Structural Change in Space
Comparing the Spatial Distribution of Employment in Selected Sub-Saharan Countries

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In this presentation:

1) Motivation
2) Theoretical predictions
3) Data and methods
4) Results
5) Discussion and Conclusions
• Recent wave of interest in developing clusters, Special Economic Zones or Export Processing Zones in SSA countries

• However, not much is known about the actual distribution of employment within SSA countries and its evolution over time

• This paper establishes a set stylized facts on the spatial distribution of wage and non-wage employment for a set of SSA countries before and after structural reforms

• Contrast stylized facts with predictions from New Economic Geography models and inform about the feasibility of developing industrial clusters in SSA countries
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• New Economic Geography (NEG): large firms producing under Increasing Returns to Scale (IRS) locate near large consumer markets and export to distant smaller markets after paying transportation costs ($t$)

• SSA countries: high $t$’s and small scale of production → How applicable is the NEG framework for SSA countries?

• Under NEG, without IRS firms disperse in space in search for consumers. In resource-rich countries spatial disparities are due to the uneven distribution of endowments (e.g., natural resources) over space
Theoretical predictions

• Gollin et al (2012): resource-rich African countries have agglomerations based on the consumption of non-tradables (“consumer cities”), as opposed to the consumption of tradable manufactures or services (“production cities”) → benefits from agglomeration?

• Gerrtise & Moreno-Monroy (2012): A large small-scale informal sector may impede the emergence of a large-scale manufacturing sector → diminishing transportation costs may not be enough to bring about agglomeration

• Behrens & Pholo Bala (2011): Skilled workers can choose to become part of an unproductive urban elite, so that rent-seeking behaviour can result in agglomeration and urban primacy → benefits from agglomeration?
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Data sources and adjustments

- (Spatially) comprehensive employment series population census random samples (10%) provided by the Integrated Public Use Microdata Series (IPUMS) for Tanzania 1988 and 2002; Guinea 1983 and 1996; Senegal 1988 and 2002; Malawi 1987 and 1998; and Mali 1987 and 1998

- Different level of spatial disaggregation by country and year → analysis at comparable units in terms of relative extension and number of observations (e.g. province/department/region)

- Changes in boundaries: indicators and maps are constructed using the oldest boundaries
Data sources and adjustments

• Employees classified using comparable variable “class of worker” as **wage** if class of worker = “worked for someone else as wage/salary worker”, and as **non-wage** if class of worker = “self-employed or “unpaid worker” (apprentices and family workers)

• Underlying assumption: non-wage employment corresponds to small scale activities producing non-tradable goods and services. Wage employment corresponds to larger scale public and private activities

### Table 1: General characteristics

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Area (in km²)</th>
<th>GDP per capita, PPP (constant 2005 USD)</th>
<th>Population</th>
<th>Population density (persons per km²)</th>
<th>% urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanzania</td>
<td>1988</td>
<td>948,087</td>
<td>822.99</td>
<td>23,104,240</td>
<td>24.37</td>
<td>18.04*</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td></td>
<td>936.78</td>
<td>37,327,350</td>
<td>39.37</td>
<td>39.7</td>
</tr>
<tr>
<td>Guinea</td>
<td>1983</td>
<td>245,857</td>
<td>N/A</td>
<td>4,578,370</td>
<td>18.62</td>
<td>25.7</td>
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<tr>
<td></td>
<td>1996</td>
<td></td>
<td>833.27</td>
<td>7,290,710</td>
<td>29.65</td>
<td>29.9</td>
</tr>
<tr>
<td>Senegal</td>
<td>1988</td>
<td>196,190</td>
<td>1,521.71</td>
<td>7,001,990</td>
<td>35.69</td>
<td>38.36*</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td></td>
<td>1,524.59</td>
<td>9,945,620</td>
<td>50.69</td>
<td>40.62</td>
</tr>
<tr>
<td>Malawi</td>
<td>1987</td>
<td>118,484</td>
<td>596.90</td>
<td>7,986,690</td>
<td>67.41</td>
<td>10.66</td>
</tr>
<tr>
<td></td>
<td>1998</td>
<td></td>
<td>670.24</td>
<td>9,913,930</td>
<td>83.67</td>
<td>14.46</td>
</tr>
<tr>
<td>Mali</td>
<td>1987</td>
<td>1,240,000</td>
<td>627.41</td>
<td>7,853,840</td>
<td>6.33</td>
<td>21.94*</td>
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<tr>
<td></td>
<td>1998</td>
<td></td>
<td>707.61</td>
<td>9,913,300</td>
<td>7.99</td>
<td>27.11</td>
</tr>
</tbody>
</table>

Source: WDI and own elaboration based on IPUMS data. *indicates urban share drawn from WDI.
A-spatial measures of concentration

- Coefficient of variation (CV): Ratio of the standard deviation over the mean of (wage and non-wage) employment. CV=0 → uniform distribution, increase in CV over time → employment became more concentrated

- CV is “a-spatial”: it is not informative about the location of agglomerations and doesn’t consider geographical interaction. However it is comparable over time and across countries

- Degree of concentration by industries measured with the Theil index (GE(1)) and the half the squared coefficient of variation (GE(2)). A higher value of GE(1)/GE(2) indicates larger concentration
Spatial measures of concentration

- Global Moran’s I: Index which expresses the overall degree of similarity between spatially close regions (spatial autocorrelation) with respect to a numerical variable, i.e. wage or non wage employment
- Spatial interaction is measured by an inverse distance matrix. Distance is measured as bilateral distance between region’s centroids
- The index can take a positive (negative) statistically significant value, indicating that nearby regions exhibit similar (dissimilar) values of wage or non wage employment; or it can be statistically insignificant (null hypothesis is spatial randomness)
- A Local Indicator of Spatial Association (LISA) indicates where clusters (or cold spots) are located in space, i.e., identifies regions with high (or low) employment which are surrounded by neighbors with high (or low) employment
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In all countries except Senegal, wage employment became both smaller in size and more concentrated. This concentration is partly explained by an increasing concentration of wage employment in the largest city.

Non-wage employment is far less concentrated and follows a different trend over time than wage employment in all countries.

In Tanzania, non-wage employment became more dispersed between 1988 and 2002. In Malawi and Mali it remained stable. In Senegal and Guinea, it increased from initially very low levels.
• GE(1) and GE(2) (not shown) for all industries close to lower bound → generally very low level of employment concentration

• Highest concentration levels in market services (except Guinea 1983), and lowest in Agriculture and Mining (by far the largest employer) before and after structural reforms

• Non-wage employment absolutely less concentrated than wage employment in Agriculture & Mining, Secondary and Market Services for all countries and years

• In Malawi and Mali over time: 1) no movement of employment toward sectors displaying larger concentration, and 2) increase in the share of “dispersed” non-wage employment
No global spatial autocorrelation of wage employment for all countries except for Senegal → concentration of wage employment does not “spill-over” neighboring regions

Markedly different patterns for non-wage employment (except in Senegal) → positive and relatively high for Tanzania and Mali

Note: Shaded indicates not statistically significant at 95% level of confidence
No significant hot-spots or clusters of wage employment for Tanzania, Guinea and Malawi

Center of non-wage employment clusters in Tanzania at highly populated area near Lake Victoria (mining areas); cold spots around Dar-es-Salam

Persistency of center of clusters of non-wage employment over time
Significant and stable cluster of wage employment in the Dakar Region and Thiès department in the coast of Senegal

Non-wage employment located in different subnational units than the wage employment clusters (similar for Mali)

Weaker cluster identified in a cercle surrounding the capital city, Bamako in Mali (not shown)
Increasingly localized concentration of wage employment (except for Senegal). Smaller numbers fall mostly under non-market services and not in large-scale establishments producing tradables.

Spatial allocation of non-wage employment in space mostly explained by the distribution of natural resources (e.g. in Tanzania) and new urban settlements ‘dispersed’ in interior areas (“consumer cities”) → Evidence at odds with policy frameworks considering the “creation” of employment clusters?

Low levels of concentration and small variation across industries → Movement of employment toward more concentrated sectors and change within sectors with respect to the scale of their activities (i.e., more wage employment) both necessary for structural transformation.
Thank you

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Appendix
Figure 1: Distribution of wage and non-wage employment

Tanzania
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Guinea
Figure 1: Distribution of wage and non-wage employment in Malawi
Figure 1: Distribution of wage and non-wage employment in Mali