Policy brief
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Trade integration and spatially balanced development

Implications for Uganda and Rwanda

In brief

- Spatially balanced development is a key dimension of inclusive growth because peripheral regions shoulder a disproportionate burden of poverty, disease, unemployment, and violence in many developing countries.
- In recent decades, economic research has established that international trade lifts income levels and growth rates on average. However, the state of knowledge is less advanced on the distributional effects of international trade, in particular in terms of spatial development.
- This paper explores empirically whether regional trade liberalisation - through improved trade facilitation or lower tariffs - contributes to more balanced spatial development using high-resolution spatial data on light emissions.
- The authors document the existence of a "border shadow effect" whereby border regions are, on average, less developed than others.
- The authors further outline several policy implications and conclude that overland regional trade on activity in peripheral regions can contribute to more balanced spatial development.

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Introduction

Since 2005, the Aid-for-Trade (AFT) initiative has succeeded in stopping the shrinkage of trade-related commitments in overall sector-allocable aid, mobilising funding and raising the visibility of trade-related projects. This may have contributed to the growth acceleration observed in sub-Saharan Africa (SSA) in the first years of the century. In East Africa, results in terms of improved trade facilitation are visible. The scores of East African countries in terms of the World Bank's Logistics Performance Index (LPI) have improved, with all of them boasting scores above the level predicted by their income level. Closer to the ground, transit times along the Northern corridor linking Mombasa to Kigali via Nairobi and Kampala have shrunk from about 26 hours to 16 hours on average, largely thanks to the elimination of waiting time at borders. At the same time, transit costs have also gone down, as a competitive market structure passed on lower fuel costs to users (Calabrese and Eberhard-Ruiz, 2016).

Should we expect this to lead to rather more or rather less spatial inequality? According to the World Bank's 2009 *World Development Report* (WDR):

"[t]he openness to trade and capital flows that makes markets more global also makes subnational disparities in income larger and persist for longer in today's developing countries. Not all parts of a country are suited for accessing world markets, and coastal and economically dense places do better. China's GDP per capita in 2007 was the same as that of Britain in 1911. Shanghai, China's leading area, today has a GDP per capita the same as Britain in 1988, while lagging Guizhou is closer to Britain in 1930."[1]

By contrast, Krugman and Livas-Elizondo (1996) argued that the growth of oversized metropolises in many developing countries after independence was at least partly due to the inward-looking trade policies they adopted. Their reasoning was that the main centripetal (agglomeration) factor was the strength of firms' backward and forward linkages (to markets and suppliers). As trade liberalisation would reduce the dependence of firms on domestic markets and suppliers, location close to those would become less crucial relative to congestion effects, leading to dispersion. These two perspectives are somewhat representative of a vast literature (surveyed in Brülhart, 2011) that has been plagued with conflicting results, depending on model assumptions (on the theoretical side) and country specificities (on the empirical side).

1. World Bank, World Development Report 2009, p. 12; quoted in Brülhart (2011).

Scientific approach

Data and estimation

As mentioned, we use night lights captured by satellites to represent the joint density of population and economic activity at the sub-national level, where national-account data on economic activity are rarely available. Night light data have been collected by the US Air Force since the 1970s and declassified since the early 1990s. Land-use data comes from the Center for Sustainability and the Global Environment (SAGE) of the University of Wisconsin, agricultural data from Earthstat, and road location data comes from the ESRI dataset. Finally, trade data comes from the United Nations' COMTRADE database, tariffs from UNCTAD's TRAINS, and LPI data from the World Bank. We use years from 2007 onward for which LPI data is available.

Our unit of analysis is a geo-referenced cell of 10 × 10 km along cross-border highways, up to 200 km away from each border and 5 km on each side of the highway. In SSA, activity and population tend to cluster strongly along highways; thus, most cells away from our 5 km buffer zone have zero emissions, and by focusing on road cells, we do not lose much information.

Although our application concerns East Africa (more specifically Uganda and Kenya), in order to have enough degrees of freedom, estimates are obtained from regression analysis covering all cross-border highways in the world for which LPI data is available for the two countries straddling the border. However, in order to ensure that SSA is no exception to our results, we also run our regressions on a sub-sample of all African cross-border highways.

Our estimation approach consists of regressing night light intensity, cell by cell, on distance to the nearest border and the interaction of distance with trade intensity. As is well known, trade itself depends on the size of the trading economies, creating a channel of reverse causation. We control for this by using trade-facilitation variables (logistics performance and tariffs) as instrumental variables for trade volumes. We also control for a host of confounding influences in order to obtain "clean" identification.

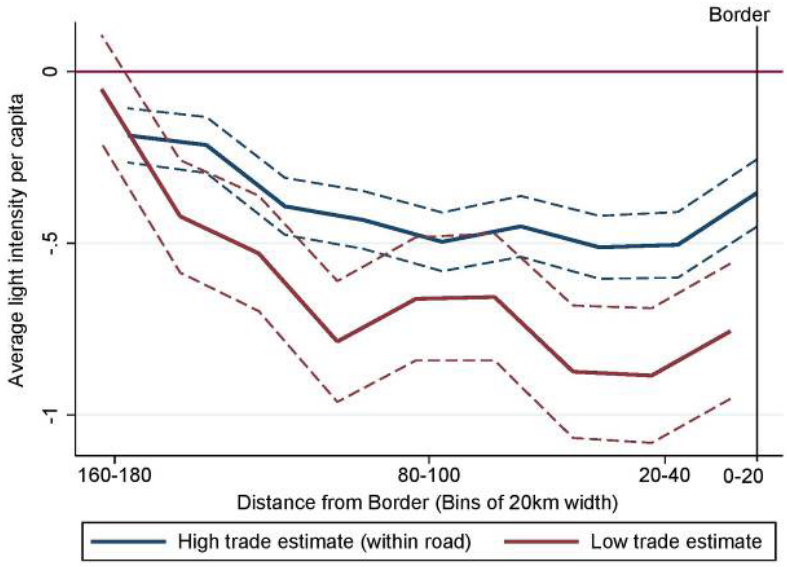
The hypotheses we test are as follows:

- Border shadow effect: Activity and hence night lights *increase* with distance to the nearest border;
- Positive effect of trade on border-region development: The correlation between night lights and distance to the border is *weakened* by increases in overland trade attributable to lower tariffs and better trade facilitation.

Results

Our results are illustrated, in a nutshell, by Figure 1, which shows (i) how night light intensity goes down as one gets closer to a land border, and (ii) how this effect is dampened by more trade.

Figure 1: How trade affects the border shadow

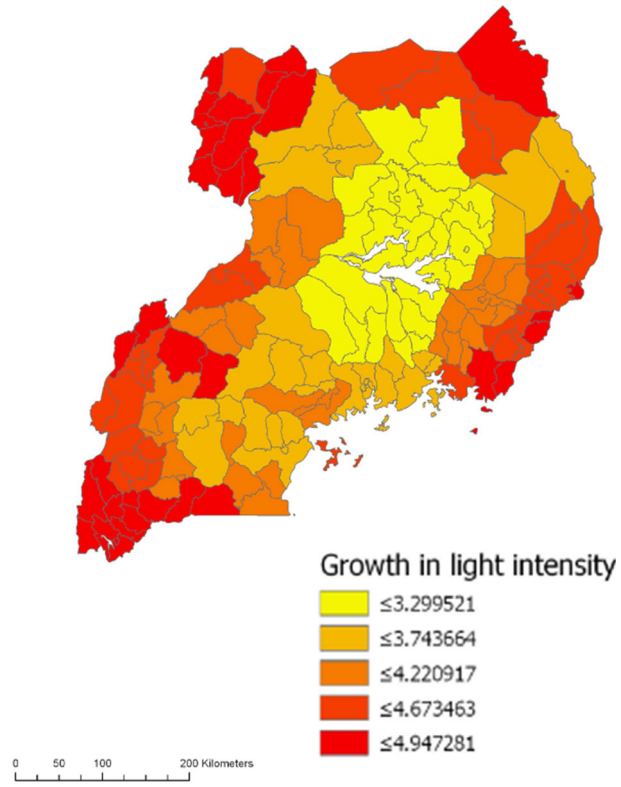


Source: Authors' calculations

The pattern suggested by the data clearly fits the hypothesis that trade contributes to more activity in border regions. Interestingly, there seems to be a blip in light emissions very close to the border. This may reflect the presence of activities linked directly to cross-border trade, such as amenities for truckers. Those may, incidentally, reflect poorly-functioning borders, as long waiting times for trucks generate local activity, and smuggling activities typically require physical presence at the border.

Figure 2 summarises graphically the main argument of our paper. If Uganda were to raise its overall LPI score to the level of Kenya's, a relatively modest improvement, the result in terms of additional economic activity would be distributed across Uganda's territory as shown, with larger percentage increases (4.6-4.9%) shown in red and smaller (less than 3.3%) in yellow. Clearly, border regions would benefit most from the hypothesised improvement in trade facilitation. The result for Rwanda is largely the same, although less clearly visible because the country is much smaller.

Figure 2: Simulated light emission increase from country-level improvement in trade facilitation, by district, Uganda



Source: Author calculations using ArcGIS software. Note: The simulated trade-facilitation improvement is a rise in Uganda's LPI score to the level of Kenya's.

While the development of border areas would contribute, as discussed, to more balanced spatial development, it is important to bring some nuance in the interpretation of our results. In the case of Uganda, central-Northern areas are particularly underdeveloped. Figure 2 suggests that those do not stand to benefit particularly from improvements in trade facilitation. By contrast, Western border districts along the Nairobi-Kampala-Kigali corridor stand to benefit strongly, as do Southern ones close to the border with Rwanda.

The growth of activity near the border caused by additional trade could be due to two distinct causal channels. On one hand, increased light emission could be due to the growth of service activities directly related to trade, such as roadside amenities for truckers. Indeed, as already discussed, activity peaks near border points could reflect dysfunctional borders. On the other hand, they could be due to the growth of trade-enabled productive activities, such as the production of crops for export. In order to disentangle these two channels of influence, we turn to a different approach. For each geo-referenced cell, we identify the primary crop grown on that cell, in terms of acreage, as a proportion of the cell's

total arable land. We then "instrument" exports of that crop by the tariff imposed on it by the neighboring country. Then, in a second stage, light emissions are "explained" by exports of the main crop instrumented by the tariff on that crop. Again, the result is strongly suggestive of a dispersion effect, suggesting that the driving force of our results is growth not just in trade-related services, but also—and perhaps more importantly—in trade-enabled production.

Policy implications

- Our results document the existence of a "border-shadow" effect whereby border regions are systematically less developed than others. We find that this border-shadow effect applies to Rwanda and Uganda, two landlocked East African countries that heavily depend on overland trade, suggesting that it is not the fact that they are landlocked *per se* that holds back economic development, but rather proximity to borders.
- Most importantly, we show that overland trade mitigates the border-shadow effect. Thus, international trade (in our case, regional integration) leads to more balanced spatial development. As backwardness has tended to go side-by-side with exposure to violence in SSA and in particular in Uganda, whose Northern provinces have been plagued by recurrent strife, fostering the development of peripheral regions may carry the added benefit of reducing the exposure of local populations to violence.
- We also show, by focusing on agricultural trade, that the effect we are capturing reflects the dispersion of trade-enabled productive activities rather than that of directly trade-related services such as roadside amenities.
- Our results have potentially important implications for the ongoing debate about whether more trade is conducive to inclusive development or to increased inequality. Given that, as the literature suggests and as we document in this paper, border areas tend to be less developed than inland ones, the positive effect of overland regional trade on activity in those regions can contribute to more balanced spatial development.
- Our approach carries no direct implication for the effect of overland trade on overall income inequality between households. However, our results on agricultural trade make it possible to speculate that selective liberalisation/facilitation of overland trade in crops grown primarily by farm households with above-average incomes would lead to a widening of income inequality *within* geographic cells, working against the reduction of income inequality *between* cells due to a more balanced spread of economic activity.
- Conversely, liberalisation/facilitation of overland trade in crops grown primarily by farm households with below-average incomes would lead to a narrowing of income inequality within cells, reinforcing the effect of a more balanced spread of economic activity. We leave the exploration of this issue for further research.

References

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