Colonial Institutions, Marriage Markets, and HIV: Evidence from Mozambique

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Colonial Institutions

Importance: Fundamental determinant of long-run outcomes

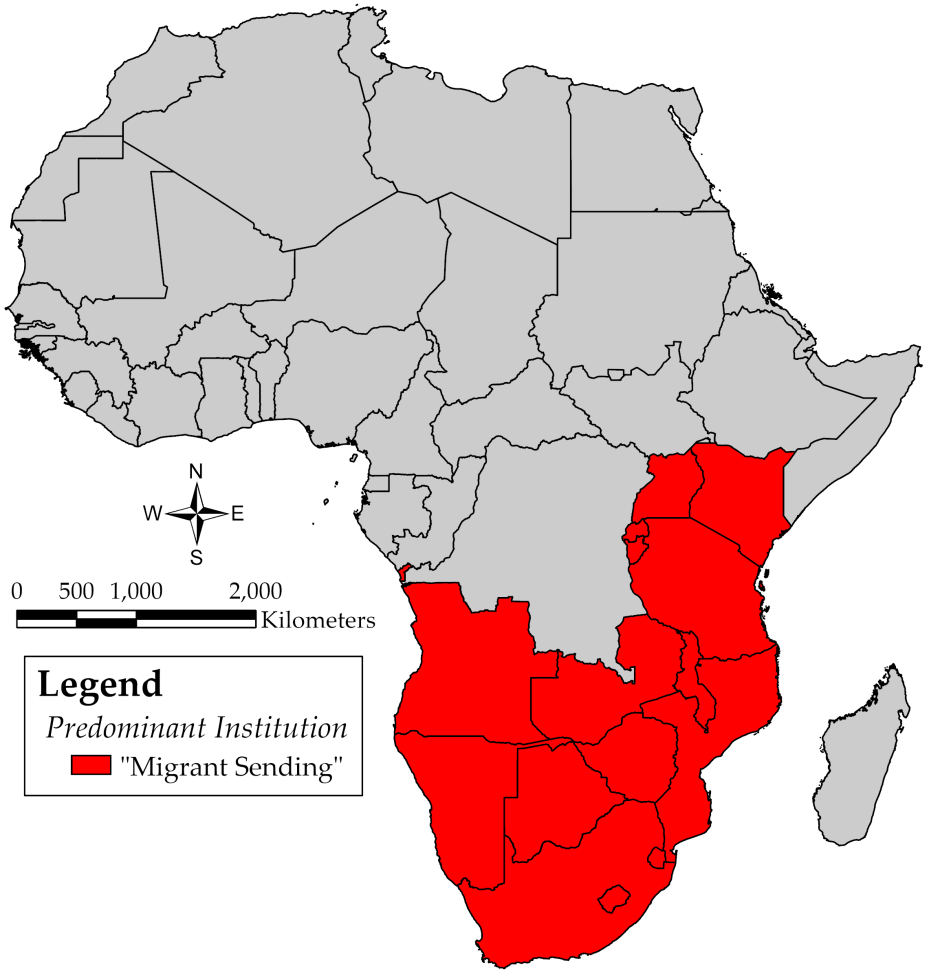
Know from comparing "inclusive" (Europe) vs "extractive" (colonies)

Colonial Institutions

Africa: Extractive institutions everywhere, but different types

→ Development policy may need to account for which one was imposed

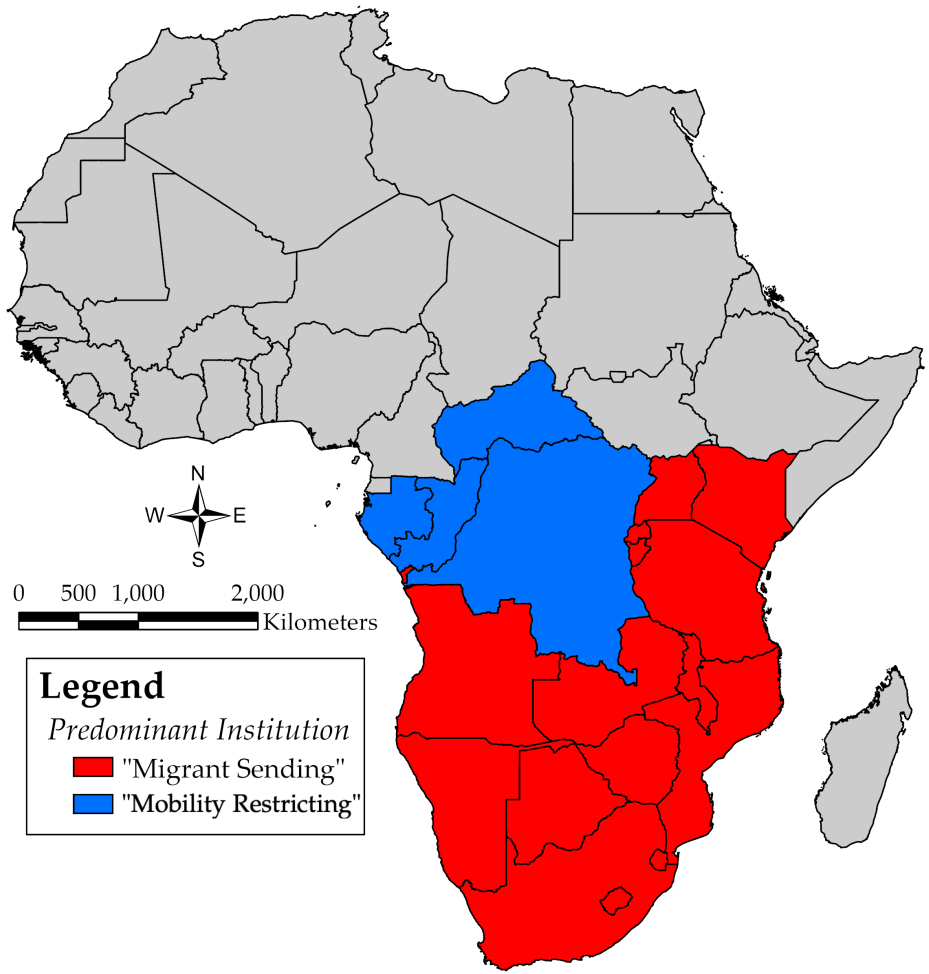
Colonial Institutions



Amin (1972) grouped colonies by predominant extractive institution

1. **"Migrant-sending":** Pushed men into "circular" migration

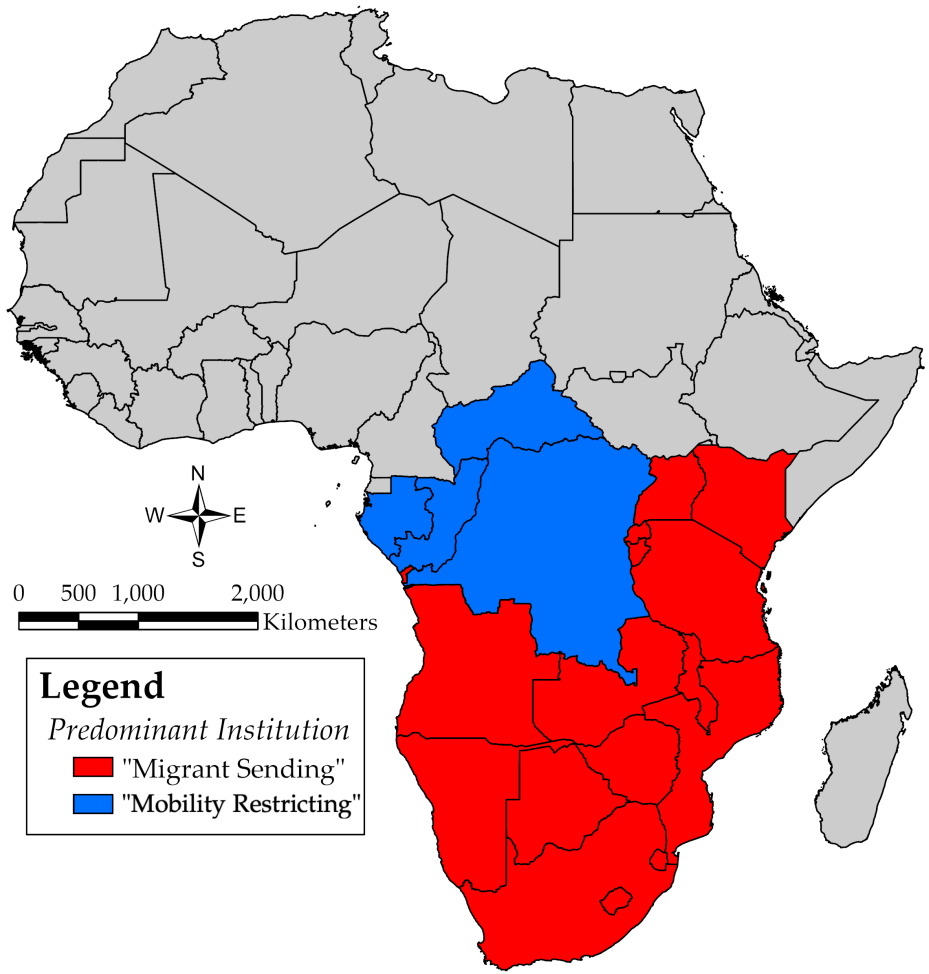
Colonial Institutions



Amin (1972) grouped colonies by predominant extractive institution

2. **"Mobility-restricting":** Grant of land (and people) to company

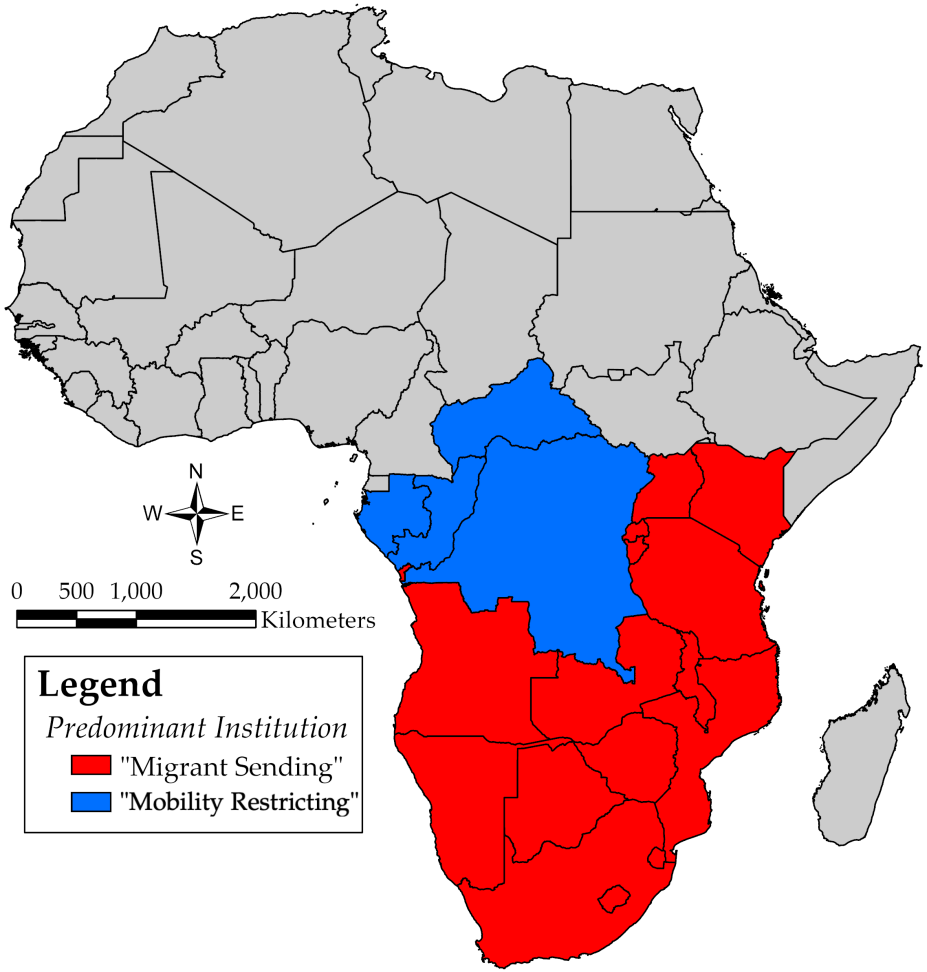
Colonial Institutions



Organized economic and social life for decades (1890s-1970s)

Today: World's poorest, highest HIV prevalence countries

This Paper



→ **Question:** How did the colonialist's choice of extractive institution shape subsequent health and wealth in Sub-Saharan Africa?

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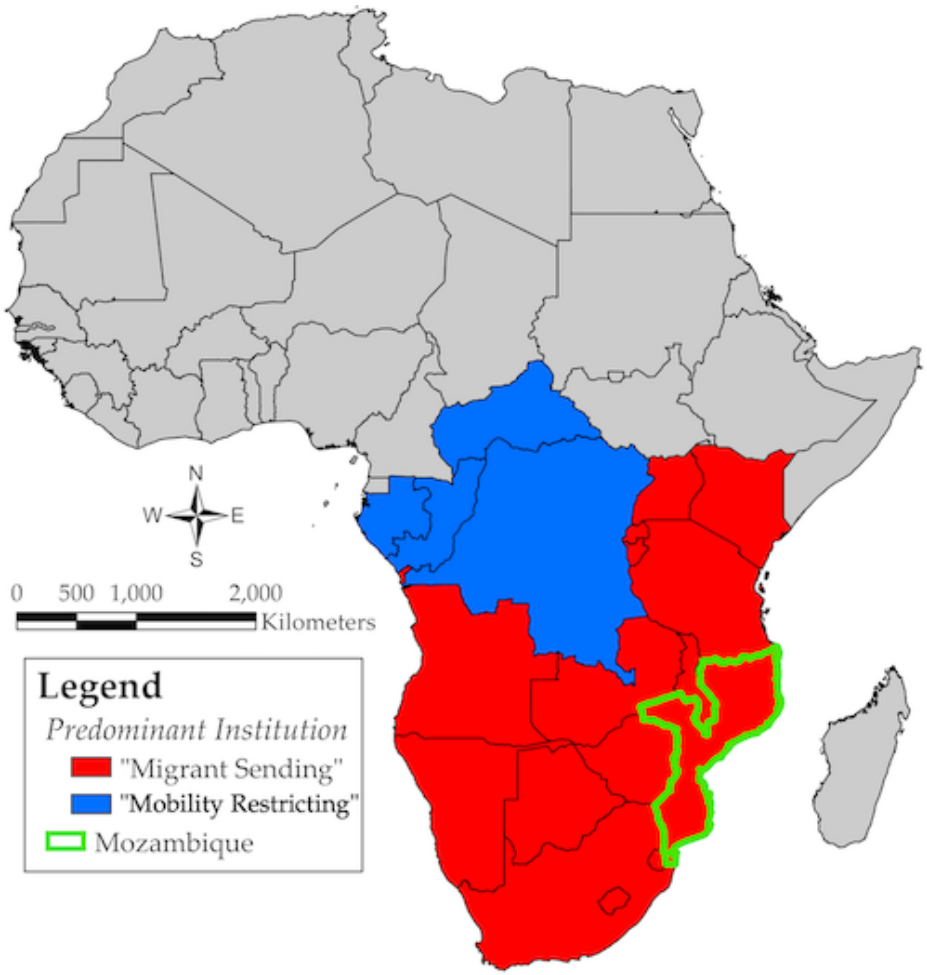

Idea: Make comparisons within unique colony that had both

Mozambique: Arbitrary border between institutions (1893-1942)

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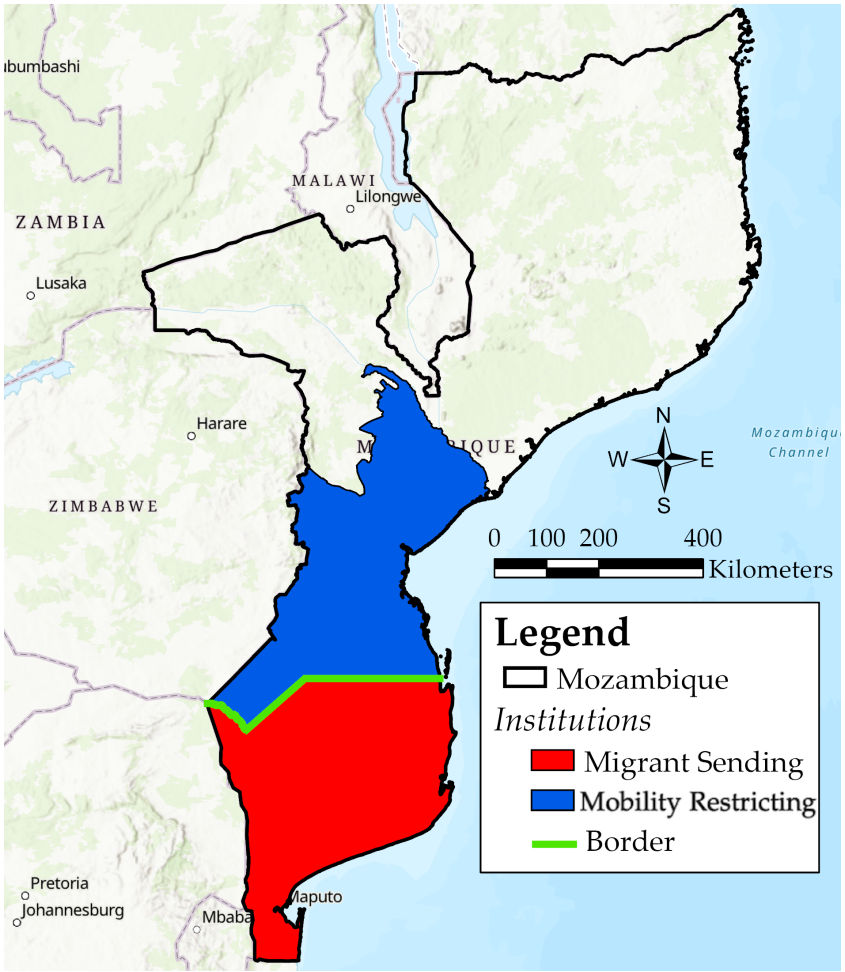

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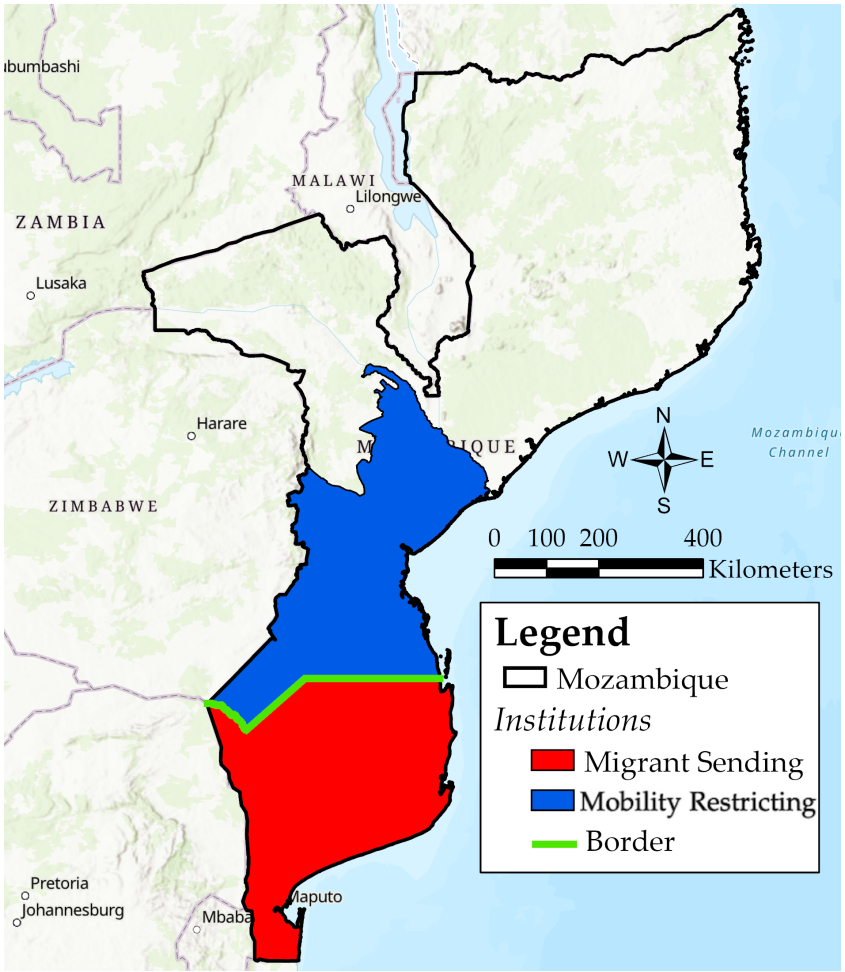

→ **Strategy:** Spatial RD design along border between institutions

Interpretation: Impact of assignment to one *instead of other*

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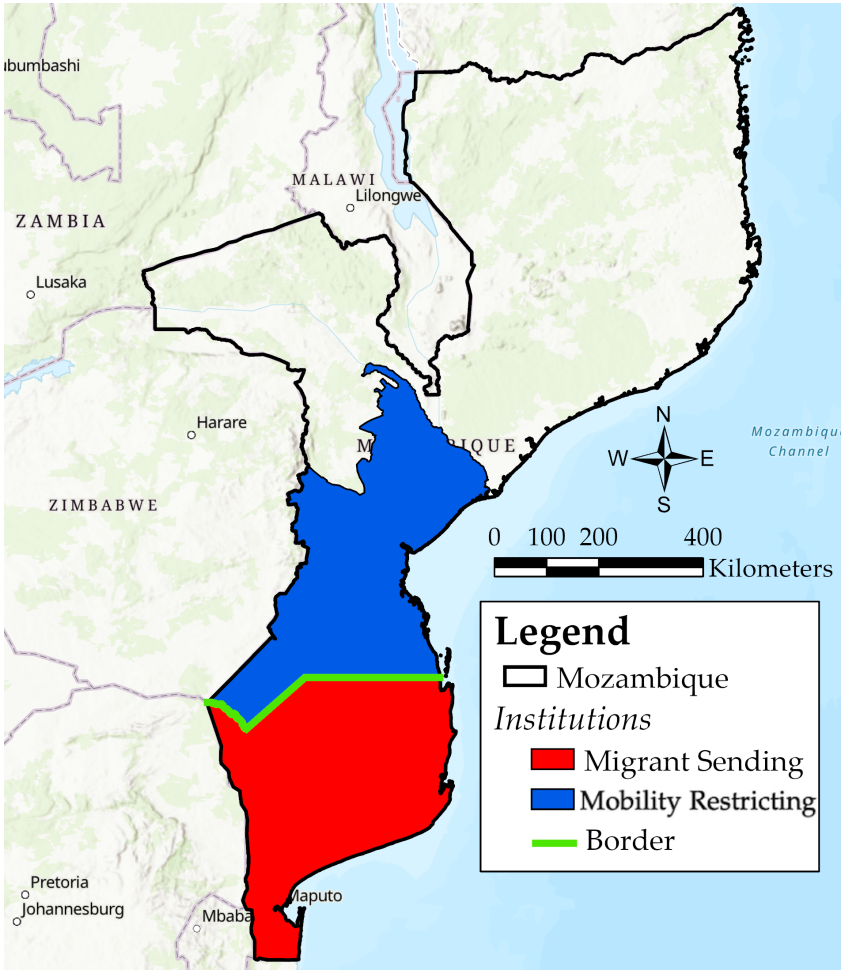

Note: RD identifies "black box" of institutional differences

→ Unpack with narratives, data: Generate hypotheses, test channels

Roadmap

1. **Colonial-Era Differences: Narrative**
   - Both very extractive, reduced wealth from circular migration
   - Migrants earned bridewealth earlier $\rightarrow$ lower spousal age gaps
2. **Colonial-Era Differences: Quantitative**
   - Circular migration rates equalized after border erased
   - But spousal age gaps continued to be lower afterward
3. **Linking Past and Present**
   - OLG model: Explain continuing marriage market differences
   - Intuition for why lower age gaps today $\rightarrow$ lower HIV risk
4. **Present-Day Differences**
   - Lower HIV (and age gaps) in former migrant-sending region
   - Few differences, if any, in measures of development

Contributions

1. **Institutions:** First evidence on comparative impacts of extraction

   Acemoglu, Johnson, & Robinson (2001); Banerjee & Iyer (2005); Dell (2010); Michalopoulos & Papaioannou (2014, 2016); Dell & Olken (2020); Lowes & Montero (2021*a*); Méndez-Chacón & Van Patten (2021)

2. **Migration:** Long-run effects on health and development

   Black et al. (2015); Dinkelman & Mariotti (2016); Abramitzky, Boustan, & Eriksson (2019); Khanna, Theoharides, & Yang (2020); Derenoncourt (2021)

3. **Marriage markets with asset transfers:** Long-run behavior

   Tertilt (2005); Chiappori, Iyigun, & Weiss (2009); Greenwood, Guner, & Vandenbrouke (2017); Ashraf et al. (2020); Calvi (2020); Corno, Hildebrandt, & Voena (2020)

4. **History as a determinant of health:** HIV pandemic

   Iliffe (2006); Alsan & Wanamaker (2018); Anderson (2018); Bertocchi & Dimico (2019); Dwyer-Lindgren et al. (2019); Cagé & Rueda (2020); Lowes & Montero (2021*b*)

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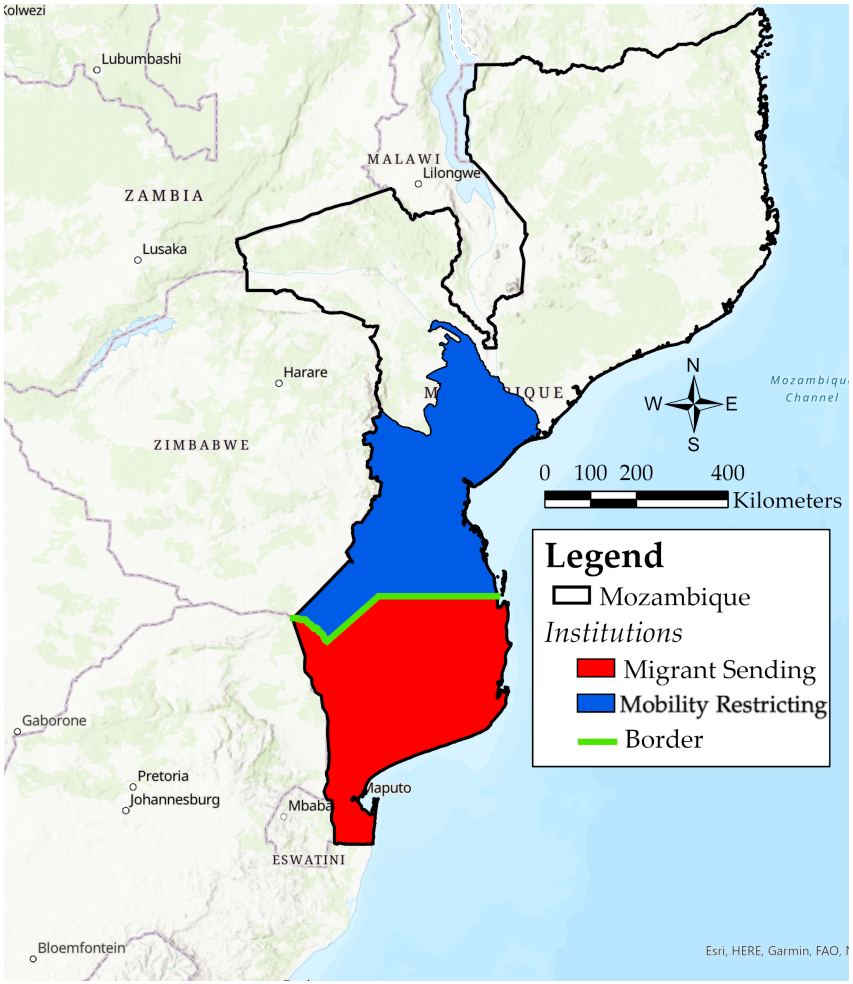
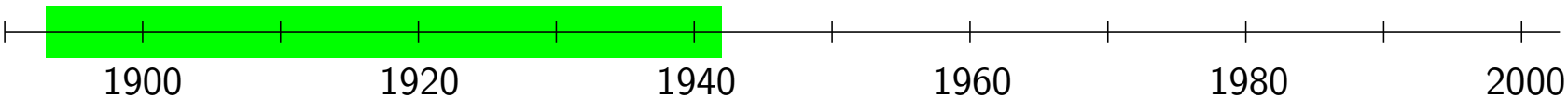
Establishing the Institutions



Arbitrary border between institutions



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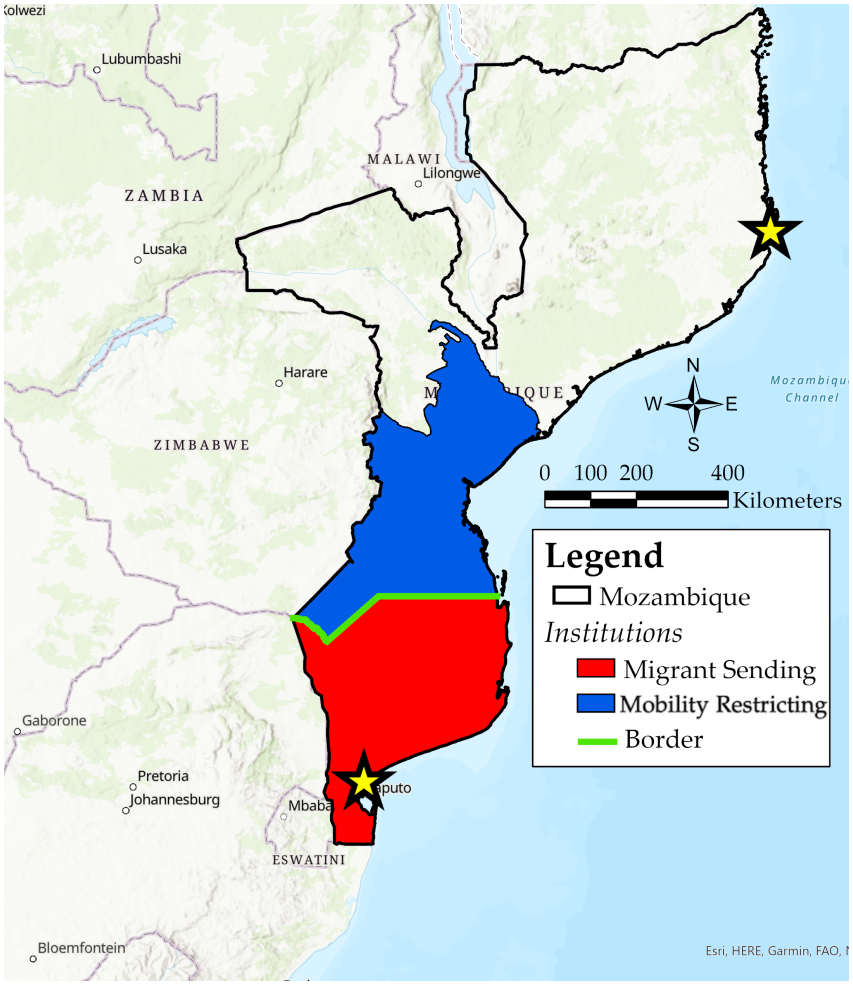
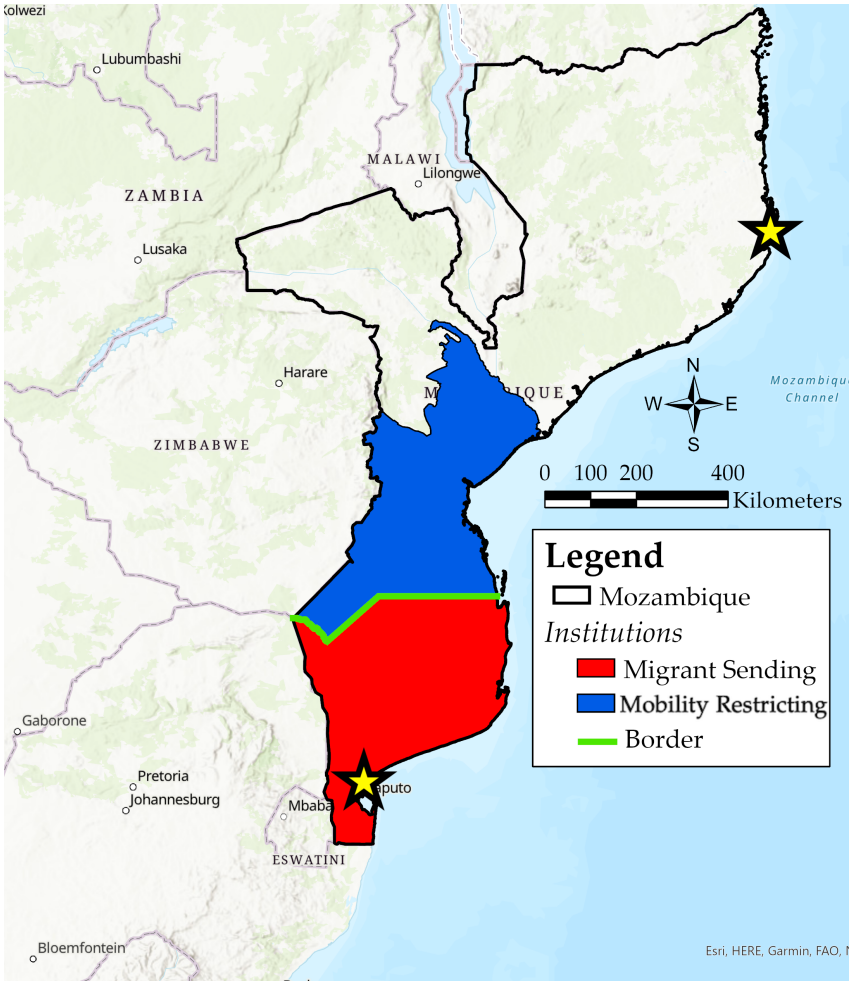


Berlin Conference (1884-85): "Effectively occupy" colony to keep it

→ **Solution:** Expand state out from port cities, lease areas farther away

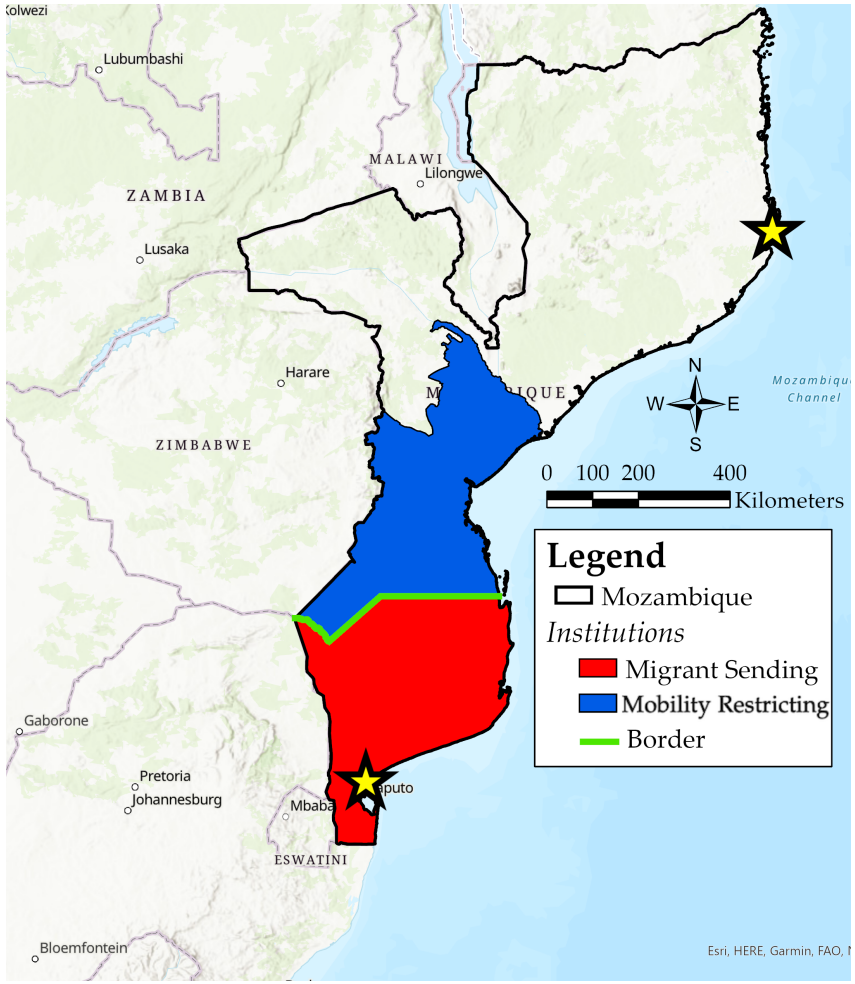
Establishing the Institutions



Portuguese split southern half of colony between 2 institutions

1. **Mobility-restricting:** 50-year lease on area btwn. rivers in 1891

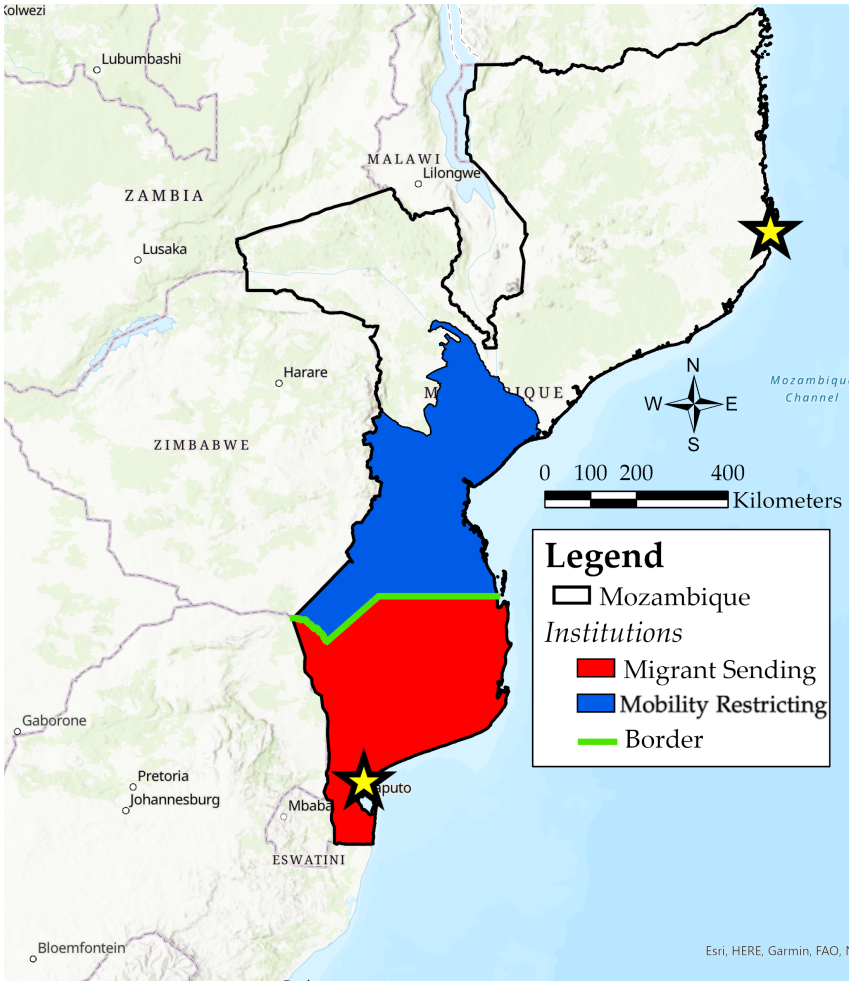
Establishing the Institutions



Portuguese split southern half of colony between 2 institutions

1. **Mobility-restricting:** Moved border south in 1893 ▸ Decree text

Establishing the Institutions



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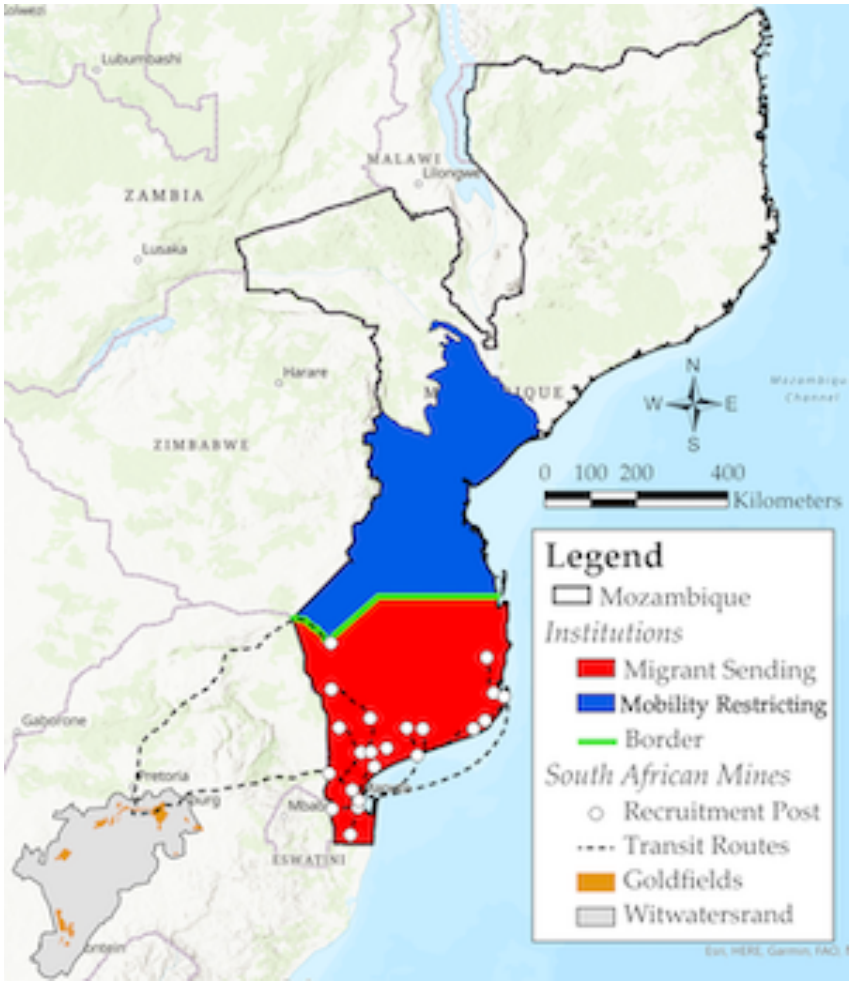
→ **Arbitrary border:** Straight lines on a map, did not reflect conditions

Establishing the Institutions



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2. **Migrant-sending:** Profit from preexisting migration with 1897 treaty

Extracting Wealth from Labor

Same law in both regions: Forced men into wage labor markets

- "All natives ... are subject to the obligation, moral and legal, of attempting to obtain [paid] work" (Newitt, 1995, p. 384)

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- 1-year contracts, only men allowed, half of pay held in Mozambique

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- Used chiefs, police, violence, pass laws to enforce regime ▸ Descriptions

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Extraction: Severe on both sides of the border

- "The [migrant-sending institution] was governed by the Portuguese colonial state no less exploitatively than the [mobility-restricting institution was] by the company" (Allina, 2012, p. 94)
- "Portugal was the chief recipient of the profits of [migration, holding] ... back the development of the [migrant-sending region]" (Harries, 1994, p. 175)

Effects of Circular Migration

Marriage markets: Resulted in husbands and wives closer in age

- "Men took up migrant labor . . . to [earn] bridewealth. . . . Marriage . . . persuad[ed] them to return home" (Guthrie, 2018, p. 72)
- Migrants "able marry at a younger age" (Harries, 1982, p. 327)
- Helped single brothers marry: Parents used daughters' bride prices to acquire wives for unmarried sons (Junod, 1912)

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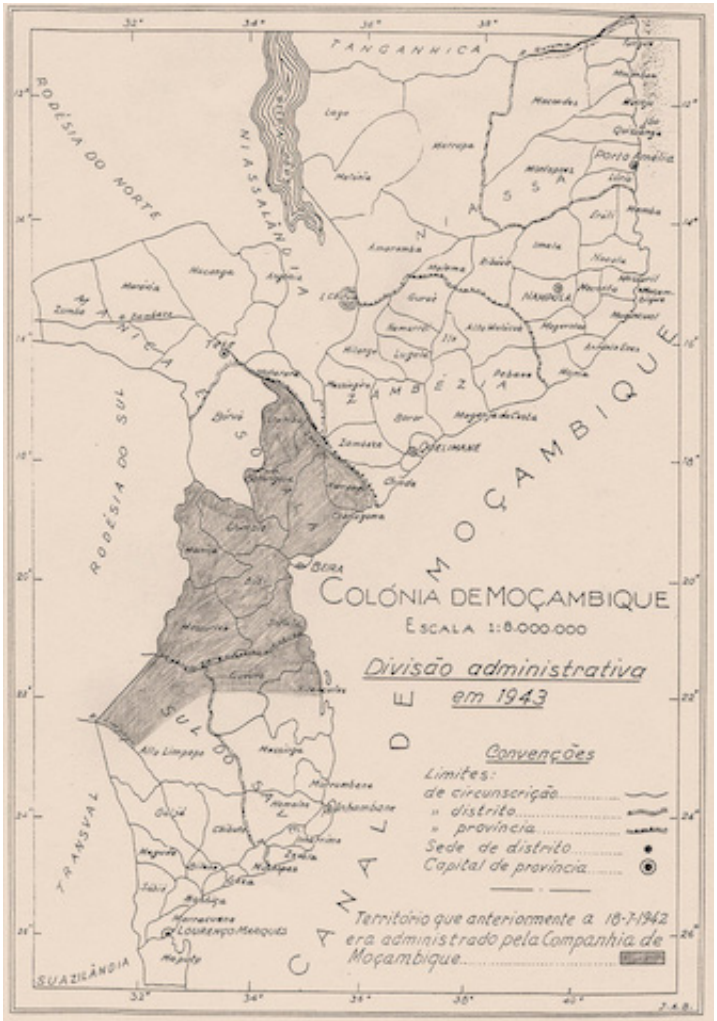
Human capital: Little provision of schooling (Helgesson, 1994)

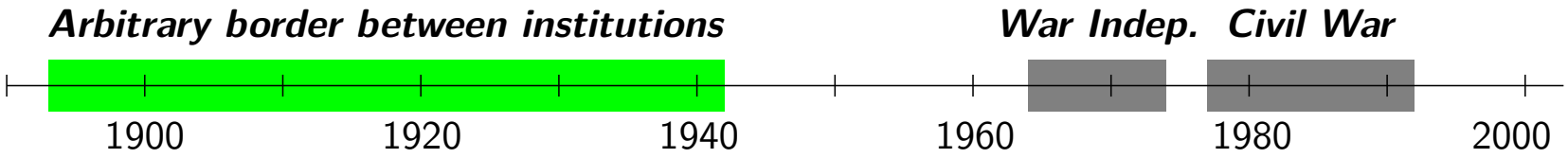
End of Border between Institutions



Portuguese dictator: Thought lease eroded national sovereignty

→ 1942: Charter lapsed, territory reorganized, institutional border erased

End of Portuguese Rule to Today



War of Independence: 1964-74 (mostly in north)

Civil war: 1977-92

- 60K died in violence, 1 million from famine; heavy use of landmines
- Major reason Mozambique is extremely poor: \$3.55/day PPP

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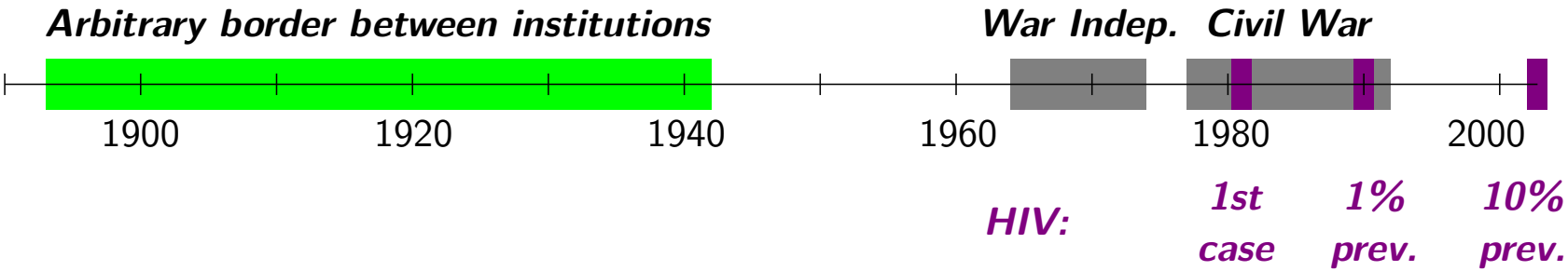

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HIV: Epidemic's explosive phase not until late 1990s (Iliffe, 2006)

- First documented case in 1981 (Audet et al., 2010)
- Today, 11.3% of adults HIV positive (UNAIDS, 2020)

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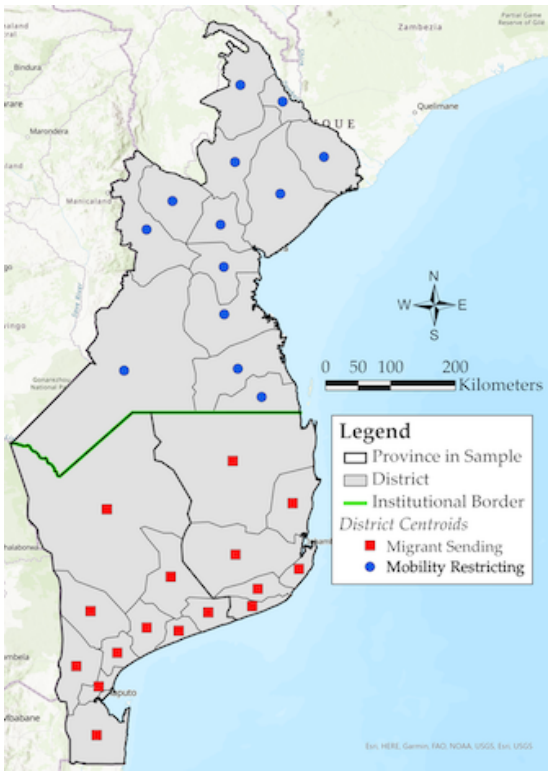
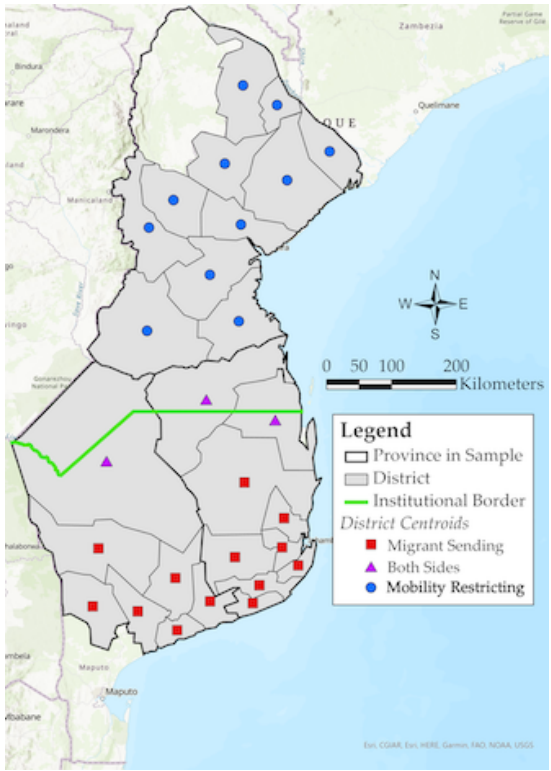
Data



2 Years before Border Erased (1940)



18 Years after Border Erased (1960)

Colonial censuses: Digitized, georeferenced district-level summaries

Restrict sample to closest provinces on either side of border

▸ 1940 example ▸ 1960 example

Outcomes of Interest

1. **Circular migration:** Share of men ages 15-64 ("prime-age") working away from home

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3. **Fertility:** Ratio of children ages 0-4 to women ages 15-44 ("child-woman ratio")
4. **Human capital:** Share of children enrolled in school at enumeration

Empirical Strategy

RD design:

$$y_d = \alpha + \tau \text{MigrantSending}_d + f(\text{Dist}_d) + \text{Lon}_d + \epsilon_d \quad \text{for } d \in B$$

District-level variables:

- $f(\text{Dist}_d)$: Local linear specification in d's centroid's distance to the border, triangular weighting kernel (Cattaneo et al., 2019)
- Lon_d: d's centroid's longitude coordinate
- B: Set of districts in provinces closest to border

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Estimation and inference:

- Causal effect of assigning territory to migrant-sending institution *vs* *mobility-restricting institution*
- Weight districts by relevant population
- 1960 districts straddling former border $\rightarrow$ mask differences
- Robust and Conley (1999) SEs (100 km bandwidth, Bartlett kernel)
- Moran (1950) spatial autocorrelation measure and SD

RD Validity

Murdock (1959) Ethnic Groups in Mozambique

Necessary condition: All other factors changed smoothly at border

✓ Entirely w/in ethnic group, neighbors same cultural group ▸ Geography

RD Results: 2 Years before Border Erased (1940)

	Migration	*Marriage and Fertility Ratios*	*Human Capital*
	Men Work Abroad (1)		
Migrant Sending	0.207		
	(0.089)		
	[0.085]		
Observations	29		
Bandwidth	-503, 401		
Spatial Autocorrelation	-0.14		
Spatial Autocorrelation SD	0.11		
Mobility Restricting Mean	0.047		
Mobility Restricting SD	0.089		

Notes: Observations are districts. Robust standard errors in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Left and right limits of the RD bandwidth are shown. Regressions estimate a local linear RD specification on each side of the border using a triangular kernel and include longitude as a control. Districts are weighted by the size of the relevant population. Columns (2)-(4) exclude an extreme outlier for that outcome as described in the text.

1. **Circular migration:** ↑ 21 p.p. (2.3 SD) ▸ RD plot ▸ RD plot by age group

RD Results: 2 Years before Border Erased (1940)

	Migration	*Marriage and Fertility Ratios*			*Human Capital*
	Men Work Abroad (1)	Marriage Ages 15-24 (2)	Marriage Ages 25-34 (3)	Child-Woman (4)	
Migrant Sending	0.207	0.269	0.312	0.202	
	(0.089)	(0.080)	(0.113)	(0.098)	
	[0.085]	[0.061]	[0.088]	[0.092]	
Observations	29	28	28	28	
Bandwidth	-503, 401	-503, 401	-503, 401	-503, 401	
Spatial Autocorrelation	-0.14	0.26	0.14	-0.15	
Spatial Autocorrelation SD	0.11	0.11	0.11	0.12	
Mobility Restricting Mean	0.047	0.364	0.696	0.848	
Mobility Restricting SD	0.089	0.177	0.304	0.144	

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2. **Marriage:** ↑ 3 married young M per 10 married young F (1-1.5 SD)

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3. **Fertility:** ↑ 2 children for every 10 reproductive-age F (1.4 SD)

RD Results: 2 Years before Border Erased (1940)

	Migration	*Marriage and Fertility Ratios*			*Human Capital*	
	Men Work Abroad (1)	Marriage Ages 15-24 (2)	Marriage Ages 25-34 (3)	Child-Woman (4)	Boys in School (5)	Girls in School (6)
Migrant Sending	0.207	0.269	0.312	0.202	-0.028	-0.001
	(0.089)	(0.080)	(0.113)	(0.098)	(0.016)	(0.006)
	[0.085]	[0.061]	[0.088]	[0.092]	[0.015]	[0.006]
Observations	29	28	28	28	29	29
Bandwidth	-503, 401	-503, 401	-503, 401	-503, 401	-503, 401	-503, 401
Spatial Autocorrelation	-0.14	0.26	0.14	-0.15	-0.03	-0.06
Spatial Autocorrelation SD	0.11	0.11	0.11	0.12	0.11	0.10
Mobility Restricting Mean	0.047	0.364	0.696	0.848	0.050	0.006
Mobility Restricting SD	0.089	0.177	0.304	0.144	0.044	0.009

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4. **Schooling:** ↓ 3 p.p. for boys, no diff. for girls, but low provision

RD Results: 18 Years after Border Erased (1960)

	Migration	*Marriage and Fertility Ratios*	*Human Capital*
	Men Work Abroad		
	(1)		
Migrant Sending	-0.025		
	(0.049)		
	[0.050]		
Observations	27		
Bandwidth	-500, 294		
Spatial Autocorrelation	-0.09		
Spatial Autocorrelation SD	0.12		
Mobility Restricting Mean	0.163		
Mobility Restricting SD	0.116		

Notes: Observations are districts. Robust standard errors in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Left and right limits of the RD bandwidth are shown. Regressions estimate a local linear RD specification on each side of the border using a triangular kernel and include longitude as a control. Districts are weighted by the size of the relevant population. Columns (1)-(3) exclude an extreme outlier for that outcome as described in the text.

1. **Circular migration:** Convergence $\rightarrow$ border mattered

RD Results: 18 Years after Border Erased (1960)

	Migration	*Marriage and Fertility Ratios*			*Human Capital*
	Men Work Abroad (1)	Marriage Ages 15-24 (2)	Marriage Ages 25-34 (3)	Child-Woman (4)	
Migrant Sending	-0.025	0.102	0.106	0.056	
	(0.049)	(0.057)	(0.147)	(0.086)	
	[0.050]	[0.053]	[0.131]	[0.082]	
Observations	27	27	27	28	
Bandwidth	-500, 294	-500, 294	-500, 294	-500, 294	
Spatial Autocorrelation	-0.09	-0.03	-0.15	0.05	
Spatial Autocorrelation SD	0.12	0.12	0.10	0.12	
Mobility Restricting Mean	0.163	0.267	0.635	0.807	
Mobility Restricting SD	0.116	0.166	0.235	0.123	

Notes: Observations are districts. Robust standard errors in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Left and right limits of the RD bandwidth are shown. Regressions estimate a local linear RD specification on each side of the border using a triangular kernel and include longitude as a control. Districts are weighted by the size of the relevant population. Columns (1)-(3) exclude an extreme outlier for that outcome as described in the text.

2. **Marriage:** ↑ 1 : 10 marriage ratio (0.6 SD) ▸ RD plot

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	[0.050]	[0.053]	[0.131]	[0.082]	
Observations	27	27	27	28	
Bandwidth	-500, 294	-500, 294	-500, 294	-500, 294	
Spatial Autocorrelation	-0.09	-0.03	-0.15	0.05	
Spatial Autocorrelation SD	0.12	0.12	0.10	0.12	
Mobility Restricting Mean	0.163	0.267	0.635	0.807	
Mobility Restricting SD	0.116	0.166	0.235	0.123	

Notes: Observations are districts. Robust standard errors in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Left and right limits of the RD bandwidth are shown. Regressions estimate a local linear RD specification on each side of the border using a triangular kernel and include longitude as a control. Districts are weighted by the size of the relevant population. Columns (1)-(3) exclude an extreme outlier for that outcome as described in the text.

3. **Fertility:** ↑ 0.5 : 10 child-woman ratio (0.4 SD)

RD Results: 18 Years after Border Erased (1960)

	Migration	*Marriage and Fertility Ratios*			*Human Capital*	
	Men Work Abroad (1)	Marriage Ages 15-24 (2)	Marriage Ages 25-34 (3)	Child-Woman (4)	Boys in School (5)	Girls in School (6)
Migrant Sending	-0.025	0.102	0.106	0.056	-0.014	-0.026
	(0.049)	(0.057)	(0.147)	(0.086)	(0.033)	(0.024)
	[0.050]	[0.053]	[0.131]	[0.082]	[0.029]	[0.021]
Observations	27	27	27	28	28	28
Bandwidth	-500, 294	-500, 294	-500, 294	-500, 294	-500, 294	-500, 294
Spatial Autocorrelation	-0.09	-0.03	-0.15	0.05	0.44	0.24
Spatial Autocorrelation SD	0.12	0.12	0.10	0.12	0.12	0.13
Mobility Restricting Mean	0.163	0.267	0.635	0.807	0.089	0.041
Mobility Restricting SD	0.116	0.166	0.235	0.123	0.061	0.040

Notes: Observations are districts. Robust standard errors in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Left and right limits of the RD bandwidth are shown. Regressions estimate a local linear RD specification on each side of the border using a triangular kernel and include longitude as a control. Districts are weighted by the size of the relevant population. Columns (1)-(3) exclude an extreme outlier for that outcome as described in the text.

4. **Schooling:** ↓ 1 p.p. for boys, provision increased but still low

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OLG Marriage Market Model: Predictions

Setup: 2 sexes (M, F), 2 ages (Y, O), F only fecund when Y, μ Y die before O, O do not work, sister's bride price to *unmarried* brother next period

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0. **Assumption at baseline ("Period 0"):** Young women's wages $>$ young men's $\rightarrow$ young men cannot afford to marry

Period	Age	M Marrying	F Marrying	Share w. Age Gap
0	Y		N_0	1
	O	$(1-\mu)N_0$		

OLG Marriage Market Model: Predictions

Setup: 2 sexes (M, F), 2 ages (Y, O), F only fecund when Y, μ Y die before O, O do not work, sister's bride price to *unmarried* brother next period

1. **Shock ("Period 1"):** ϵ young men's wages $\gg$ young women's $>$ $(1-\epsilon)$ young men's $\rightarrow$ ϵ young men marry, bride price increases

Period	Age	M Marrying	F Marrying	Share w. Age Gap
0	Y		N_0	1
	O	$(1-\mu)N_0$		
1	Y	ϵN_0	N_0	$\frac{1-\mu}{1-\mu+\epsilon}$ ↓
	O	$(1-\mu)N_0$		

OLG Marriage Market Model: Predictions

Setup: 2 sexes (M, F), 2 ages (Y, O), F only fecund when Y, μ Y die before O, O do not work, sister's bride price to *unmarried* brother next period

2. **Period 2 results:** Population growth from higher wages ($N_1 > N_0$), surviving former circular migrants priced out of marriage in old age

Period	Age	M Marrying	F Marrying	Share w. Age Gap
0	Y O	 $(1-\mu)N_0$	N_0	1
1	Y O	ϵN_0 $(1-\mu)N_0$	N_0	$\frac{1-\mu}{1-\mu+\epsilon}$ ↓
2	Y O	ϵN_1 $(1-\mu)(1-\epsilon)N_0$	N_1	$\frac{(1-\mu)(1-\epsilon)}{(1-\mu)(1-\epsilon)+\epsilon\frac{N_1}{N_0}}$ ↓

OLG Marriage Market Model: Predictions

Setup: 2 sexes (M, F), 2 ages (Y, O), F only fecund when Y, μ Y die before O, O do not work, sister's bride price to *unmarried* brother next period

3. **Period 3 results:** Some smaller degree of population growth ($N_2 > N_1$) $\rightarrow$ continued but smaller drop in age-disparate marriages

Period	Age	M Marrying	F Marrying	Share w. Age Gap
0	Y O	 $(1-\mu)N_0$	N_0	1
1	Y O	ϵN_0 $(1-\mu)N_0$	N_0	$\frac{1-\mu}{1-\mu+\epsilon}$ $\downarrow$
2	Y O	ϵN_1 $(1-\mu)(1-\epsilon)N_0$	N_1	$\frac{(1-\mu)(1-\epsilon)}{(1-\mu)(1-\epsilon)+\epsilon\frac{N_1}{N_0}}$ $\downarrow$
3	Y O	ϵN_2 $(1-\mu)(1-\epsilon)N_1$	N_2	$\frac{(1-\mu)(1-\epsilon)}{(1-\mu)(1-\epsilon)+\epsilon\frac{N_2}{N_1}}$ $\downarrow$

OLG Marriage Market Model: Predictions

Setup: 2 sexes (M, F), 2 ages (Y, O), F only fecund when Y, μ Y die before O, O do not work, sister's bride price to *unmarried* brother next period

→ **Migrant-sending institution:** Period 0 in 1860-89, Period 1 in 1890-1919, Period 3 in 1950-79 with 30-year generations

Period	Age	M Marrying	F Marrying	Share w. Age Gap
1860–1889	Y O	$(1-\mu)N_0$	N_0	1
1890–1919	Y O	ϵN_0 $(1-\mu)N_0$	N_0	$\frac{1-\mu}{1-\mu+\epsilon}$ ↓
1920–1949	Y O	ϵN_1 $(1-\mu)(1-\epsilon)N_0$	N_1	$\frac{(1-\mu)(1-\epsilon)}{(1-\mu)(1-\epsilon)+\epsilon\frac{N_1}{N_0}}$ ↓
1950–1979	Y O	ϵN_2 $(1-\mu)(1-\epsilon)N_1$	N_2	$\frac{(1-\mu)(1-\epsilon)}{(1-\mu)(1-\epsilon)+\epsilon\frac{N_2}{N_1}}$ ↓

OLG Marriage Market Model: Predictions

Setup: 2 sexes (M, F), 2 ages (Y, O), F only fecund when Y, μ Y die before O, O do not work, sister's bride price to *unmarried* brother next period

→ **Mobility-restricting institution:** Period 0 in 1910-39, Period 1 in 1940-69, Period 3 in 2000-29 with 30-year generations

Period	Age	M Marrying	F Marrying	Share w. Age Gap
1910–1939	Y O	$(1-\mu)N_0$	N_0	1
1940–1969	Y O	ϵN_0 $(1-\mu)N_0$	N_0	$\frac{1-\mu}{1-\mu+\epsilon}$ ↓
1970–1999	Y O	ϵN_1 $(1-\mu)(1-\epsilon)N_0$	N_1	$\frac{(1-\mu)(1-\epsilon)}{(1-\mu)(1-\epsilon)+\epsilon\frac{N_1}{N_0}}$ ↓
2000–2029	Y O	ϵN_2 $(1-\mu)(1-\epsilon)N_1$	N_2	$\frac{(1-\mu)(1-\epsilon)}{(1-\mu)(1-\epsilon)+\epsilon\frac{N_2}{N_1}}$ ↓

Implications for Today

Age gaps: One of the most important risk factors for HIV in Sub-Saharan Africa (de Oliveira et al., 2017; Schaefer et al., 2017)

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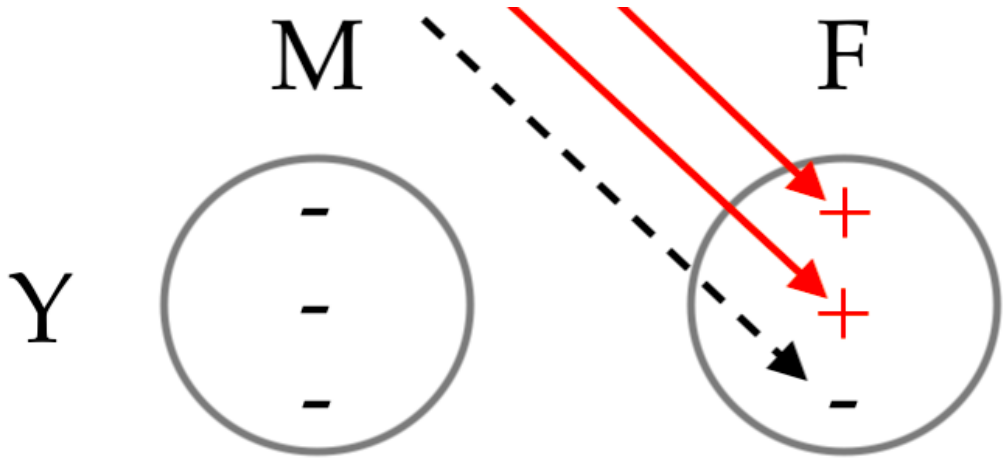
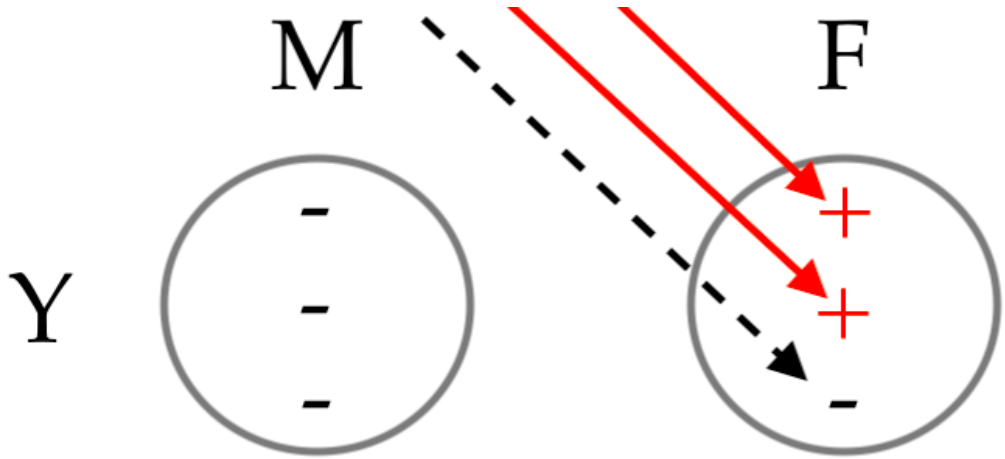
First-order effect: Increases spread of HIV to next generation



Implications for Today

Age gaps: One of the most important risk factors for HIV in Sub-Saharan Africa (de Oliveira et al., 2017; Schaefer et al., 2017)

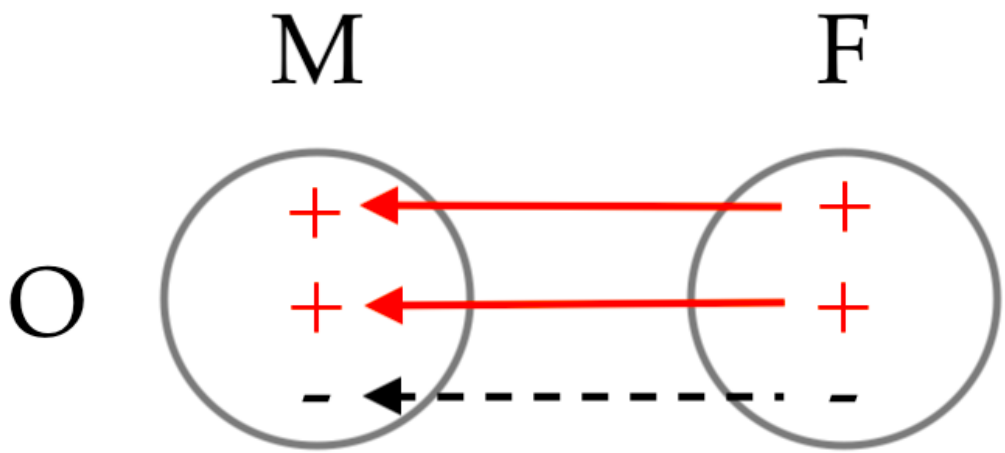
Intuition: Old men transmit HIV to young women . . .



Implications for Today

Age gaps: One of the most important risk factors for HIV in Sub-Saharan Africa (de Oliveira et al., 2017; Schaefer et al., 2017)

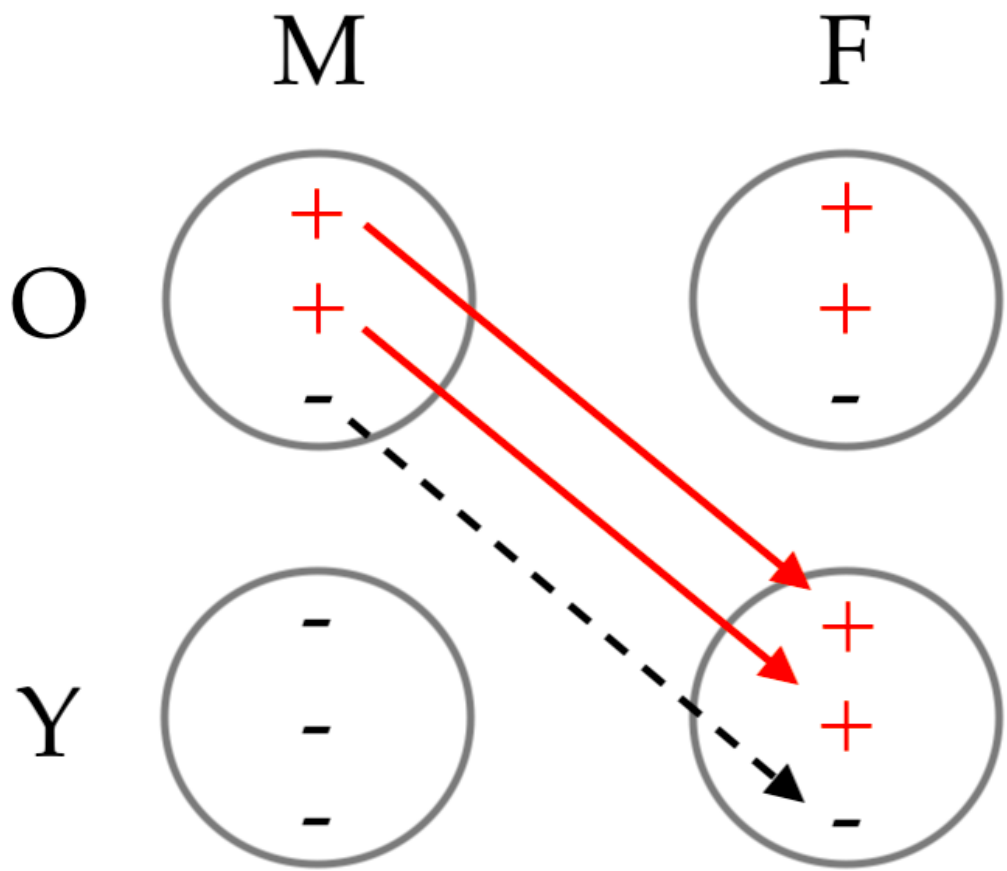
Intuition: . . . who as they age transmit to similarly-aged men . . .



Implications for Today

Age gaps: One of the most important risk factors for HIV in Sub-Saharan Africa (de Oliveira et al., 2017; Schaefer et al., 2017)

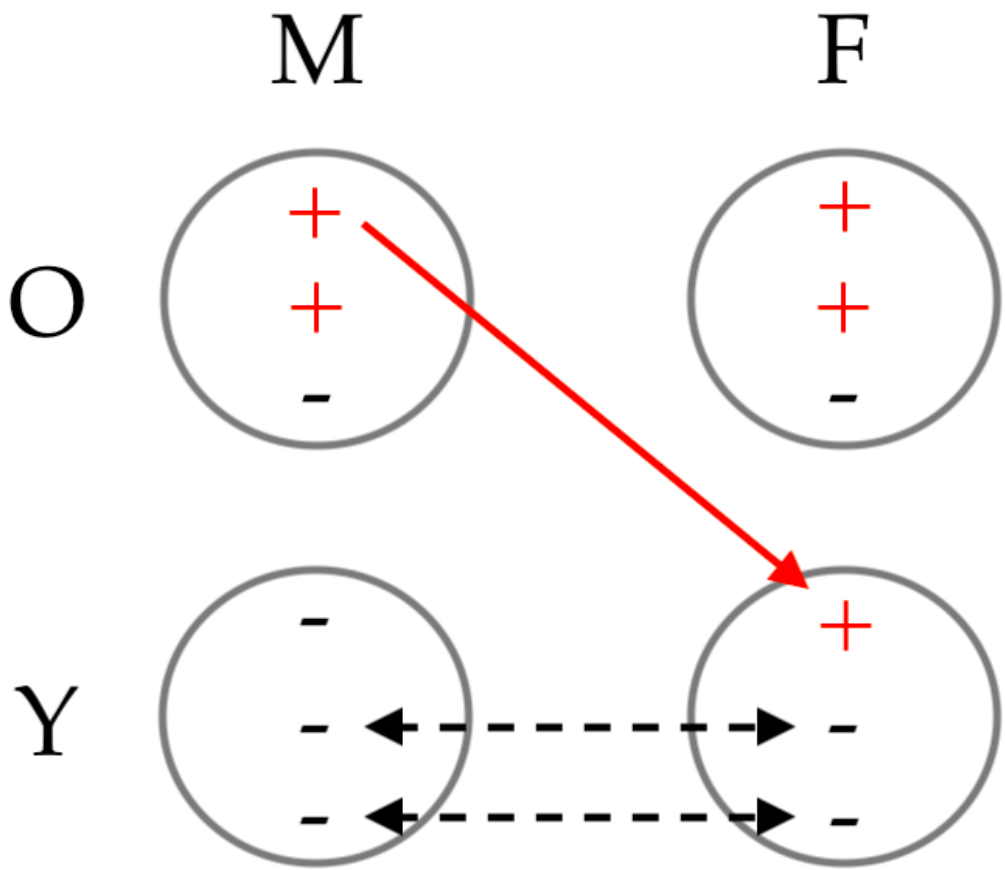
Intuition: . . . and the cycle continues



Implications for Today

Age gaps: One of the most important risk factors for HIV in Sub-Saharan Africa (de Oliveira et al., 2017; Schaefer et al., 2017)

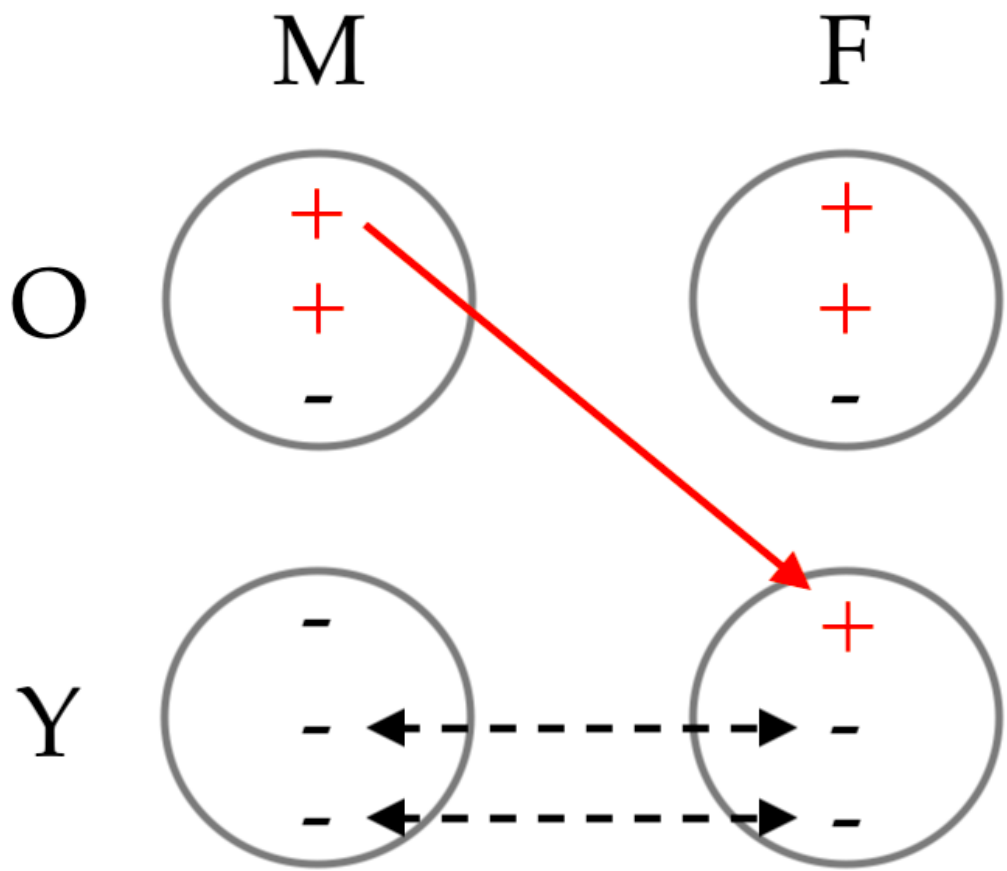
→ Fewer age-disparate relationships reduces spread of HIV



Implications for Today

Age gaps: One of the most important risk factors for HIV in Sub-Saharan Africa potentially lower in migrant-sending institution

(**Also second-order effects:** Related to unequal bargaining power)



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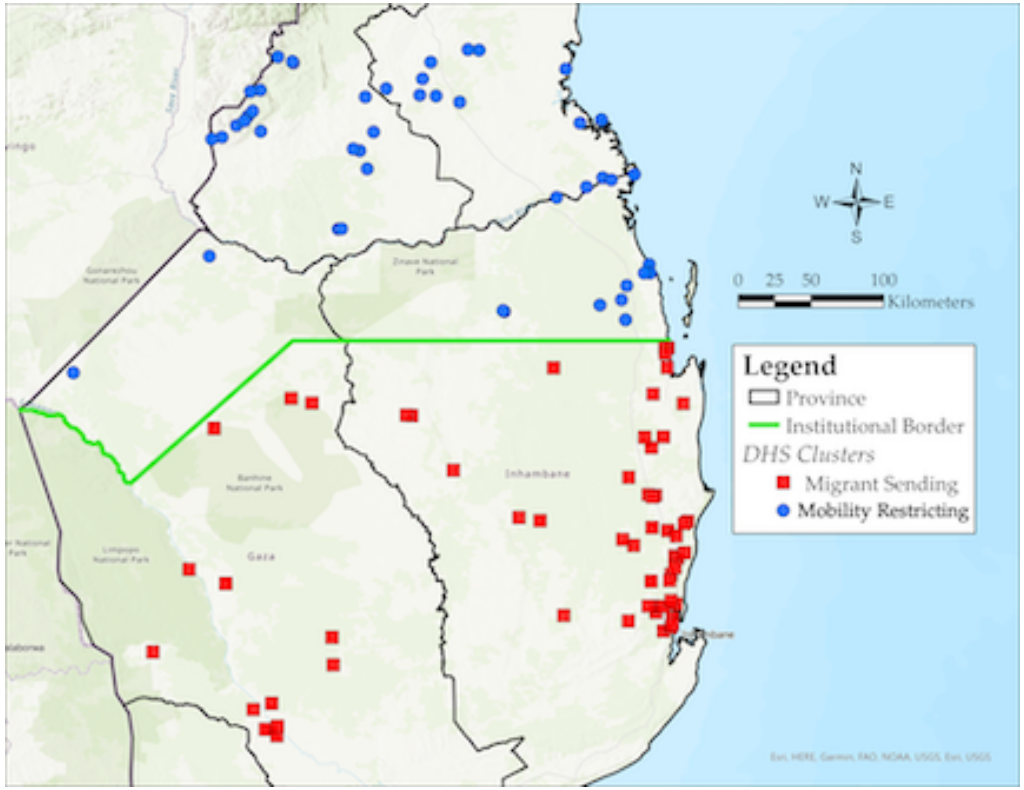
Data



DHS Clusters within 200 km of Border (2009, '11, '15, '18)

DHS: Georeferenced survey clusters

1. HIV: Blood test results
2. Development: Asset index, childhood stunting, number of children born in last 5 years, years of schooling

Empirical Strategy

RD design:

$$y_{i,c} = \alpha + \tau \text{MigrantSending}_c + f(\text{Dist}_c) + \text{Lon}_c + \mathbf{X}_i\beta + \delta_t + \epsilon_{i,c}$$
$$\text{for } c \in B^*_{\text{MSE}}$$

New features:

- Data for individual i in survey cluster c
- Controls $\mathbf{X}_i$ (age, age squared, female indicator), year FE δ_t
- B^*_{MSE}: Set of clusters within Calonico, Cattaneo, & Titiunik (2014) MSE-optimal bandwidth

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New details:

- Slight displacement of clusters to protect privacy $\rightarrow$ drop clusters possibly on wrong side of border, classical measurement error
- Clustered SEs, continue to use Conley (1999) as well
- Sometimes "too few" clusters in bandwidth $\rightarrow$ wild cluster bootstrap p-values (Cameron, Gelbach, & Miller, 2008)

RD Results: HIV Positive

	Pooled (1)	Women (2)	Men (3)
Migrant Sending	-0.103	-0.089	-0.097
	(0.049)	(0.053)	(0.084)
	[0.037]	[0.041]	[0.093]
Observations	860	588	212
Clusters	21	22	14
Bandwidth	124.4	128.3	86.5
Wild Cluster Bootstrap p	0.073	0.137	0.458
Spatial Autocorrelation	0.07	-0.05	0.05
Spatial Autocorrelation SD	0.21	0.20	0.19
Mobility Restricting Mean	0.215	0.214	0.198
Mobility Restricting SD	0.411	0.411	0.400

Notes: Clustered standard errors in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Regressions estimate a local linear RD specification on each side of the border with a triangular kernel and include age, age squared, a female indicator, and longitude as controls. Bandwidths are MSE-optimal (Calonico, Cattaneo, & Titiunik, 2014). Wild cluster bootstrap p-values are calculated using 999 repetitions and a small-sample correction (Cameron, Gelbach, & Miller, 2008).

↓ 10 p.p. prevalence (0.25 SD) ▸ RD plots ▸ Refusals (Lowes & Montero, 2021*b*)

Effects similar when separating sexes (imprecise for men) ▸ Age profiles

RD Results: Development

	Assets	*Stunting*	*Years of Schooling*	
	Index	Children	Females	Males
	(1)	(2)	(3)	(4)
Migrant Sending	0.067	-0.055	0.377	0.224
	(0.322)	(0.117)	(0.327)	(0.782)
	[0.414]	[0.132]	[0.281]	[0.795]
Observations	2,513	258	883	815
Clusters	22	15	19	22
Bandwidth	59.6	108.0	64.8	71.5
Wild Cluster Bootstrap p	0.862	0.824	0.302	0.818
Spatial Autocorrelation	-0.19	-0.30	-0.26	-0.16
Spatial Autocorrelation SD	0.15	0.25	0.16	0.15
Mobility Restricting Mean	3.375	0.376	2.498	3.443
Mobility Restricting SD	0.992	0.487	2.565	3.037

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Small differences, if any, in outcomes along border ($\leq$0.1 SD)

Differences ruled out (not shown): Civil war violence, landmines

HIV Channel: Partner Age Gaps

	Spouse	*Last Sex Partner*	
	Women	Women	Men
	(1)	(2)	(3)
Migrant Sending	-0.790	-3.129	-1.912
	(0.289)	(1.492)	(0.828)
	[0.220]	[1.257]	[0.833]
Observations	9,307	204	300
Clusters	15	14	63
Bandwidth	138.3	56.4	179.0
Wild Cluster Bootstrap p	0.075	0.154	0.081
Spatial Autocorrelation	0.18	0.06	0.12
Spatial Autocorrelation SD	0.21	0.17	0.08
Mobility Restricting Mean	8.380	7.265	5.110
Mobility Restricting SD	6.585	5.324	4.167

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Age gaps: Man's age minus woman's age

- Linked spouses in IPUMS 10% sample of 2007 census ▸ Admin. post map
- Last reported sexual partner in DHS

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Age gaps: Much smaller in former migrant-sending region

- Spouses: ↓ 0.8 years (0.1 SD) ▸ RD plot
- Sexual partners: ↓ 1.9-3.1 years (0.5-0.6 SD) ▸ RD plot

HIV Channel: Additional Factors Ruled Out

Second-order effects of age gaps: Unequal bargaining power

- Men have concurrent partners less often (Evans et al., 2019)
- Women have later sexual debuts (Mabaso et al., 2021) ▸ Table

Rule out HIV risk factors unrelated to institutions:

- Genital ulcers (effect points in opposite direction)
- Forced and transactional sex
- Women's health decision making
- Men's medical circumcision (Maffioli, 2017)
- Public-sector health facilities (Maina et al., 2019)

Summary of Paper

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$\rightarrow$ **Helps in design of targeted and effective programs** addressing one of the modern world's deadliest pandemics

Roadmap

5. **Appendix Slides**

Appendix: Decree Expanding Leased Territory

"Whereas the Mozambique Company **has at its disposal important means of action** and consequently it is **highly expedient** that the territories alluded to should be administered by that company so as to **insure the proper development and defense of those territories:**

. . . The administration and exploitation of the territory bounded by . . . **the Limpopo [River on the west]**, and following the course of this river as far as the point where it is **intersected by the 32nd meridian** . . . on the south, by the **direct line** starting from the last-named point as far as that where the **33rd meridian intersects the 22nd parallel of latitude**, and following the course of the said **parallel of latitude as far as the sea** . . . is granted to the Mozambique Company."

Source: Great Britain Foreign Office (1901, pp. 601-602)

◂ Back

Appendix: Labor Coercion by the Company

Police powers:

- Officials told chiefs "on such and such a date they had to supply a certain number of men to go to work; generally, ... because [some] cannot manage to organize the number of workers requested, one or more police go to help the chiefs who fell short" (as cited in Allina, 2012, p. 50)

Punishments for evasion:

- "Workers returning from abroad ... [were conscripted] into forced labor almost immediately, such that they ... could no go home for any length of time" (Allina, 2012, p. 58)
- Punish wives, mothers if men tried to flee system (Guthrie, 2018)

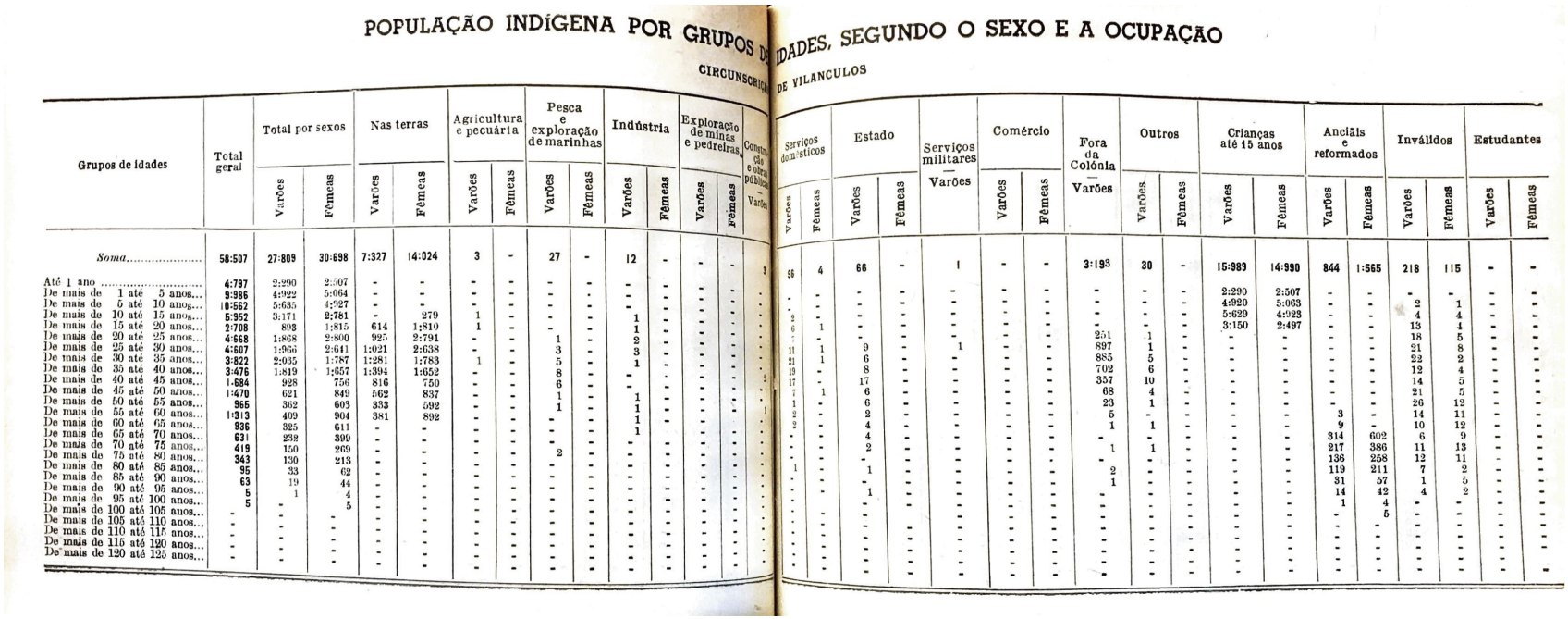
League of Nations report: "The [B]lacks [say] ... that they are the slaves of the Mozambique Company" (Ross, 1925, p. 53)

New system: Hut taxes and pass books

- 1927: Doubled annual hut tax (required wage labor), mandated all males over age 14 carry pass books with work history, anyone not carrying pass books punished with forced labor (Allina, 2012)

◂ Back

Appendix: 1940 Census Summary Example



POPULAÇÃO INDÍGENA POR GRUPOS DE IDADES, SEGUNDO O SEXO E A OCUPAÇÃO

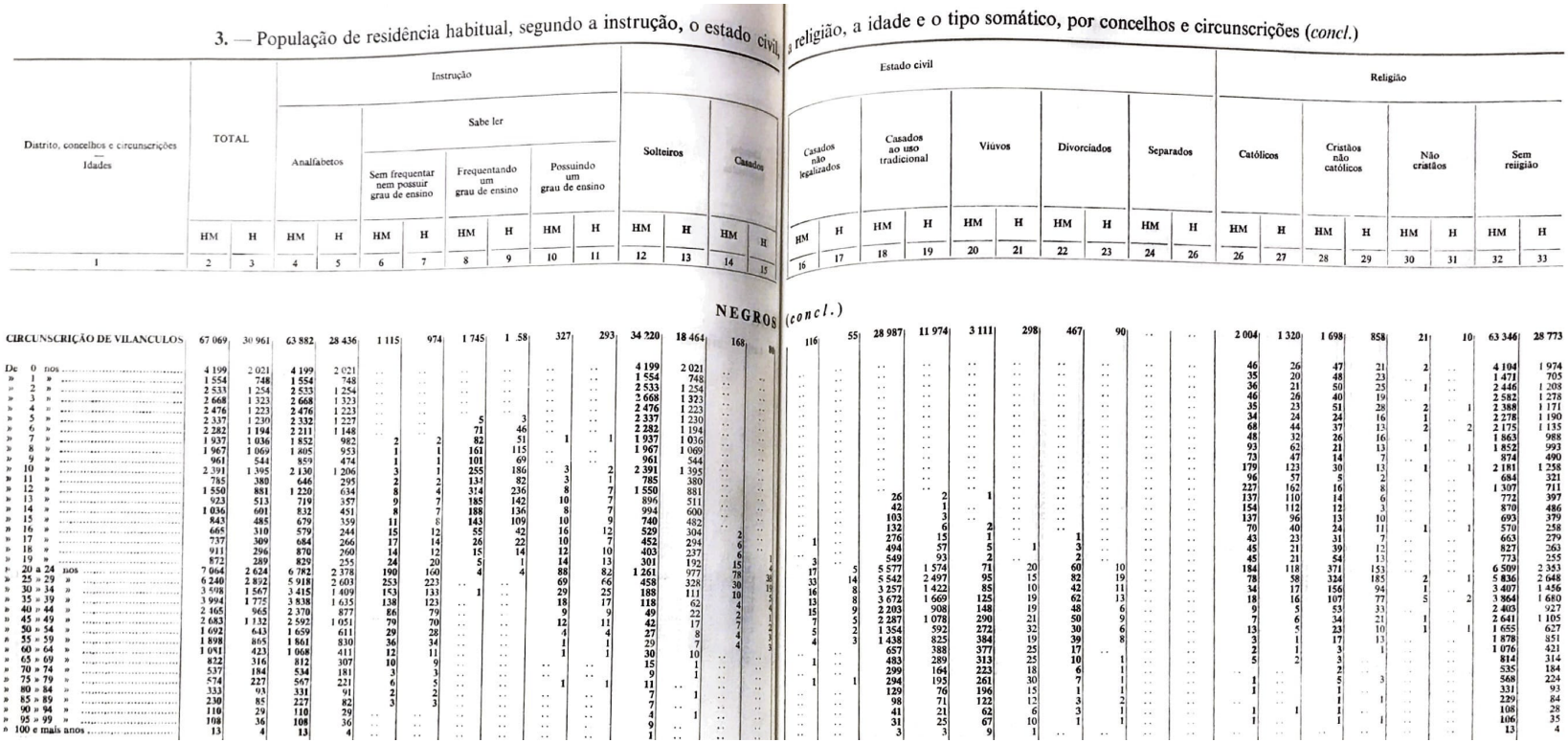
CIRCUNSCRIÇÃO DE VILANCULOS

Grupos de idades	Total geral	Total por sexos		Nas terras		Agricultura e pecuária		Pesca e exploração de marinhas		Indústria		Exploração de minas e pedreiras		Construção e obras públicas		Serviços domésticos		Estado		Serviços militares	Comércio		Fora da Colónia	Outros		Crianças até 15 anos		Anciãis e reformados		Inválidos		Estudantes	
		Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Varões	Fêmeas	Varões	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas
Soma	58:507	27:809	30:698	7:327	14:024	3	-	27	-	12	-	-	-	1		96	4	66	-	1	-	-	3:193	30	-	15:989	14:990	844	1:565	218	115	-	-
Até 1 ano	4:797	2:290	2:507	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2:290	2:507	-	-	-	-	-	-
De mais de 1 até 5 anos...	9:986	4:922	5:064	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4:920	5:063	-	-	-	-	-	-
De mais de 5 até 10 anos...	10:562	5:635	4:927	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5:629	4:923	-	-	2	1	-	-
De mais de 10 até 15 anos...	5:952	3:171	2:781	-	279	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3:150	2:497	-	-	4	4	-	-
De mais de 15 até 20 anos...	2:708	893	1:815	614	1:810	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	4	-	-
De mais de 20 até 25 anos...	4:668	1:868	2:800	925	2:791	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	251	1	-	-	-	-	-	18	5	-	-
De mais de 25 até 30 anos...	4:607	1:966	2:641	1:021	2:638	-	-	3	-	3	-	-	-	-	-	11	1	9	-	1	-	-	897	1	-	-	-	-	-	21	8	-	-
De mais de 30 até 35 anos...	3:822	2:035	1:787	1:281	1:783	1	-	5	-	1	-	-	-	-	-	21	1	6	-	-	-	-	885	5	-	-	-	-	-	22	2	-	-
De mais de 35 até 40 anos...	3:476	1:819	1:657	1:394	1:652	-	-	8	-	-	-	-	-	-	-	19	-	8	-	-	-	-	702	6	-	-	-	-	-	12	4	-	-
De mais de 40 até 45 anos...	1:684	928	756	816	750	-	-	6	-	-	-	-	-	-	-	17	-	17	-	-	-	-	337	10	-	-	-	-	-	14	5	-	-
De mais de 45 até 50 anos...	1:470	621	849	562	837	-	-	1	-	1	-	-	-	-	-	7	1	6	-	-	-	-	68	4	-	-	-	-	-	21	5	-	-
De mais de 50 até 55 anos...	965	362	603	333	592	-	-	1	-	1	-	-	-	-	-	12	-	6	-	-	-	-	23	1	-	-	-	-	-	26	12	-	-
De mais de 55 até 60 anos...	1:313	409	904	381	892	-	-	-	-	1	-	-	-	-	-	12	-	2	-	-	-	-	5	-	-	-	-	3	-	14	11	-	-
De mais de 60 até 65 anos...	936	325	611	-	-	-	-	-	-	1	-	-	-	-	-	12	-	4	-	-	-	-	1	1	-	-	-	9	-	10	12	-	-
De mais de 65 até 70 anos...	631	232	399	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	314	602	6	9	-	-
De mais de 70 até 75 anos...	419	150	269	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	1	-	-	-	217	386	11	13	-	-
De mais de 75 até 80 anos...	343	130	213	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	136	258	12	11	-	-
De mais de 80 até 85 anos...	95	33	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	-	119	211	7	2	-	-
De mais de 85 até 90 anos...	63	19	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	31	57	1	5	-	-
De mais de 90 até 95 anos...	5	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	14	42	4	2	-	-
De mais de 95 até 100 anos...	5	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	-	-	-	-
De mais de 100 até 105 anos...	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-
De mais de 105 até 110 anos...	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
De mais de 110 até 115 anos...	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
De mais de 115 até 120 anos...	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
De mais de 120 até 125 anos...	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Vilanculos District: Indigenous Population by Age Group, Sex, and Occupation

◂ Back

Appendix: 1960 Census Summary Example



3. — População de residência habitual, segundo a instrução, o estado civil, a religião, a idade e o tipo somático, por concelhos e circunscrições (*concl.*)

NEGROS (*concl.*)

Distrito, concelhos e circunscrições — Idades	TOTAL		Instrução								Estado civil										Religião							
			Analfabetos		Sabe ler						Solteiros		Casados		Casados não legalizados		Casados ao uso tradicional		Viúvos		Divorciados		Separados		Católicos		Cristãos não católicos		Não cristãos		Sem religião	
					Sem frequentar nem possuir grau de ensino		Frequentando um grau de ensino		Possuindo um grau de ensino																					
	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H	HM	H
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26	26	27	28	29	30	31	32	33
CIRCUNSCRIÇÃO DE VILANCULOS	67 069	30 961	63 882	28 436	1 115	974	1 745	1 58	327	293	34 220	18 464	168	116	55	28 987	11 974	3 111	298	467	90	..	..	2 004	1 320	1 698	858	21	10	63 346	28 773
De 0 nos	4 199	2 021	4 199	2 021	..	..	..	..	..	..	4 199	2 021	..	..	..	..	..	..	..	..	..	..	..	..	46	26	47	21	2	..	4 104	1 974
» 1 »	1 554	748	1 554	748	..	..	..	..	..	..	1 554	748	..	..	..	..	..	..	..	..	..	..	..	..	35	20	48	23	..	..	1 471	705
» 2 »	2 533	1 254	2 533	1 254	..	..	..	..	..	..	2 533	1 254	..	..	..	..	..	..	..	..	..	..	..	..	36	21	50	25	1	..	2 446	1 208
» 3 »	2 668	1 323	2 668	1 323	..	..	..	..	..	..	2 668	1 323	..	..	..	..	..	..	..	..	..	..	..	..	46	26	40	19	..	..	2 582	1 278
» 4 »	2 476	1 223	2 476	1 223	..	..	..	..	..	..	2 476	1 223	..	..	..	..	..	..	..	..	..	..	..	..	35	23	51	28	2	1	2 388	1 171
» 5 »	2 337	1 230	2 332	1 227	..	..	5	3	..	..	2 337	1 230	..	..	..	..	..	..	..	..	..	..	..	..	34	24	24	16	1	..	2 278	1 190
» 6 »	2 282	1 194	2 211	1 148	8	7	71	46	..	..	2 282	1 194	..	..	..	..	..	..	..	..	..	..	..	..	68	44	37	13	2	2	2 175	1 135
» 7 »	1 937	1 036	1 852	982	2	2	82	51	1	1	1 937	1 036	..	..	..	..	..	..	..	..	..	..	..	..	48	32	26	16	..	..	1 863	988
» 8 »	1 967	1 069	1 805	953	1	1	161	115	..	..	1 967	1 069	..	..	..	..	..	..	..	..	..	..	..	..	93	62	21	13	1	1	1 852	993
» 9 »	961	544	859	474	1	1	101	69	..	..	961	544	..	..	..	..	..	..	..	..	..	..	..	..	73	47	14	7	..	..	874	490
» 10 »	2 391	1 395	2 130	1 206	3	1	255	186	3	2	2 391	1 395	..	..	..	..	..	..	..	..	..	..	..	..	179	123	30	13	1	1	2 181	1 258
» 11 »	785	380	646	295	2	2	134	82	3	1	785	380	..	..	..	..	..	..	..	..	..	..	..	..	96	57	5	2	..	..	684	321
» 12 »	1 550	881	1 220	634	8	4	314	236	8	7	1 550	881	..	..	..	..	..	..	..	..	..	..	..	..	227	162	16	8	..	..	1 307	711
» 13 »	923	513	719	357	9	7	185	142	10	7	896	511	..	..	..	..	..	..	..	..	..	..	..	..	137	110	14	6	..	..	772	397
» 14 »	1 036	601	832	451	8	7	188	136	8	7	994	600	..	..	..	..	26	2	1	..	..	..	..	..	154	112	12	3	..	..	870	486
» 15 »	843	485	679	359	11	8	143	109	10	9	740	482	..	..	..	..	42	1	..	..	..	..	..	..	137	96	13	10	..	..	693	379
» 16 »	665	310	579	244	15	12	55	42	16	12	529	304	2	..	..	..	103	3	..	..	..	..	..	..	70	40	24	11	1	1	570	258
» 17 »	737	309	684	266	17	14	26	22	10	7	452	294	6	..	..	..	132	6	2	..	..	..	..	..	43	23	31	7	..	..	663	279
» 18 »	911	296	870	260	14	12	15	14	12	10	403	237	6	..	1	..	276	15	1	..	..	..	..	..	45	21	39	12	..	..	827	263
» 19 »	872	289	829	255	24	20	5	1	14	13	301	192	15	3	..	..	494	57	5	1	3	..	..	..	45	21	54	13	..	..	773	255
» 20 a 24 nos	7 064	2 624	6 782	2 378	190	160	4	4	88	82	1 261	977	78	17	5	5 577	1 574	71	20	60	10	..	..	..	184	118	371	153	..	..	6 509	2 353
» 25 » 29 »	6 240	2 892	5 918	2 603	253	223	..	..	69	66	458	328	30	33	14	5 542	2 497	95	15	82	19	..	..	..	78	58	324	185	2	1	5 836	2 648
» 30 » 34 »	3 598	1 567	3 415	1 409	153	133	..	..	29	25	188	111	10	16	8	3 257	1 422	85	10	42	11	..	..	..	34	17	156	94	1	..	3 407	1 456
» 35 » 39 »	3 994	1 775	3 838	1 635	138	123	..	..	18	17	118	62	4	13	8	3 672	1 669	125	19	62	13	..	..	..	18	16	107	77	5	2	3 864	1 680
» 40 » 44 »	2 165	965	2 370	877	86	79	..	..	9	9	49	22	2	15	9	2 203	908	148	19	48	6	..	..	..	9	5	53	33	..	..	2 403	927
» 45 » 49 »	2 683	1 132	2 592	1 051	79	70	..	..	12	11	42	17	7	7	5	2 287	1 078	290	21	50	9	..	..	..	7	6	34	21	1	1	2 641	1 105
» 50 » 54 »	1 692	643	1 659	611	29	28	..	..	4	4	27	8	4	5	2	1 354	592	272	32	30	6	..	..	..	13	5	23	10	1	1	1 655	627
» 55 » 59 »	1 898	865	1 861	830	36	34	..	..	1	1	29	7	3	4	3	1 438	825	384	19	39	8	..	..	..	3	1	17	13	..	..	1 878	851
» 60 » 64 »	1 091	423	1 068	411	12	11	..	..	1	1	30	10	..	..	..	657	388	377	25	17	..	..	..	..	2	1	3	1	..	..	1 076	421
» 65 » 69 »	832	316	812	307	10	9	..	..	..	..	15	1	..	..	..	483	289	313	25	10	1	..	..	..	5	2	3	..	..	..	814	314
» 70 » 74 »	537	184	534	181	3	3	..	..	..	..	9	1	..	..	..	299	164	223	18	6	1	..	..	..	..	..	2	..	..	..	535	184
» 75 » 79 »	574	227	567	221	6	5	..	..	1	1	11	..	..	..	1	294	193	261	30	7	1	..	..	..	1	..	5	3	..	..	568	224
» 80 » 84 »	333	93	331	91	2	2	..	..	..	..	7	1	..	..	..	129	76	196	15	1	1	..	..	..	1	..	1	..	..	..	331	93
» 85 » 89 »	230	85	227	82	3	3	..	..	..	..	7	..	..	..	..	98	71	122	12	3	2	..	..	..	..	..	1	1	..	..	229	84
» 90 » 94 »	110	29	110	29	..	..	..	..	..	..	4	1	..	..	..	41	21	62	6	3	1	..	..	..	1	1	1	..	..	..	108	28
» 95 » 99 »	108	36	108	36	..	..	..	..	..	..	9	..	..	..	..	31	25	67	10	1	1	..	..	..	1	..	1	1	..	..	106	35
» 100 e mais anos	13	4	13	4	..	..	..	..	..	..	1	..	..	..	..	3	3	9	1	..	..	..	..	..	..	..	..	..	..	..	13	4

Vilanculos District: Black Resident Population by Education, Marital Status, Religion, Age, and Sex

◂ Back

Appendix: RD Validity

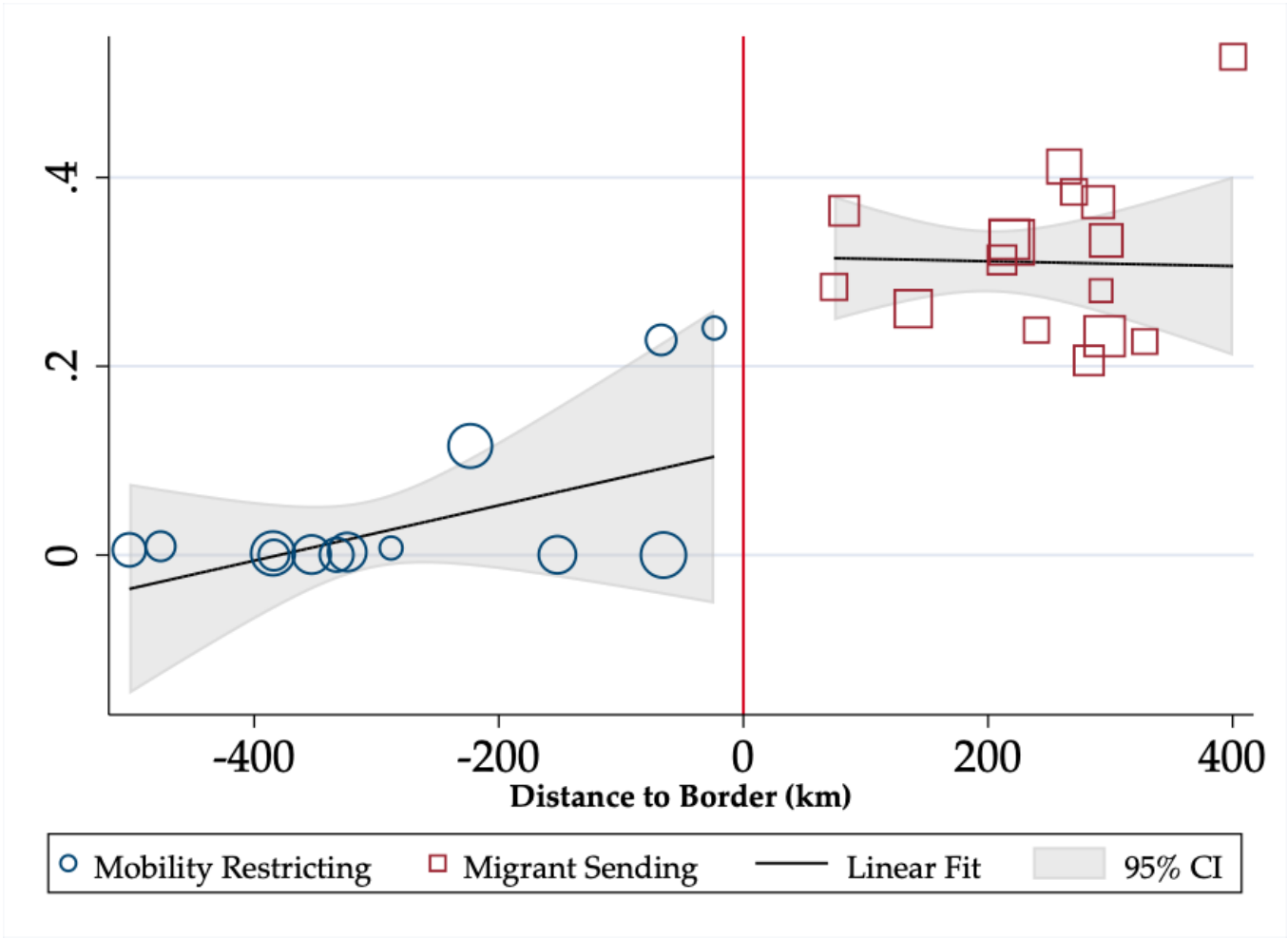
	Geographic Traits				*Disease Suitability*	
	Elevation (1)	Rainfall (2)	Slope (3)	Soil Index (4)	Malaria (5)	TseTse (6)
Migrant Sending	-1.798	1.153	0.014	3.207	-0.270	-0.002
	(31.917)	(6.533)	(0.100)	(3.887)	(0.368)	(0.009)
	[23.254]	[4.045]	[0.054]	[2.658]	[0.244]	[0.007]
Observations	167	105	144	115	139	173
Clusters	29	19	26	20	23	30
Bandwidth	131.5	79.4	120.6	94.3	107.0	144.3
Wild Cluster Bootstrap p	0.950	0.866	0.812	0.435	0.504	0.827
Spatial Autocorrelation	0.40	0.42	0.29	0.11	0.09	0.57
Spatial Autocorrelation SD	0.02	0.03	0.02	0.02	0.02	0.02
Mobility Restricting Mean	182.693	40.936	0.179	49.189	10.838	1.259
Mobility Restricting SD	109.318	44.759	0.132	9.894	1.757	0.078

Notes: Observations are 0.25 $\times$ 0.25 degree cells. Standard errors clustered by third-level administrative unit in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Regressions estimate a local linear RD specification on each side of the border with a triangular kernel and include longitude as a control. Bandwidths are MSE-optimal (Calonico, Cattaneo, & Titiunik, 2014). Wild cluster bootstrap p-values are calculated using 999 repetitions and a small-sample correction (Cameron, Gelbach, & Miller, 2008).

Necessary condition: All other factors changed smoothly at border

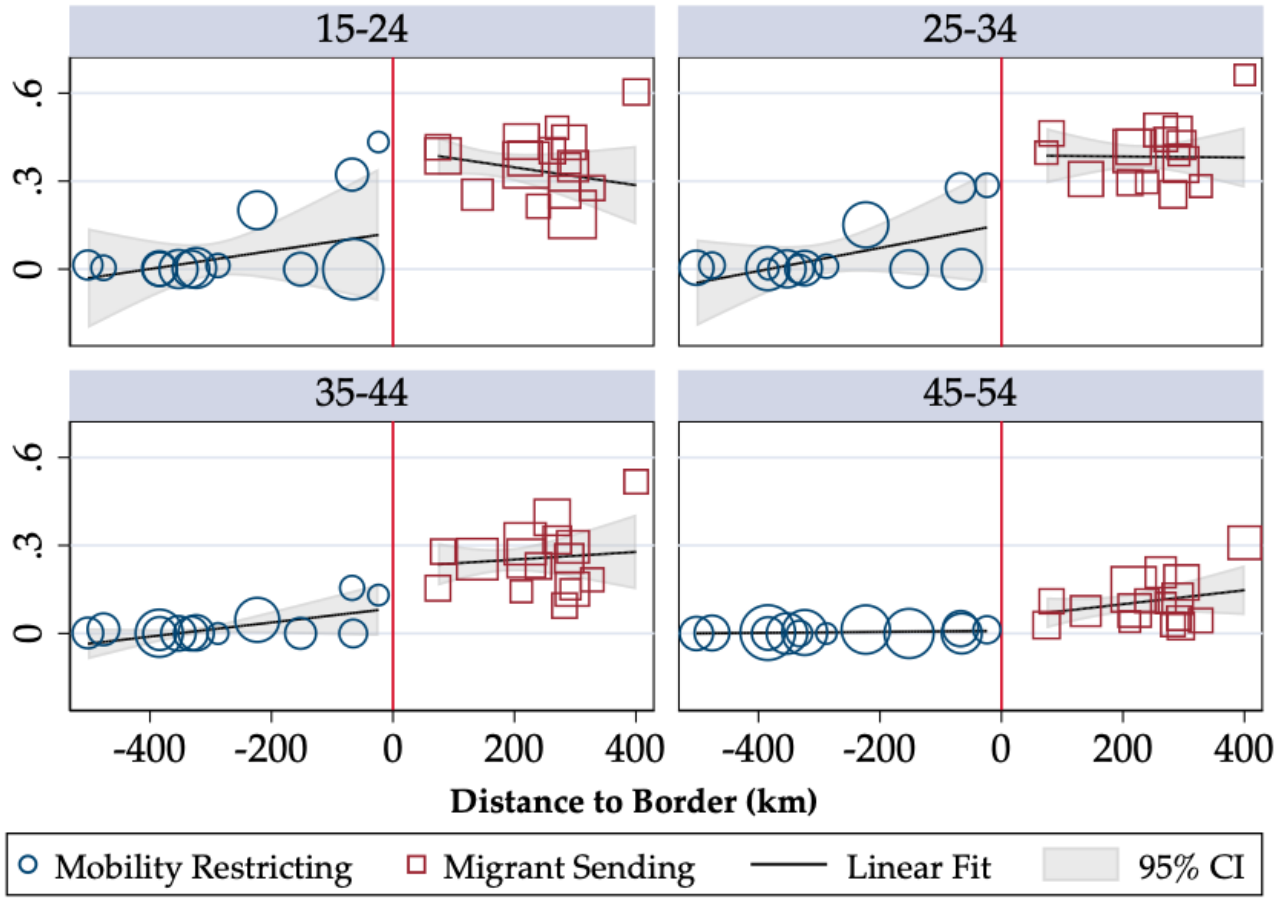
✓ No discontinuities in geographic, disease traits ◂ Back

Appendix: RD Plot for Circular Migration (1940)



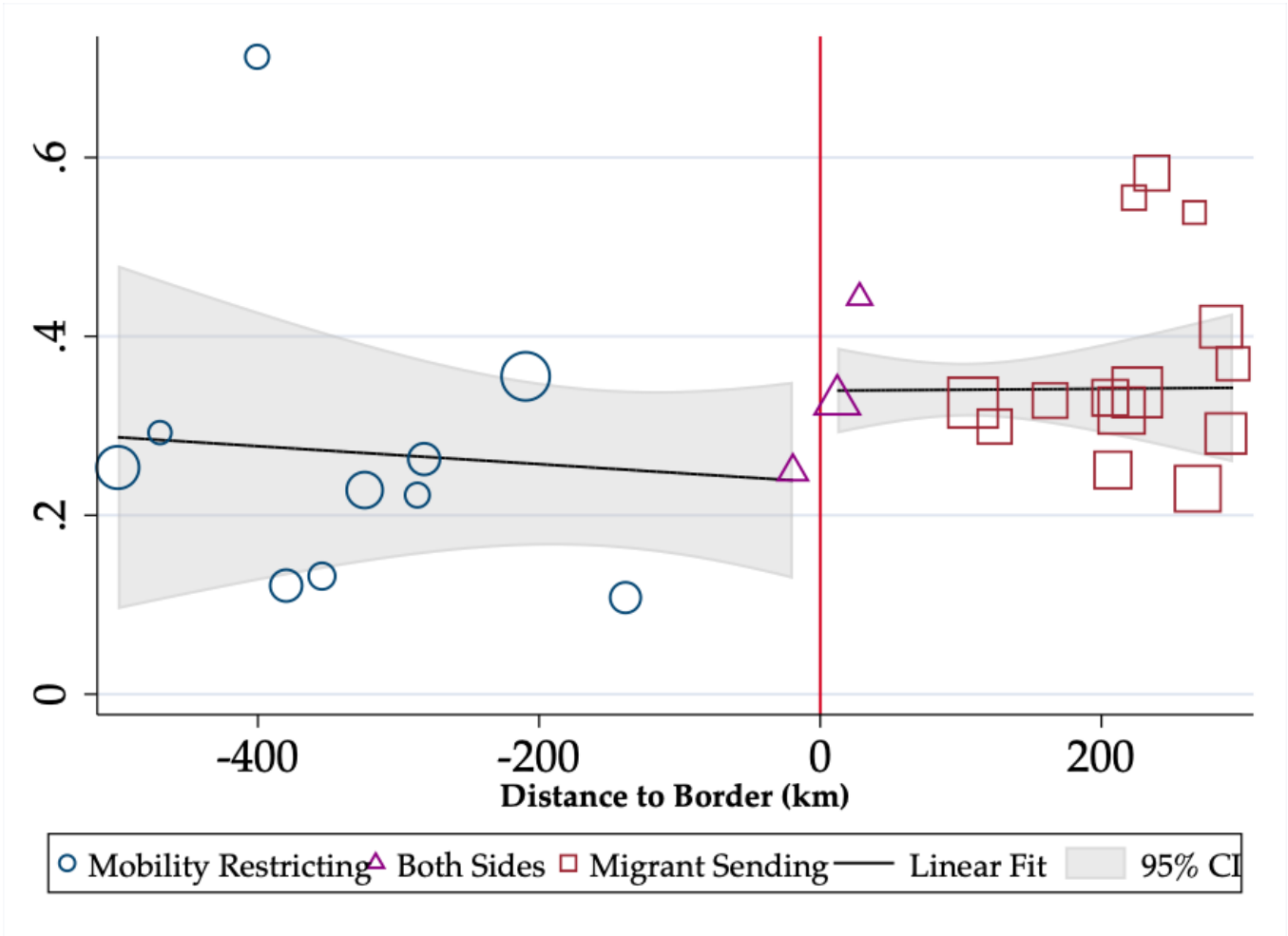
◂ Back

Appendix: RD Plot for Circular Migration by Age (1940)



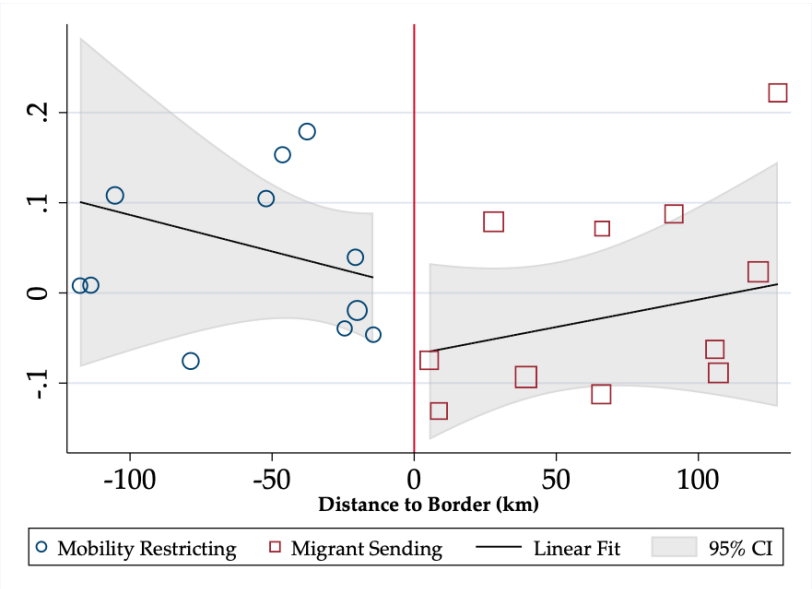
◂ Back

Appendix: RD Plot for Marriage Ratio, 15-24 (1960)



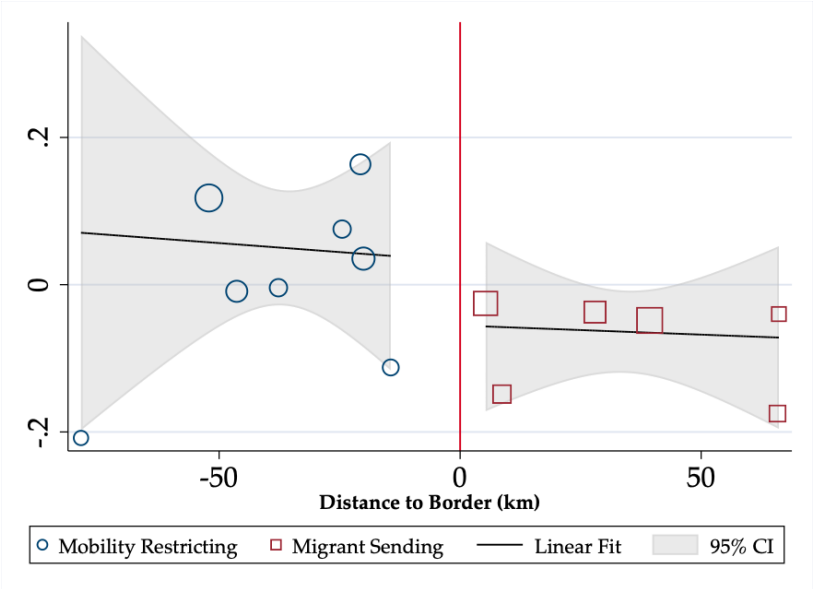
Back

Appendix: RD Plots for HIV Prevalence



Women

Net of Age, Age Squared, Longitude, Year FE



Men

Net of Age, Age Squared, Longitude, Year FE

Back

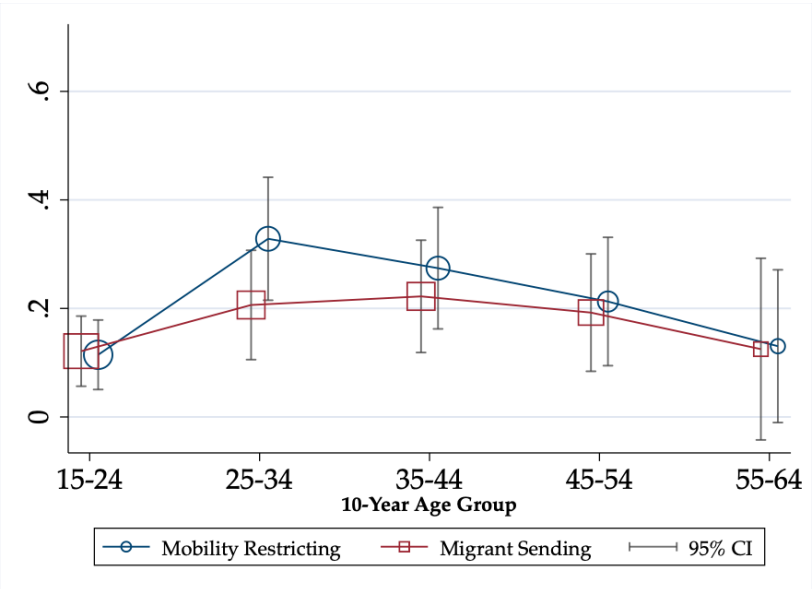
Appendix: Blood Test Refusals

	Refused Blood Test		
	Pooled (1)	Women (2)	Men (3)
Migrant Sending	0.009	0.010	-0.006
	(0.006)	(0.006)	(0.006)
	[0.006]	[0.006]	[0.007]
Observations	478	500	141
Clusters	13	20	12
Bandwidth	148.4	176.8	132.8
Wild Cluster Bootstrap p	0.428	0.195	0.432
Spatial Autocorrelation	0.31	0.28	0.67
Spatial Autocorrelation SD	0.27	0.21	0.24
Mobility Restricting Mean	0.009	0.004	0.000
Mobility Restricting SD	0.094	0.066	0.000

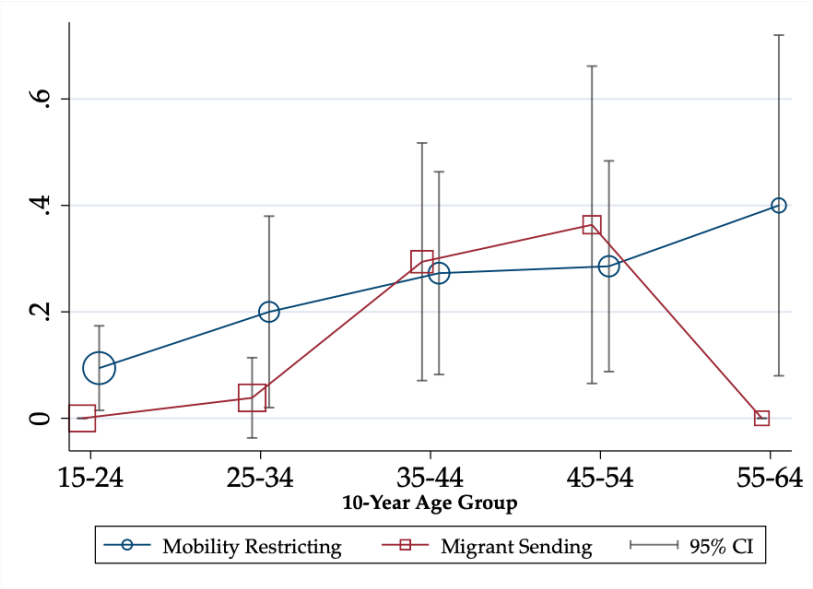
Notes: Clustered standard errors in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Regressions estimate a local linear RD specification on each side of the border with a triangular kernel and include age, age squared, a female indicator, and longitude as controls. Bandwidths are MSE-optimal (Calonico, Cattaneo, & Titiunik, 2014). Wild cluster bootstrap p-values are calculated using 999 repetitions and a small-sample correction (Cameron, Gelbach, & Miller, 2008).

Negligible differences in very low refusal rates ◂ Back

Age Profiles of HIV Prevalence



Women

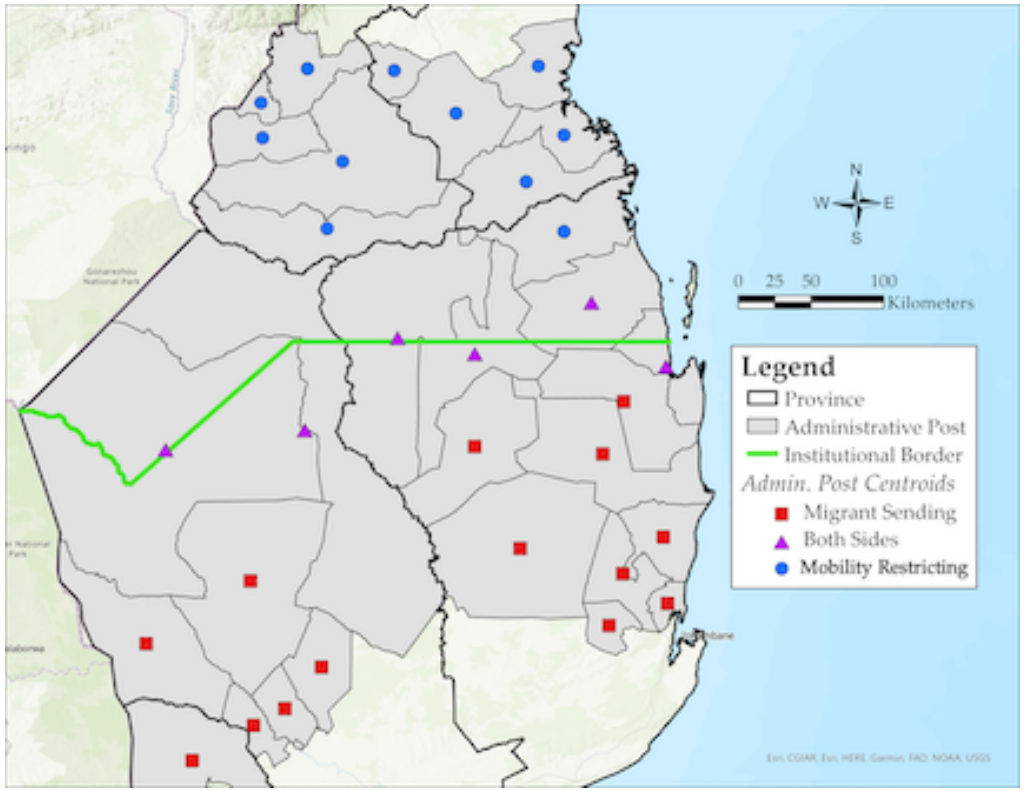


Men

Compare mean HIV prevalence by 10-year age group within B^*_{MSE}

→ **Rationalize large RD estimates:** Large gaps between former migrant-sending and mobility-restricting institutions Back

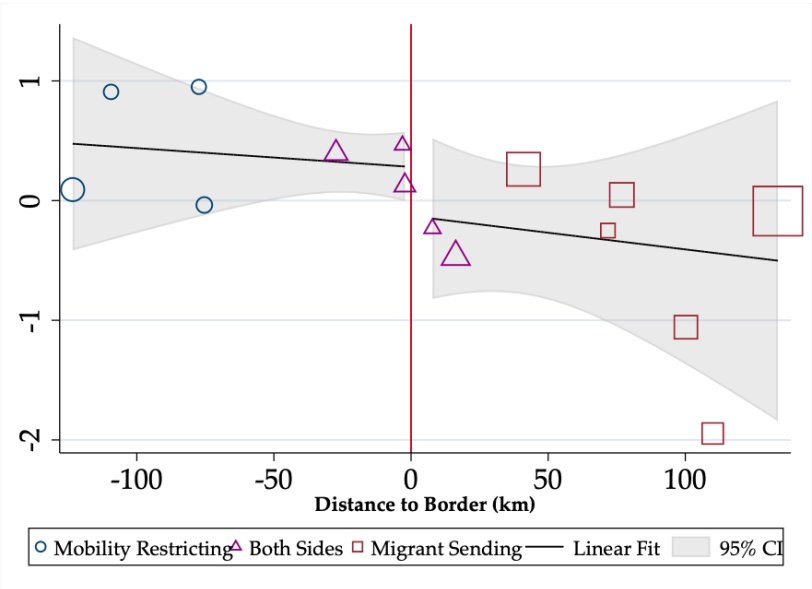
Appendix: Georeferenced 2007 Census Data



Administrative Posts with Centroids within 200 km of Border

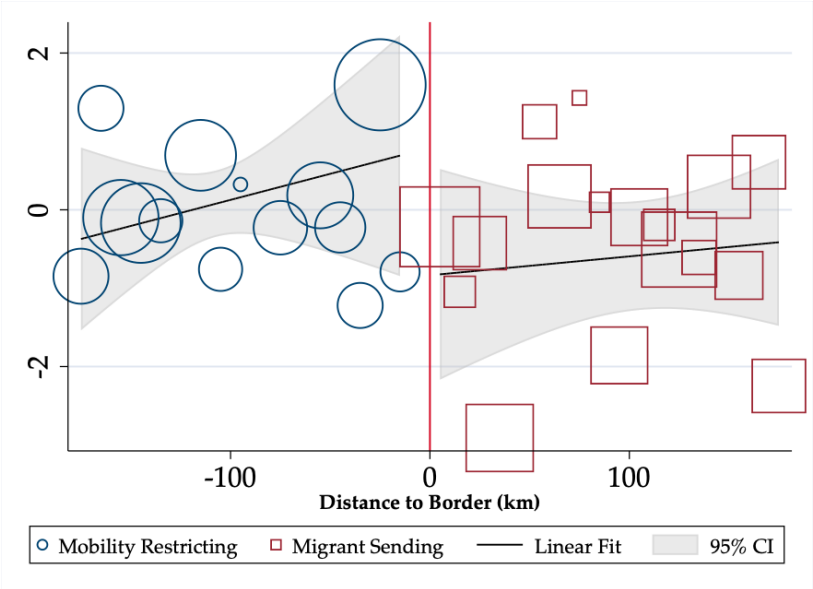
◂ Back

Appendix: RD Plots for Age Disparities between Partners



Census: Women with Spouse

Net of Age, Age Squared, Longitude



DHS: Men with Last Sex Partner

Net of Age, Age Squared, Longitude, Year FE

◂ Back

HIV Channel: Associated Risk Factors

	Concurrent Partners	*Age at First Sex*	*Condom Used Last Sex*	
	Men	Women	Men	Women
	(1)	(2)	(3)	(4)
Migrant Sending	-0.157	0.813	0.065	0.001
	(0.086)	(0.379)	(0.058)	(0.045)
	[0.081]	[0.403]	[0.061]	[0.039]
Observations	250	603	136	375
Clusters	54	26	26	28
Bandwidth	156.1	86.8	85.3	96.1
Wild Cluster Bootstrap p	0.153	0.169	0.448	0.986
Spatial Autocorrelation	0.07	0.01	0.14	-0.28
Spatial Autocorrelation SD	0.09	0.15	0.15	0.16
Mobility Restricting Mean	0.258	16.127	0.069	0.056
Mobility Restricting SD	0.439	2.007	0.256	0.230

Notes: Clustered standard errors in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel in brackets. Regressions estimate a local linear RD specification on each side of the border with a triangular kernel and include age, age squared, and longitude as controls. Bandwidths are MSE-optimal (Calonico, Cattaneo, & Titiunik, 2014). Wild cluster bootstrap p-values are calculated using 999 repetitions and a small-sample correction (Cameron, Gelbach, & Miller, 2008).

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