential migrants. At the same time, regional agricultural policies must strike a balance and weigh multiple considerations. Firstly, regions hit harder by GCC likely demand greater investments than other rural areas, prompting discussions about regional development preferences. Secondly, idiosyncratic regional measures supporting agriculture and diminishing emigration of a particular region may inadvertently increase emigration from areas lacking such supportive policies.

These insights emphasize the need for a regional development and migration lens when assessing a nation's structural transformation paths. Our research offers a significant understanding of economic transformation, regional growth, climate change adaptation, and migration strategy formulation, all pivotal for realizing national development objectives in SSA nations similar to Senegal. Further studies can expand on our work by investigating more strategies and policy alternatives, like investing in infrastructure, education, and social welfare schemes, and their impacts on regional growth. In the end, an all-encompassing grasp of the intricate dynamics of structural transformation, climate change, and internal migration proves essential for designing policies that foster inclusive and sustainable development.

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