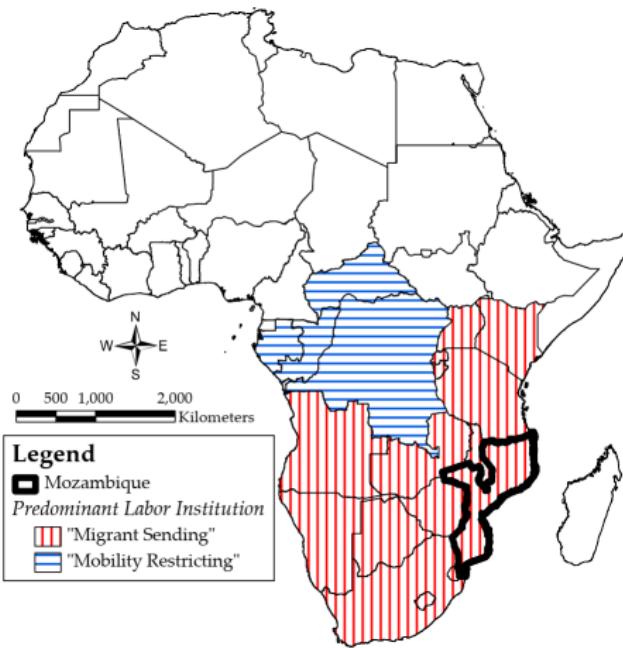


Colonial Labor Institutions, Marriage Markets, and HIV: Evidence from Mozambique

Jon Denton-Schneider (Clark)

December 13, 2022

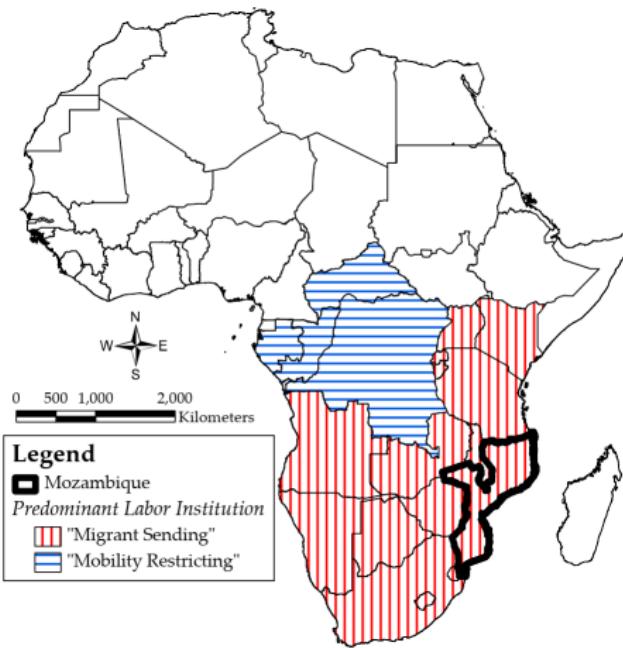
Labor Institutions in Colonial Africa



“Inclusive” vs “extractive” important for long-run outcomes

Africa: Extractive institutions everywhere, but different types

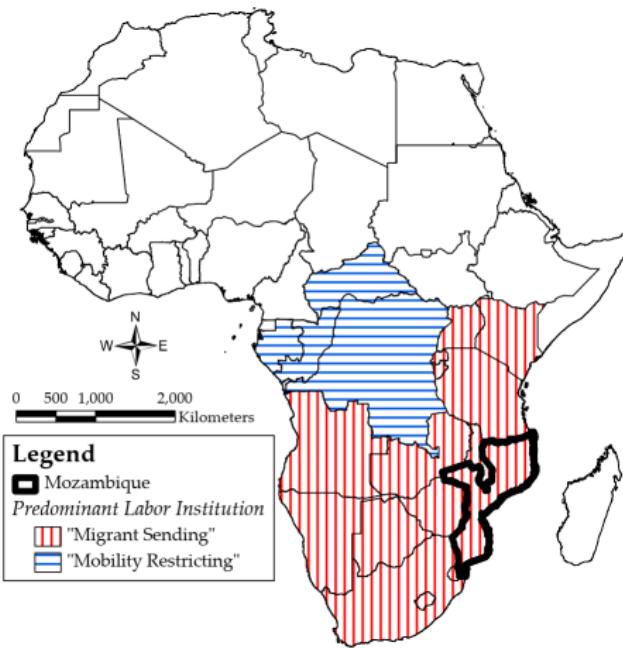
Labor Institutions in Colonial Africa



Amin (1972) grouped colonies by predominant extractive institution

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

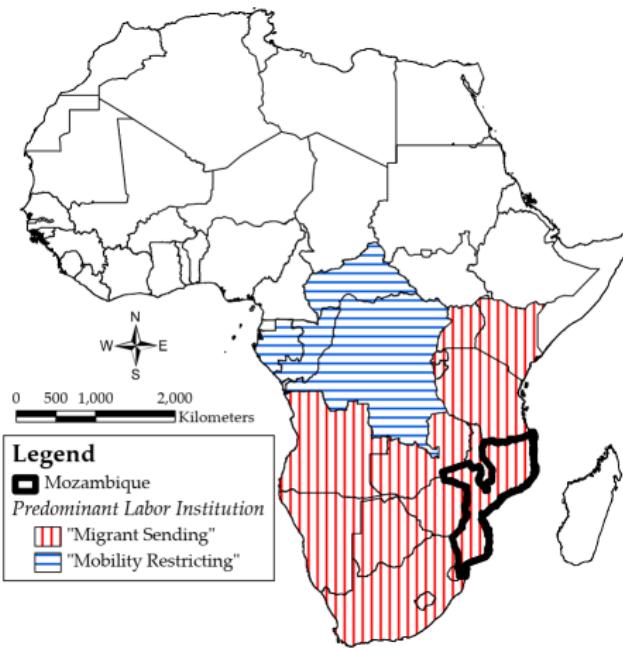
Labor Institutions in Colonial Africa



Amin (1972) grouped colonies by predominant extractive institution

- ② “Mobility-restricting”: Grant of land (and people) to company

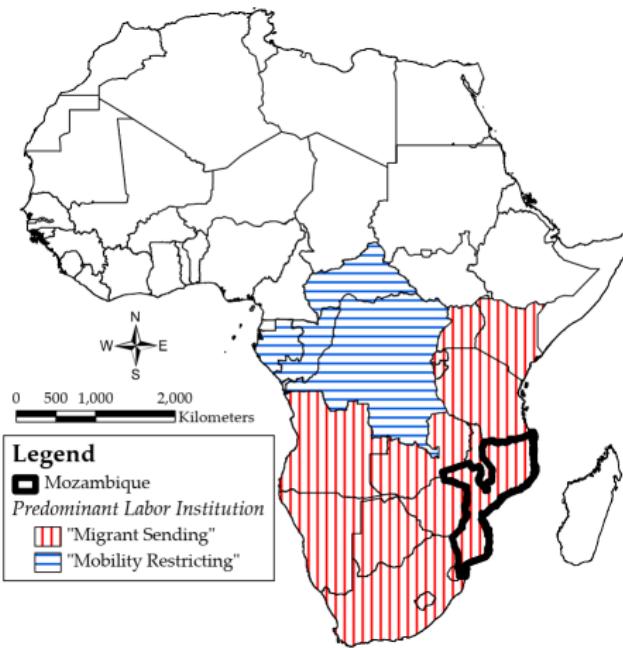
Labor Institutions in Colonial Africa



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

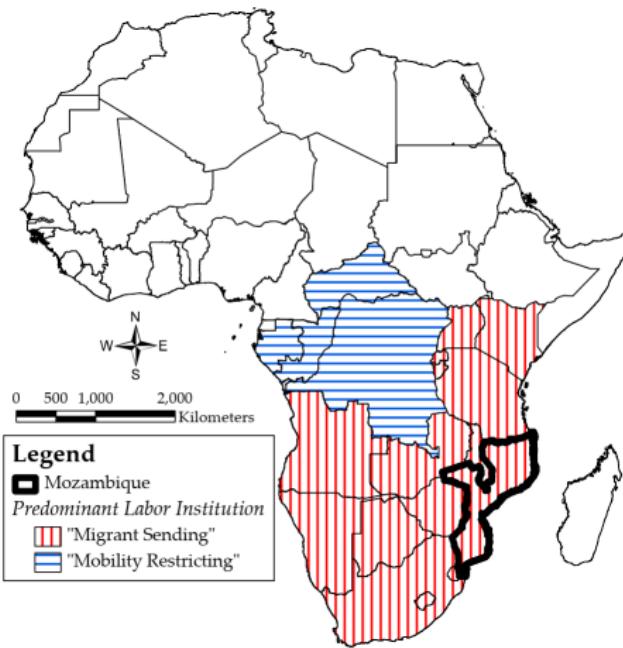
Today: World's poorest, highest HIV prevalence countries

This Paper



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

This Paper



Idea: Make comparisons within unique colony that had both

Mozambique: Arbitrary border between institutions (1893-1942)

This Paper



Idea: Make comparisons within unique colony that had both
Mozambique: Arbitrary border between institutions (1893-1942)

This Paper



→ **Strategy:** Spatial RD design along border between institutions
Interpretation: Impact of assignment to one *instead of other*

Roadmap

① Colonial-Era Differences: Narrative

- Migrants earned bridewealth earlier → lower spousal age gaps

② Colonial-Era Differences: Quantitative

- Age gaps lower, even after circular migration rates equalized

③ Linking Past and Present

- Age gaps still lower today → lower HIV risk

④ Present-Day Differences

- Lower HIV (and age gaps) in former migrant-sending area

Roadmap

① Colonial-Era Differences: Narrative

- ▶ Migrants earned bridewealth earlier → lower spousal age gaps

② Colonial-Era Differences: Quantitative

- ▶ Age gaps lower, even after circular migration rates equalized

③ Linking Past and Present

- ▶ Age gaps still lower today → lower HIV risk

④ Present-Day Differences

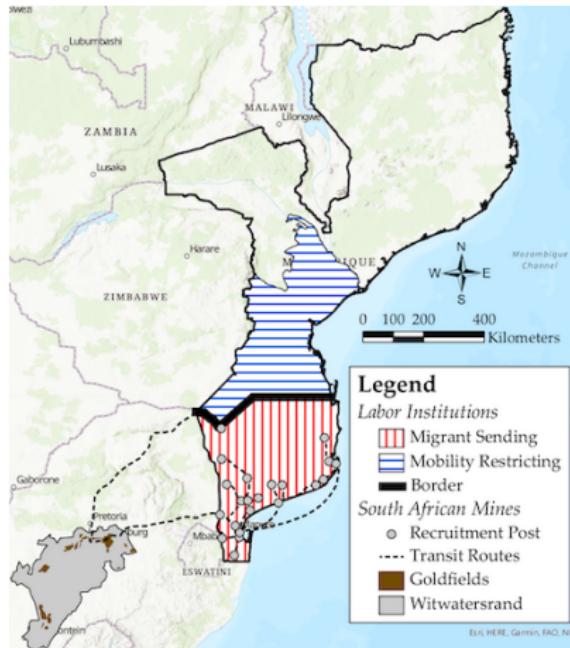
- ▶ Lower HIV (and age gaps) in former migrant-sending area

Separating the Institutions



Arbitrary border: Straight lines on a map, did not reflect conditions
Lasted from 1893 (area unexplored) to 1942 (territory reorganized)

Separating the Institutions



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

→ “Following [river until] intersected by 32nd meridian . . . ”

Separating the Institutions



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

→ “... Line [to where] 33rd meridian intersects 22nd parallel ...”

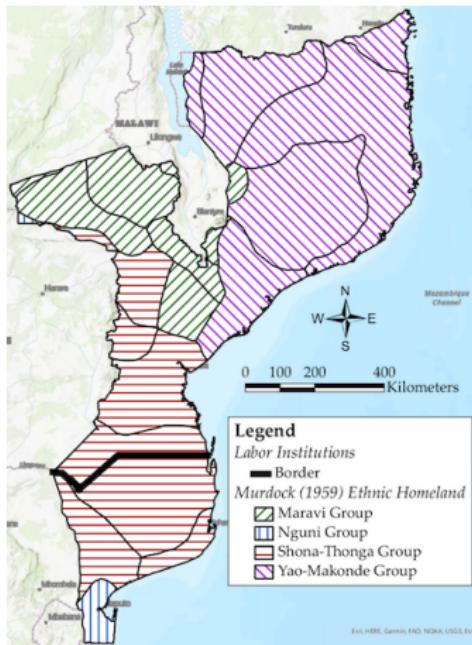
Separating the Institutions



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

→ “... Following parallel [to] sea” Text of decree

Nothing Else Going on at Border



Necessary condition: All other factors changed smoothly at border

- ✓ Within an ethnic group, neighbors in same cultural group

▶ Geography

Extracting Wealth from Labor

Migrant-sending: Pushed men into circular migration, high taxes

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

Mobility-restricting: Enclosed captive low-wage labor pool

- ▶ Chiefs, police, violence, pass laws enforced regime → Labor coercion

Extracting Wealth from Labor

Migrant-sending: Pushed men into circular migration, high taxes

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

Mobility-restricting: Enclosed captive low-wage labor pool

- ▶ Chiefs, police, violence, pass laws enforced regime → Labor coercion

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)

Important Difference between Institutions: Marriage

In a marriage market with bride price: Circular migration led to more age-similar spouses

- ▶ “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 wife for unmarried son (Junod, 1912)

Border Erased in 1942



1942: Lease ended, territory reorganized, institutional border erased

Roadmap

① Colonial-Era Differences: Narrative

- ▶ Migrants earned bridewealth earlier → lower spousal age gaps

② Colonial-Era Differences: Quantitative

- ▶ Age gaps lower, even after circular migration rates equalized

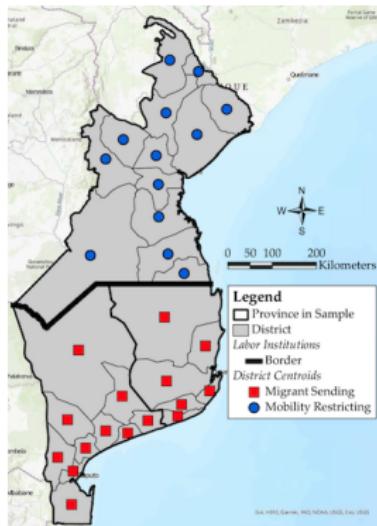
③ Linking Past and Present

- ▶ Age gaps still lower today → lower HIV risk

④ Present-Day Differences

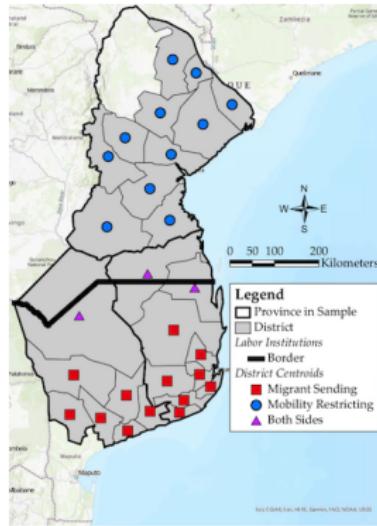
- ▶ Lower HIV (and age gaps) in former migrant-sending area

Colonial-Era Data and Empirics



2 Years before Border Erased (1940)

▶ Example



18 Years after Border Erased (1960)

▶ Example

Census: Digitized, georeferenced district summaries in 1940, 1960

- ▶ Sample: All districts in institutions within provinces closest to border

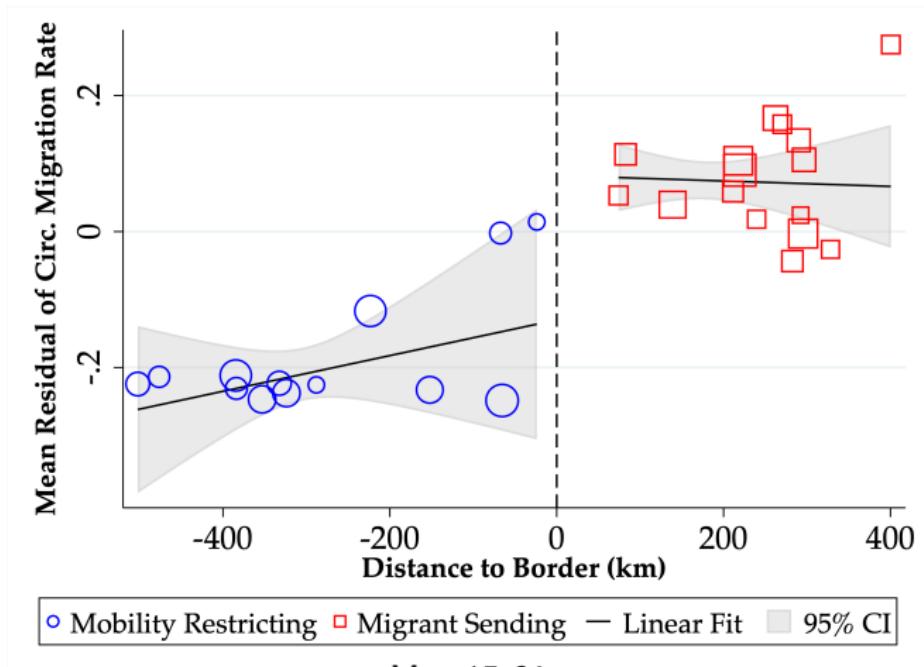
Strategy: RD, net of longitude (Kelly, 2021)

- ▶ Robustness: Randomization inference

▶ Kelly (2021)

▶ Cattaneo et al. (2015)

2 Years before Border Erased (1940): Circular Migration

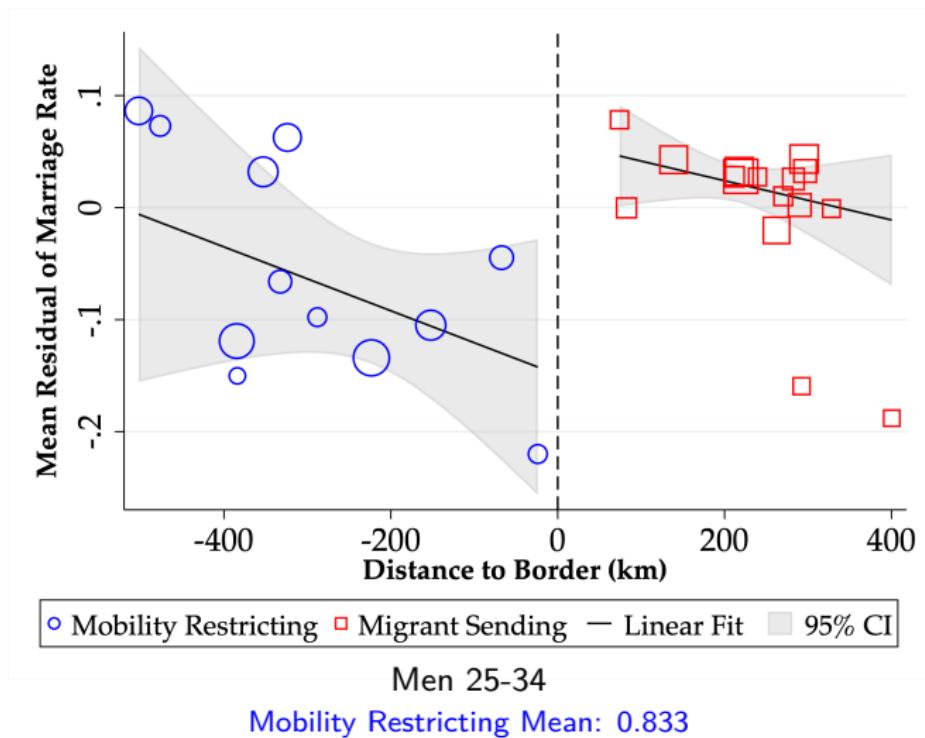


RD estimate: Men 15-64 0.21 p.p. (SE 0.09) more likely to be circular migrants just inside migrant-sending region

► Age group

► 1960

2 Years before Border Erased (1940): Men's Marriage Rate

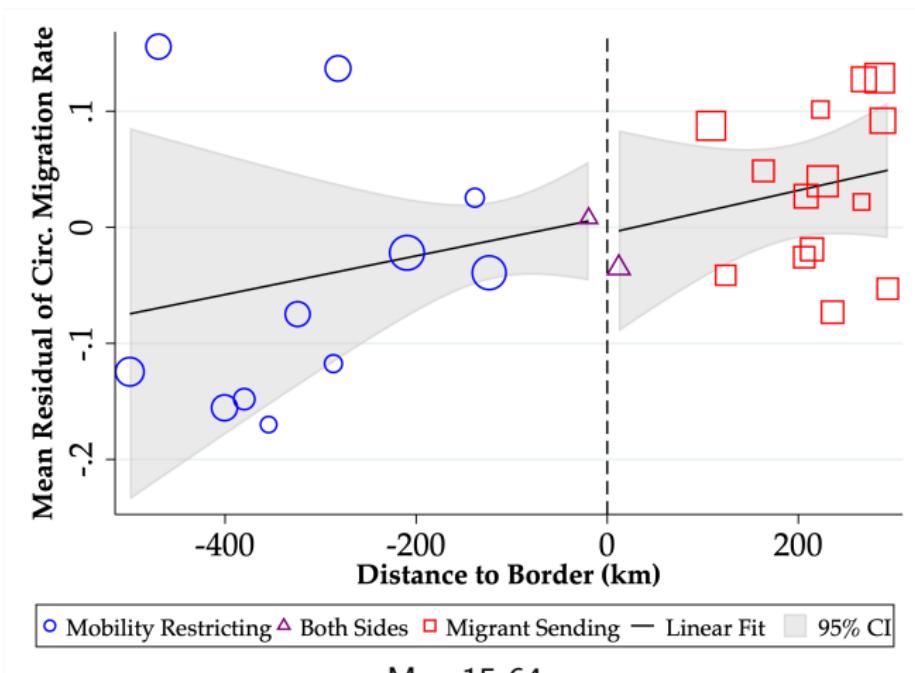


RD estimate: Men 25-34 were 0.21 p.p. (SE 0.06) more likely to be married just inside migrant-sending region

► Men 15-24

► 1960

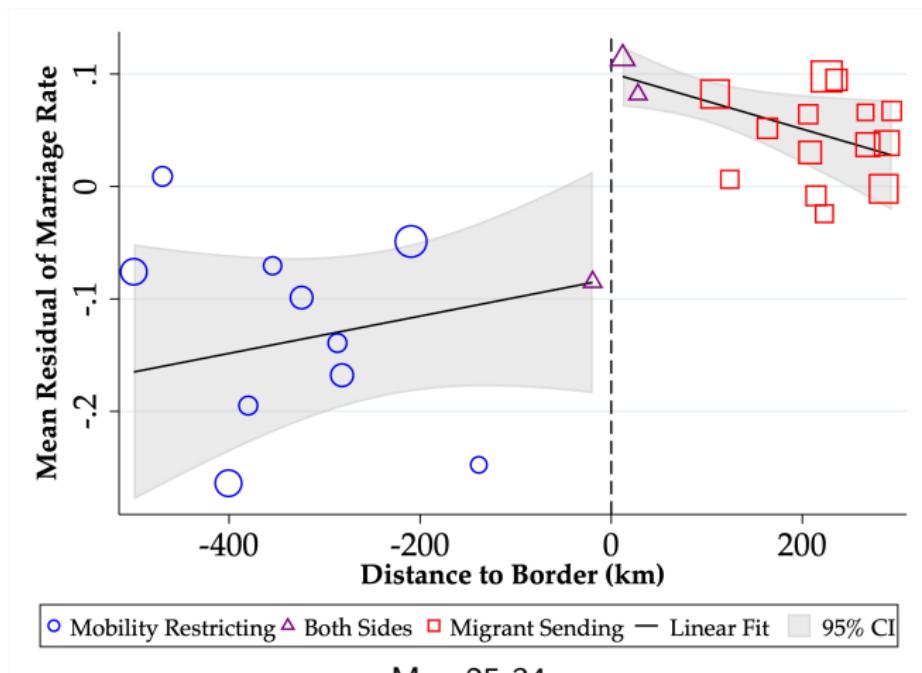
18 Years after Border Erased (1960): Circular Migration



Convergence: After mobility restrictions lifted, no difference in circular migration rates along the border

◀ 1940

18 Years after Border Erased (1960): Men's Marriage Rate



Men 25-34
Mobility Restricting Mean: 0.643

Persistence: Men 25-34 remained 0.18 p.p. (SE 0.05) more likely to be married just inside migrant-sending region

Men 15-24

1940

Roadmap

① Colonial-Era Differences: Narrative

- ▶ Migrants earned bridewealth earlier → lower spousal age gaps

② Colonial-Era Differences: Quantitative

- ▶ Age gaps lower, even after circular migration rates equalized

③ Linking Past and Present

- ▶ Age gaps still lower today → lower HIV risk

④ Present-Day Differences

- ▶ Lower HIV (and age gaps) in former migrant-sending area

Predictions: OLG Marriage Market with Bride Price

Setup: 2 generations, 2 sexes, women only fecund when young

Period 0: Old men's wages > young women's > young men's

→ All marriages are between old men and young women

Predictions: OLG Marriage Market with Bride Price

Setup: 2 generations, 2 sexes, women only fecund when young

Period 0: Old men's wages > young women's > young men's

→ All marriages are between old men and young women

Period 1: Some share of young men earn more than older men

→ Bride price inflation: Supply of brides is fixed and demand increases

→ Average age gap falls: Some young men marry, some older men can't

Predictions: OLG Marriage Market with Bride Price

Setup: 2 generations, 2 sexes, women only fecund when young

Period 0: Old men's wages > young women's > young men's

→ All marriages are between old men and young women

Period 1: Some share of young men earn more than older men

→ Bride price inflation: Supply of brides is fixed and demand increases

→ Average age gap falls: Some young men marry, some older men can't

Period 2: Young generation larger, so more older men priced out of (a second) marriage by more high-earning young men

Predictions: OLG Marriage Market with Bride Price

Setup: 2 generations, 2 sexes, women only fecund when young

Period 0: Old men's wages > young women's > young men's

→ All marriages are between old men and young women

Period 1: Some share of young men earn more than older men

→ Bride price inflation: Supply of brides is fixed and demand increases

→ Average age gap falls: Some young men marry, some older men can't

Period 2: Young generation larger, so more older men priced out of (a second) marriage by more high-earning young men

Periods 3, 4, ... : Smaller movements toward new steady state

→ Average age gap continues to fall, but by less: More young men marry, more older men can't

Predictions: OLG Marriage Market with Bride Price

Setup: 2 generations, 2 sexes, women only fecund when young

Period 0: Old men's wages > young women's > young men's

→ All marriages are between old men and young women

Period 1: Some share of young men earn more than older men

→ Bride price inflation: Supply of brides is fixed and demand increases

→ Average age gap falls: Some young men marry, some older men can't

Period 2: Young generation larger, so more older men priced out of (a second) marriage by more high-earning young men

Periods 3, 4, ... : Smaller movements toward new steady state

→ Average age gap continues to fall, but by less: More young men marry, more older men can't

This setting: Migrant-sending region has Period 1 in 1890, mobility-restricting region in 1940 → still differences today (2 periods later)?

Implications for Today: HIV Transmission

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

- ▶ Cross-sectional evidence: 1-year increase in the male-female age gap raises the woman's chance of contracting HIV by 5%

Implications for Today: HIV Transmission

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

- ▶ Cross-sectional evidence: 1-year increase in the male-female age gap raises the woman's chance of contracting HIV by 5%
- ① First-order effect: Older partner has been sexually active for longer, so he has had more time to contract HIV
- ② Second-order effects: Bargaining power in the relationship is more likely to be unequal, which could reduce safe-sex practices

Implications for Today: HIV Transmission

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

- ▶ Cross-sectional evidence: 1-year increase in the male-female age gap raises the woman's chance of contracting HIV by 5%
- ① First-order effect: Older partner has been sexually active for longer, so he has had more time to contract HIV
- ② Second-order effects: Bargaining power in the relationship is more likely to be unequal, which could reduce safe-sex practices

→ If smaller age gaps continue to today, we should expect *lower* HIV prevalence in the former migrant-sending institution

- ▶ Recall that circular migration converged by 1960, so this risk factor was equalized across the border well before Mozambique's epidemic took off in the 1990s (10 years after first documented case)

Roadmap

① Colonial-Era Differences: Narrative

- ▶ Migrants earned bridewealth earlier → lower spousal age gaps

② Colonial-Era Differences: Quantitative

- ▶ Age gaps lower, even after circular migration rates equalized

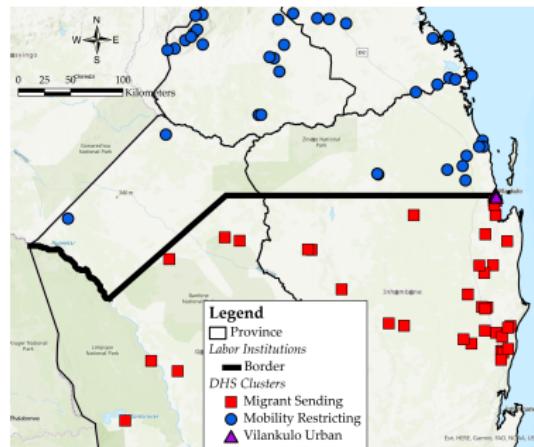
③ Linking Past and Present

- ▶ Age gaps still lower today → lower HIV risk

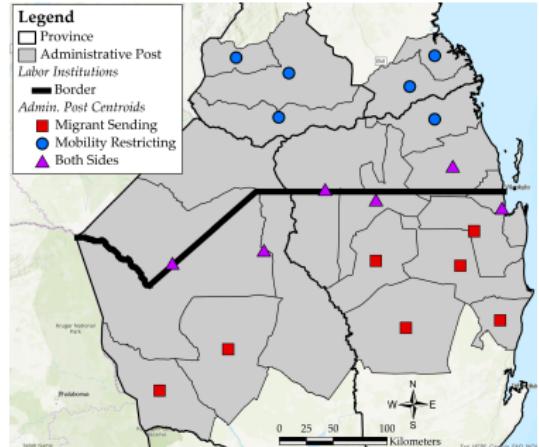
④ Present-Day Differences

- ▶ Lower HIV (and age gaps) in former migrant-sending area

Present-Day Data and Empirics



DHS Survey Clusters within 175 km of Border (2009, '11, '15, '18)



Admin-3 Units with Centroids within 150 km of Border (2007)

DHS and Census: Survey data linked to clusters or admin-3 unit

- ▶ Sample: Choose using MSE-optimal bandwidth (Calonico et al., 2014)

Strategy: RD (net of age, age², female FE, year FE, lon.)

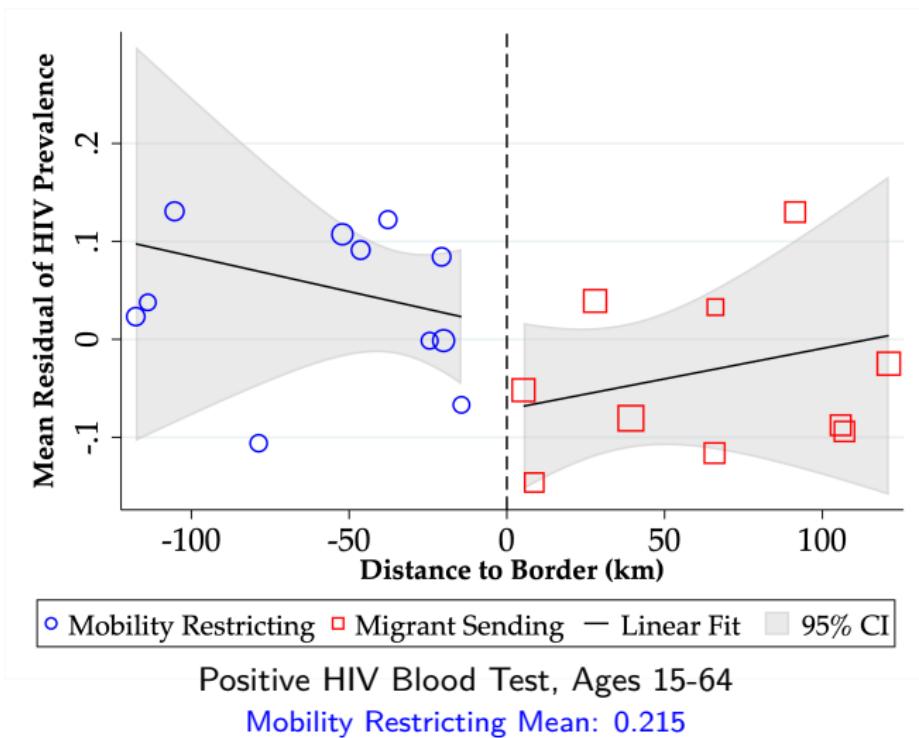
▶ Table

- ▶ Robustness: Randomization inference

▶ Kelly (2021)

▶ Cattaneo et al. (2015)

Long-Run Effects: HIV Prevalence

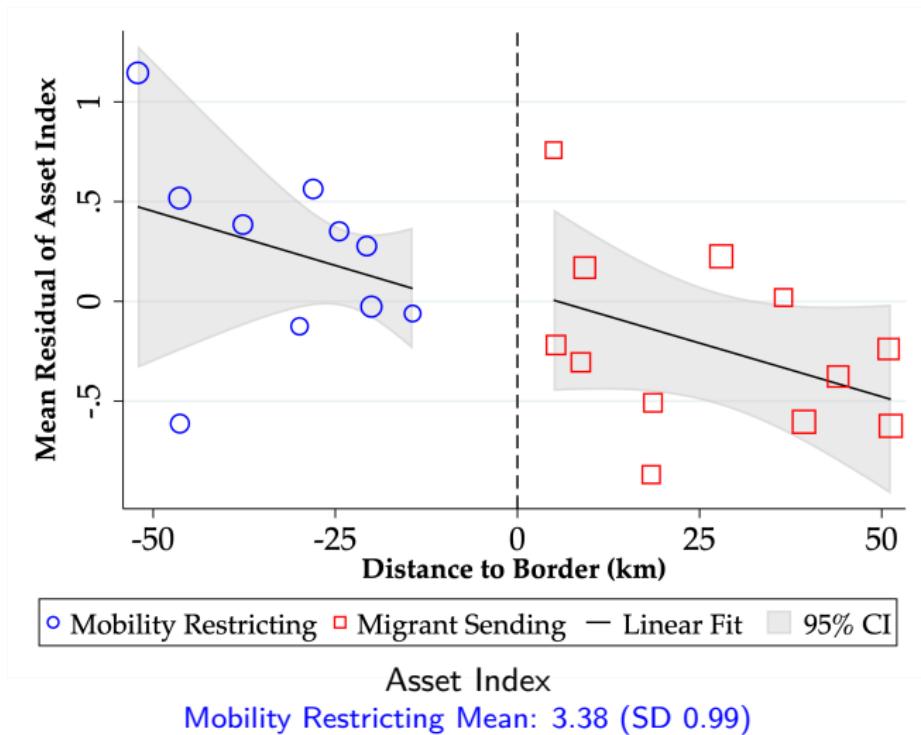


RD estimate: 0.10 p.p. (SE 0.05) lower HIV prevalence just inside migrant-sending region

► RD plots by sex

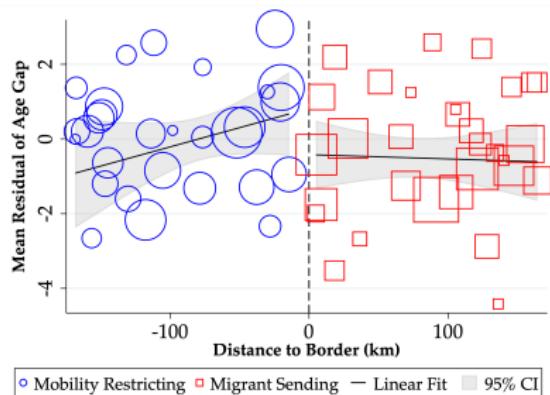
► HIV age profile within RD bandwidth

(Lack of) Long-Run Effects: Economic Development



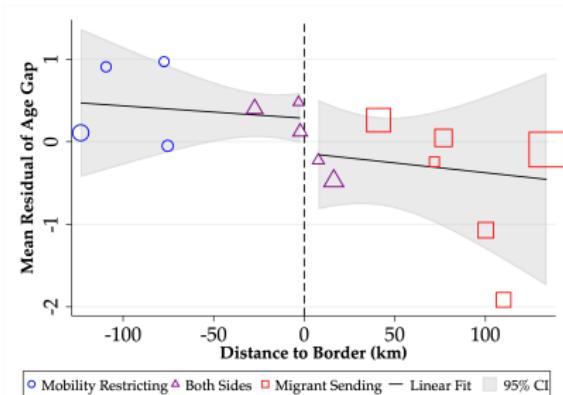
Convergence? Continued absence of differences? No discontinuities today in asset ownership, years of schooling

Explaining HIV Prevalence Result: Partner Age Gaps



Male-Female Age Gap between Most Recent Sexual Partners (DHS)

Mobility Restricting Mean: 5.68 (SD 4.51)



Male-Female Age Gap between Spouses (Census)

Mobility Restricting Mean: 8.38 (SD 6.59)

RD estimates: Age gaps are 2.0 years (SE 0.7) smaller between sexual partners, 0.8 years (SE 0.3) smaller between spouses [▶ Table](#)

Mediation analysis: 1/4 of discontinuity in HIV is due to discontinuity in age gaps [▶ Imai et al. \(2010\)](#)

Contributions

- ① **Extractive institutions:** First evidence on comparative short- and long-run impacts of major tools in African colonialism

Contributions

- ① **Extractive institutions:** First evidence on comparative short- and long-run impacts of major tools in African colonialism
- ② **Migration:** Understanding long-run effects of circular migration, as transportation costs fall rapidly around the globe

Contributions

- ① **Extractive institutions:** First evidence on comparative short- and long-run impacts of major tools in African colonialism
- ② **Migration:** Understanding long-run effects of circular migration, as transportation costs fall rapidly around the globe
- ③ **Marriage markets:** Novel channel through which history shapes present; effects of bride price practice

Contributions

- ① **Extractive institutions:** First evidence on comparative short- and long-run impacts of major tools in African colonialism
- ② **Migration:** Understanding long-run effects of circular migration, as transportation costs fall rapidly around the globe
- ③ **Marriage markets:** Novel channel through which history shapes present; effects of bride price practice
- ④ **History as determinant of health:** Informs policymakers about social context of spatial disparities in HIV pandemic

Contributions

- ① **Extractive institutions:** First evidence on comparative short- and long-run impacts of major tools in African colonialism
 - ② **Migration:** Understanding long-run effects of circular migration, as transportation costs fall rapidly around the globe
 - ③ **Marriage markets:** Novel channel through which history shapes present; effects of bride price practice
 - ④ **History as determinant of health:** Informs policymakers about social context of spatial disparities in HIV pandemic
- **Help 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)

Appendix: RD Validity

	Geographic Traits				Disease Suitability	
	Elevation (1)	Rainfall (2)	Slope (3)	Soil Index (4)	Malaria (5)	TseTse (6)
Migrant Sending	-1.798 (31.917) [23.254]	1.153 (6.533) [4.045]	0.014 (0.100) [0.054]	3.207 (3.887) [2.658]	-0.270 (0.368) [0.244]	-0.002 (0.009) [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 <i>p</i> -value	0.950	0.866	0.812	0.435	0.504	0.827
Mobility Restricting Mean	182.7	40.94	0.179	49.19	10.84	1.259
Mobility Restricting SD	109.3	44.76	0.132	9.894	1.757	0.078
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

Notes: Observations are 0.25×0.25 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: 1940 Census Summary Example

Grupos de Idades	Total geral	POPULAÇÃO INDÍGENA POR GRUPOS DE IDADES, SEGUNDO O SEXO E A OCUPAÇÃO									
		Total por sexos		Nas terras		Agricultura e pecuária		Pesa e exploração de minérios		Indústria	
		Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas	Varões	Fêmeas
Sexo.....											
Até 1 ano.....	58.337	27.869	20.458	7.317	14.624	3	-	27	-	12	-
De 1 a 4 anos.....	4.197	2.050	2.145	1.042	1.042	-	-	-	-	-	-
De 5 a 9 anos.....	10.342	5.254	5.088	2.042	2.042	-	-	-	-	-	-
De 10 a 14 anos.....	15.842	5.633	6.997	-	-	-	-	-	-	-	-
De 15 a 19 anos.....	8.992	3.171	5.811	-	-	-	-	-	-	-	-
De 20 a 24 anos.....	7.908	3.029	4.879	-	-	-	-	-	-	-	-
De 25 a 29 anos.....	4.648	2.060	2.915	2.179	2.179	-	-	-	-	-	-
De 30 a 34 anos.....	4.048	1.928	2.120	1.028	1.028	-	-	-	-	-	-
De 35 a 39 anos.....	3.823	2.015	1.397	1.281	1.281	-	-	-	-	-	-
De 40 a 44 anos.....	3.415	1.815	1.600	1.015	1.015	-	-	-	-	-	-
De 45 a 49 anos.....	3.116	1.746	1.366	916	916	-	-	-	-	-	-
De 50 a 54 anos.....	3.013	1.691	849	746	746	-	-	-	-	-	-
De 55 a 59 anos.....	2.813	1.652	653	562	562	-	-	-	-	-	-
De 60 a 64 anos.....	2.613	1.594	529	464	464	-	-	-	-	-	-
De 65 a 69 anos.....	2.313	1.411	411	302	302	-	-	-	-	-	-
De 70 a 74 anos.....	419	158	200	-	-	-	-	-	-	-	-
De 75 a 79 anos.....	136	53	123	-	-	-	-	-	-	-	-
De 80 a 84 anos.....	95	33	62	-	-	-	-	-	-	-	-
De 85 a 89 anos.....	63	22	44	-	-	-	-	-	-	-	-
De 90 a 94 anos.....	35	11	24	-	-	-	-	-	-	-	-
De 95 a 99 anos.....	1	1	4	-	-	-	-	-	-	-	-
De 100 a 104 anos.....	-	-	-	-	-	-	-	-	-	-	-
De 105 a 109 anos.....	-	-	-	-	-	-	-	-	-	-	-
De 110 a 114 anos.....	-	-	-	-	-	-	-	-	-	-	-
De 115 a 119 anos.....	-	-	-	-	-	-	-	-	-	-	-
De 120 a 124 anos.....	-	-	-	-	-	-	-	-	-	-	-

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

[◀ Back](#)

Appendix: Colonial RD Results

	Men Migrants (1)	Women Farming (2)	Married Men 15-24 (3)	Married Men 25-34 (4)	Children per Woman (5)	Boys in School (6)	Girls in School (7)
<i>Panel A. 2 Years before End of Mobility Restricting Institution (1940)</i>							
Migrant Sending	0.207 (0.089) [0.085]	0.015 (0.018) [0.016]	0.227 (0.145) [0.128]	0.210 (0.062) [0.047]	0.202 (0.098) [0.092]	-0.034 (0.014) [0.011]	-0.001 (0.006) [0.006]
Observations	29	29	28	28	28	27	29
Bandwidth	-503, 401	-503, 401	-503, 401	-503, 401	-503, 401	-503, 401	-503, 401
Kelly Exact p-value	0.059	0.643	0.002	0.006	0.000	0.240	0.819
Mobility Restricting Mean	0.047	0.958	0.300	0.833	0.848	0.042	0.006
Mobility Restricting SD					0.144		
Spatial Autocorrelation	-0.14	-0.10	-0.04	0.02	-0.15	-0.19	-0.06
Spatial Autocorrelation SD	0.11	0.10	0.11	0.11	0.12	0.12	0.10
<i>Panel B. 18 Years after End of Mobility Restricting Institution (1960)</i>							
Migrant Sending	-0.025 (0.049) [0.050]	0.009 (0.005) [0.006]	0.101 (0.048) [0.045]	0.180 (0.048) [0.040]	0.056 (0.086) [0.082]	-0.026 (0.034) [0.030]	-0.026 (0.024) [0.021]
Observations	27	27	27	27	28	26	28
Bandwidth	-500, 294	-500, 294	-500, 294	-500, 294	-500, 294	-500, 294	-500, 294
Kelly Exact p-value	0.988	0.169	0.004	0.000	0.922	0.841	0.748
Mobility Restricting Mean	0.163	0.997	0.135	0.643	0.807	0.089	0.041
Mobility Restricting SD					0.123		
Spatial Autocorrelation	-0.09	-0.03	-0.10	-0.16	0.05	0.52	0.24
Spatial Autocorrelation SD	0.12	0.11	0.13	0.13	0.12	0.13	0.13

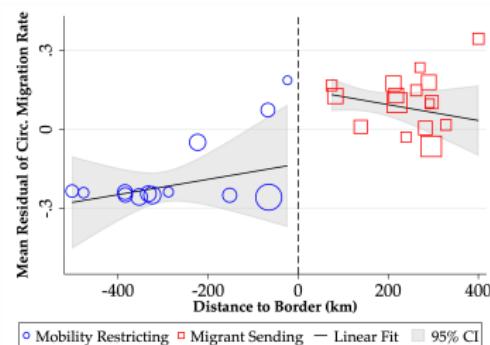
Notes: Observations are districts. Robust standard errors are in parentheses, Conley (1999) standard errors with a 100 km window and Bartlett kernel are in brackets. Regressions estimate a local linear RD specification on each side of the border with a triangular kernel and include longitude as a control. Bandwidths are set to include all districts within the provinces adjacent or closest to the border. Kelly exact p-values are calculated using the spatial randomization inference procedure suggested by Kelly (2021).

Appendix: Colonial Randomization Inference Results

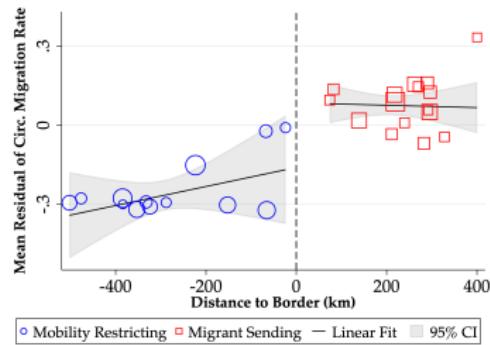
	Men Migrants (1)	Women Farming (2)	Married Men 15-24 (3)	Married Men 25-34 (4)	Children per Woman (5)	Boys in School (6)	Girls in School (7)
<i>Panel A. 2 Years before End of Mobility Restricting Institution (1940)</i>							
Migrant Sending	0.195 {0.014}	-0.008 {0.554}	0.206 {0.056}	0.137 {0.024}	0.087 {0.192}	-0.034 {0.020}	0.009 {0.714}
Observations	10	10	10	10	10	10	10
Bandwidth	-224, 218	-224, 218	-289, 218	-289, 218	-224, 220	-224, 220	-224, 218
Mobility Restricting Mean	0.117	0.960	0.263	0.768	0.757	0.038	0.002
Mobility Restricting SD					0.093		
<i>Panel B. 18 Years after End of Mobility Restricting Institution (1960)</i>							
Migrant Sending	-0.017 {0.646}	-0.001 {0.746}	0.118 {0.040}	0.202 {0.014}	-0.080 {0.276}	0.018 {0.832}	0.017 {0.738}
Observations	10	10	10	10	10	10	10
Bandwidth	-282, 207	-282, 207	-287, 164	-287, 164	-282, 164	-287, 164	-282, 164
Mobility Restricting Mean	0.238	0.995	0.143	0.620	0.827	0.089	0.055
Mobility Restricting SD					0.108		

Notes: Observations are districts. Randomization inference p -values are in curly braces. Bandwidths are set to include the 5 districts in each institution with the closest centroids to the border. The p -values are calculated using the procedure suggested by Cattaneo et al. (2015).

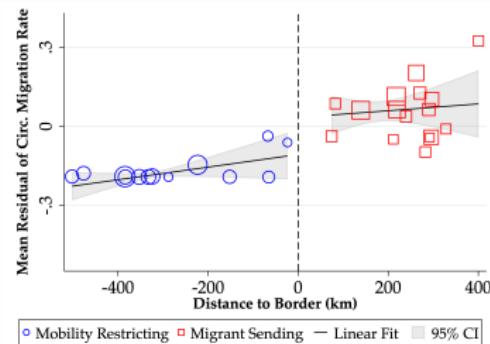
Appendix: Circular Migration by Age Group, 1940



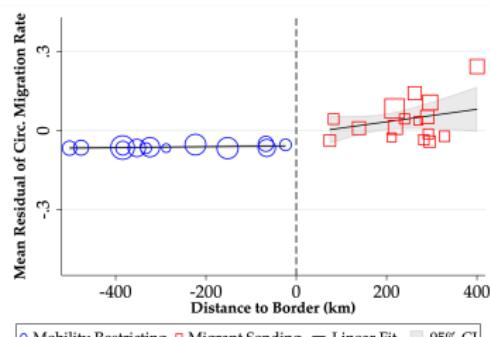
Men 15-24



Men 25-34



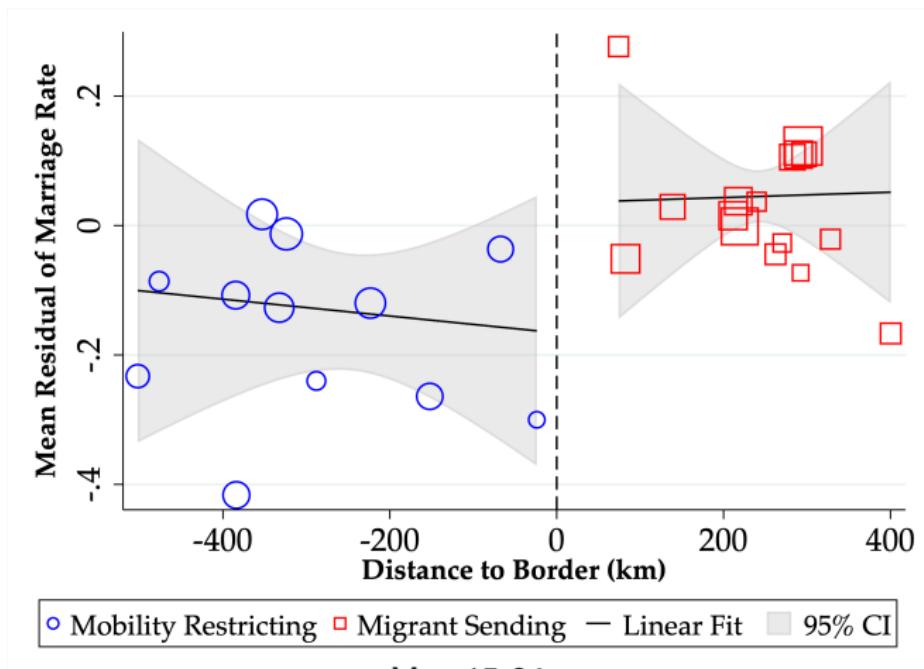
Men 35-44



Men 45-54

◀ Back

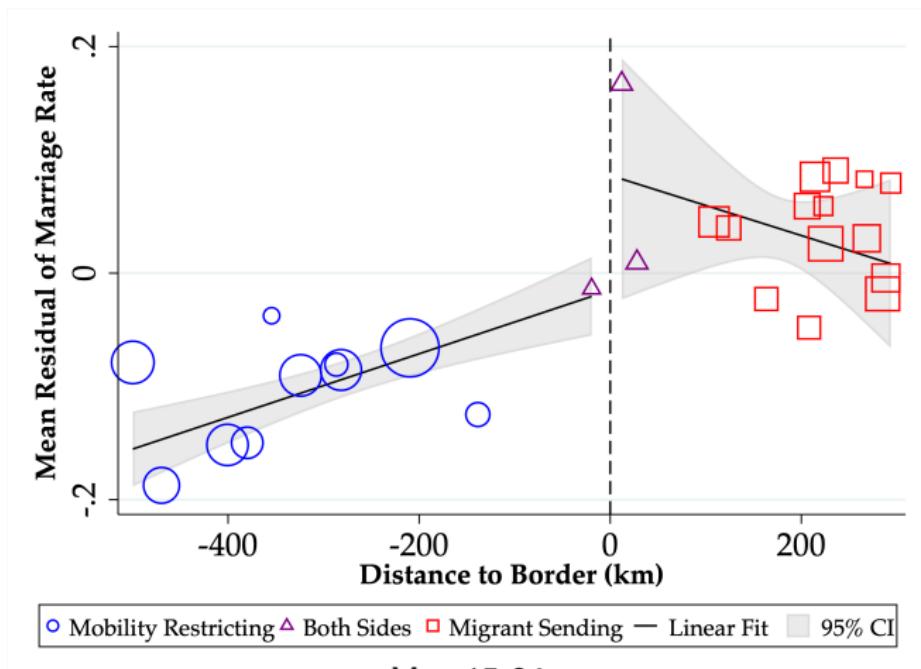
Appendix: Men's Marriage Rate, 1940



RD estimate: Men 15-24 were 0.23 p.p. (SE 0.15) more likely to be married just inside migrant-sending region

[◀ Back](#)

Appendix: Men's Marriage Rate, 1960



RD estimate: Men 15-24 were 0.10 p.p. (SE 0.05) more likely to be married just inside migrant-sending region

◀ Back

Appendix: Modern RD Results

	HIV Positive			Assets	Schooling	
	Pooled (1)	Women (2)	Men (3)	Index (4)	Female (5)	Male (6)
Migrant Sending	-0.103 (0.049) [0.037]	-0.089 (0.053) [0.041]	-0.097 (0.084) [0.093]	0.067 (0.322) [0.414]	0.377 (0.327) [0.281]	0.224 (0.782) [0.795]
Observations	860	588	212	2,513	883	815
Clusters	21	22	14	22	19	22
Bandwidth	124.4	128.3	86.5	59.6	64.8	71.5
Wild Cluster Bootstrap <i>p</i> -value	0.073	0.137	0.458	0.862	0.302	0.818
Mobility Restricting Mean	0.215	0.214	0.198	3.375	2.498	3.443
Mobility Restricting SD				0.992	2.565	3.037
Spatial Autocorrelation	0.07	-0.05	0.05	-0.19	-0.26	-0.16
Spatial Autocorrelation SD	0.21	0.20	0.19	0.15	0.16	0.15

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

◀ Back

▶ Appendix: Channel RD Results

Appendix: HIV RD Results using Kelly (2021)

	Pooled (1)	Women (2)	Men (3)
Migrant Sending	-0.151 (0.050)	-0.112 (0.061)	-0.205 (0.095)
Observations	21	22	14
Kelly Exact p -value	0.073	0.202	0.918
Moran I p -value	0.031	0.154	0.093

Notes: Observations are survey cluster-level means for those within the Calonico, Cattaneo, & Titiunik (2014) MSE-optimal bandwidths estimated with individual-level data. Exact p -values are calculated using the spatial randomization inference procedure suggested by Kelly (2021).

◀ Back

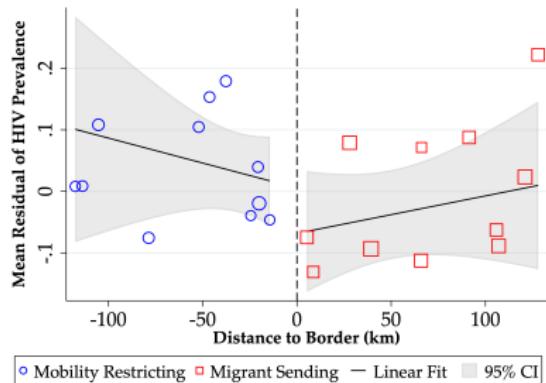
Appendix: HIV Randomization Inference Results

	Pooled (1)	Women (2)	Men (3)
Migrant Sending	-0.076 {0.016}	-0.064 {0.070}	-0.102 {0.022}
Observations	819	540	279
Clusters	20	20	20
Bandwidth	-114, 122	-114, 122	-114, 122
Mobility Restricting Mean	0.217	0.217	0.216

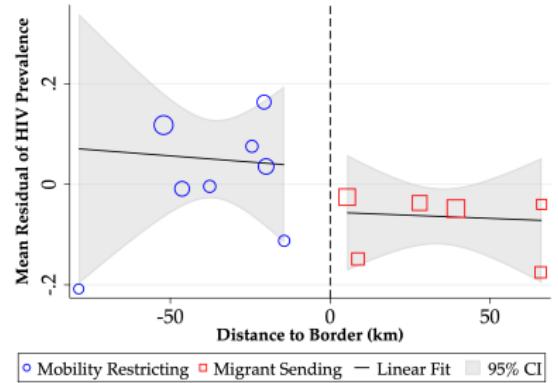
Notes: Observations are Mozambique DHS respondents. Randomization inference p -values are in curly braces. Bandwidths are set to include the 10 clusters in each institution with closest to the border. The p -values are calculated using the procedure suggested by Cattaneo et al. (2015).

◀ Back

Appendix: HIV RD Plots by Sex



Women 15-64

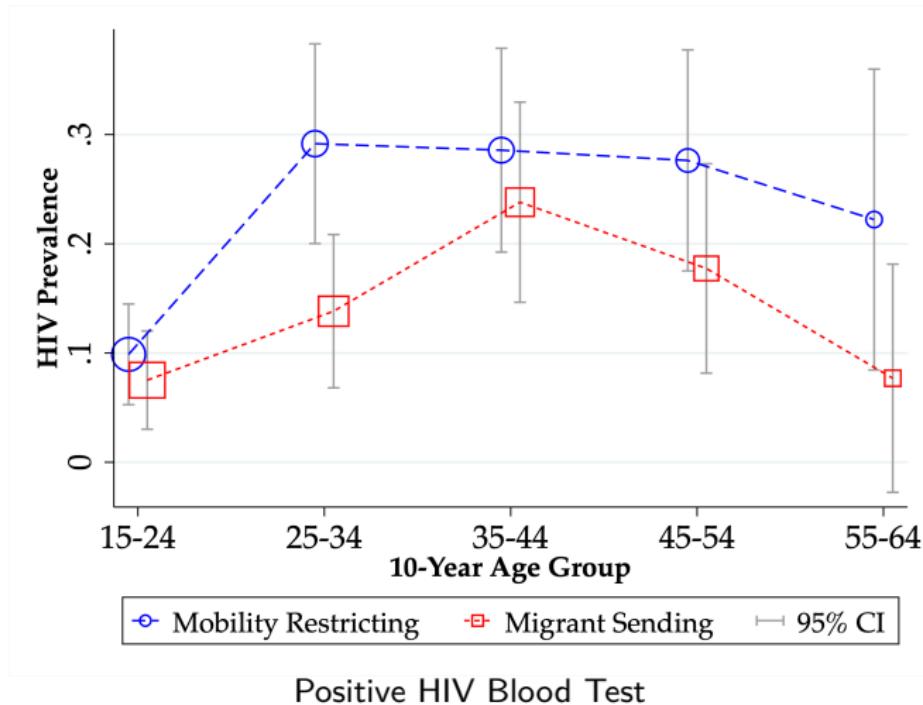


Men 15-64

RD estimates: 0.09 p.p. (SE 0.05) lower for women, 0.10 p.p. (SE 0.08) lower for men just inside migrant-sending region

[◀ Back](#)

Appendix: HIV Age Profile within RD Bandwidth



Comparison of means: Much lower HIV prevalence for all age groups within RD bandwidth in migrant-sending region

[◀ Back](#)

Appendix: Channel RD Results

	Full Sample		Married		Married
	Women (1)	Men (2)	Women (3)	Men (4)	Women (5)
<i>Panel A. Male-Female Age Gap</i>	<i>Last Sexual Partner</i>				<i>Spouse</i>
Migrant Sending	-2.309 (0.901) [0.703]	-2.042 (0.733) [0.788]	-1.867 (0.773) [0.708]	-1.769 (0.960) [1.160]	-0.794 (0.291) [0.221]
Observations	218	320	281	240	9,287
Clusters	14	60	22	57	15
Bandwidth	59.7	170.6	96.9	174.1	139.1
Wild Cluster Bootstrap <i>p</i> -value	0.131	0.053	0.048	0.230	0.072
Mobility Restricting Mean	7.34	5.68	6.91	6.75	8.38
Mobility Restricting SD	5.45	4.51	4.99	4.61	6.59
Spatial Autocorrelation	-0.03	0.11	-0.15	-0.06	0.19
Spatial Autocorrelation SD	0.16	0.09	0.17	0.09	0.21
<i>Panel B. Partners</i>	<i>Multiple Sexual Partners Last Year</i>				<i>Polygyny</i>
Migrant Sending	-0.042 (0.025) [0.035]	-0.066 (0.100) [0.084]	-0.031 (0.018) [0.025]	-0.117 (0.095) [0.076]	-0.040 (0.052) [0.068]
Observations	936	432	574	325	444
Clusters	37	46	33	57	26
Bandwidth	119.9	137.0	109.4	157.8	81.7
Wild Cluster Bootstrap <i>p</i> -value	0.337	0.540	0.329	0.285	0.684
Mobility Restricting Mean	0.02	0.23	0.01	0.28	0.34
Spatial Autocorrelation	-0.19	-0.06	-0.43	0.05	-0.11
Spatial Autocorrelation SD	0.12	0.10	0.14	0.09	0.15

Notes: Observations are Mozambique DHS respondents in Columns (1)-(4) and Mozambique 2007 census respondents in Column (5). Standard errors clustered by survey cluster (DHS data) or 3rd-level administrative unit (census data) are in parentheses. Refer to the notes in Appendix: Modern RD Results for additional details.

◀ Back

◀ Appendix: Modern RD Results

Appendix: Mediation Analysis

		HIV Positive: Pooled				
		(1)	(2)	(3)	(4)	(5)
Mediating Variable		Asset Index	Years of School	Age Gap Last Sex	Multiple Partners	Condom Last Sex
Mediation Effect		-0.007 [-0.025, 0.009]	-0.004 [-0.014, 0.003]	-0.032 [-0.062, -0.005]	0.000 [-0.005, 0.005]	-0.001 [-0.006, 0.003]
Direct Effect		-0.124 [-0.221, -0.022]	-0.114 [-0.204, -0.018]	-0.104 [-0.202, -0.000]	-0.133 [-0.223, -0.038]	-0.112 [-0.193, -0.026]
Total Effect		-0.131 [-0.233, -0.028]	-0.118 [-0.211, -0.023]	-0.136 [-0.240, -0.029]	-0.133 [-0.223, -0.039]	-0.112 [-0.194, -0.027]
Mediation/Total		0.051	0.034	0.236	-0.000	0.007
Observations		610	677	319	724	645
Bandwidth		99.6	121.9	133.3	109.8	125.2
Clusters		15	21	19	18	21
Mobility Restricting Mean		0.202	0.207	0.194	0.210	0.215

Notes: Observations are Mozambique DHS respondents. 95% confidence intervals are in brackets. Effects and confidence intervals are estimated using the causal mediation analysis procedure suggested by Imai et al. (2010) for survey clusters within the MSE-optimal RD bandwidth (Calonico, Cattaneo, & Titiunik, 2014).