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THE LONG-TERM EFFECTS OF AFRICA'S SLAVE TRADES*

NATHAN NUNN

Can part of Africa's current underdevelopment be explained by its slave trades? To explore this question, I use data from shipping records and historical documents reporting slave ethnicities to construct estimates of the number of slaves exported from each country during Africa's slave trades. I find a robust negative relationship between the number of slaves exported from a country and current economic performance. To better understand if the relationship is causal, I examine the historical evidence on selection into the slave trades and use instrumental variables. Together the evidence suggests that the slave trades had an adverse effect on economic development.

I. INTRODUCTION

Africa's economic performance in the second half of the twentieth century has been poor. One, often informal, explanation for Africa's underdevelopment is its history of extraction, characterized by two events: the slave trades and colonialism. Bairoch (1993, p. 8) writes that "there is no doubt that a large number of negative structural features of the process of economic underdevelopment have historical roots going back to European colonization." Manning (1990, p. 124) echoes Bairoch but focuses on the slave trades, writing, "Slavery was corruption: it involved theft, bribery, and exercise of brute force as well as ruses. Slavery thus may be seen as one source of precolonial origins for modern corruption."

Recent empirical studies suggest that Africa's history can explain part of its current underdevelopment. These studies focus on the link between countries' colonial experience and current economic development (Grier 1999; Englebert 2000a, 2000b;

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Acemoglu, Johnson, and Robinson 2001, 2002; Bertocchi and Canova 2002; Lange 2004). However, the other important event in Africa's history, its slave trades, has yet to be examined empirically. There are reasons to expect that the slave trades may have been at least as important as official colonial rule for Africa's development. For a period of nearly 500 years, from 1400 to 1900, the African continent simultaneously experienced four slave trades. By comparison, official colonial rule lasted from 1885 to about 1960, a total of approximately 75 years.

This paper provides the first empirical examination of the importance of Africa's slave trades in shaping subsequent economic development. In doing this, I construct measures of the number of slaves exported from each country in Africa in each century between 1400 and 1900. The estimates are constructed by combining data from ship records on the number of slaves shipped from each African port or region with data from a variety of historical documents that report the ethnic identities of slaves that were shipped from Africa. I find a robust negative relationship between the number of slaves exported from each country and subsequent economic performance. The African countries that are the poorest today are the ones from which the most slaves were taken.

This finding cannot be taken as conclusive evidence that the slave trades *caused* differences in subsequent economic development. An alternative explanation that is just as plausible is that countries that were initially the most economically and socially underdeveloped selected into the slave trades, and these countries continue to be the most underdeveloped today. In other words, the slave trades may be correlated with unobserved country characteristics, resulting in biased estimates of the effect of the slave trades on economic development.

I pursue a number of strategies to better understand the reason behind the relationship between slave exports and current economic performance. First, I review the evidence from African historians on the nature of selection into the slave trades. I also use historic data on pre-slave trade population densities to examine whether it was the less developed parts of Africa that selected into the slave trades. Both sources of evidence show that it was actually the most developed areas of Africa that tended to select into the slave trades. I discuss the reason behind this seemingly paradoxical relationship in detail. Second, I use instruments to estimate the causal effect of the slave trades on subsequent economic development. The instruments are the sailing distances

from each country to the nearest locations of demand for slave labor in each of the four slave trades. Like the OLS coefficients, the IV coefficients are negative and significant, suggesting that increased extraction during the slave trades caused worse subsequent economic performance.

I then explore the precise channel of causality underlying the relationship between slave exports and economic development. Using historical evidence as a guide, I examine whether the procurement of slaves through internal warfare, raiding, and kidnapping resulted in subsequent state collapse and ethnic fractionalization. I find that the data are consistent with these channels.

These findings complement the research of Engerman and Sokoloff (1997, 2002), which shows that slavery in the New World resulted in the evolution of institutions that were not conducive to economic growth.¹ My results show that not only was the use of slaves detrimental for a society, but the production of slaves, which occurred through domestic warfare, raiding, and kidnapping, also had negative impacts on subsequent development.

The paper is structured as follows. In the following section, I provide a description of Africa's slave trades, providing a detailed historical overview of the manner in which slaves were procured and the resulting adverse effects. In Section III, I describe the construction of the slave export figures. Section IV documents the correlations that exist in the data, and Section V turns to the issue of causality. In Section VI, guided by the historical evidence, I examine the potential channels of causality. Section VII concludes.

II. HISTORICAL BACKGROUND

Between 1400 and 1900, the African continent experienced four simultaneous slave trades. The largest and most well-known is the trans-Atlantic slave trade where, beginning in the fifteenth century, slaves were shipped from West Africa, West-Central Africa, and Eastern Africa to the European colonies in the New World. The three other slave trades—the trans-Saharan, Red Sea, and Indian Ocean slave trades—were much older and pre-dated the trans-Atlantic slave trade. During the trans-Saharan slave trade, slaves were taken from south of the Saharan desert to

1. Also see Lagerlöf (2005) and Mitchener and McLean (2003) for related evidence.

Northern Africa. In the Red Sea slave trade, slaves were taken from inland of the Red Sea and shipped to the Middle East and India. In the Indian Ocean slave trade, slaves were taken from Eastern Africa and shipped either to the Middle East and India or to plantation islands in the Indian Ocean.

A number of characteristics of Africa's slave trades make them distinct from previous slave trades. First, the total volume of slaves traded was unprecedented. During the trans-Atlantic slave trade alone, approximately 12 million slaves were exported from Africa. Another 6 million were exported in the other three slave trades. These figures do not include those who were killed during the raids or those who died on their journey to the coast. The total effect of the slave trades, according to calculations by Patrick Manning (1990, p. 171), was that by 1850 Africa's population was only half of what it would have been had the slave trades not taken place.

Africa's slave trades were also unique because, unlike previous slave trades, individuals of the same or similar ethnicities enslaved one another. This had particularly detrimental consequences, including social and ethnic fragmentation, political instability and a weakening of states, and the corruption of judicial institutions.

The most common manner in which slaves were taken was through villages or states raiding one another (Northrup 1978; Lovejoy 1994). Where groups of villages had previously developed into larger-scale village federations, relations between the villages tended to turn hostile (e.g., Azevedo 1982; Inikori 2000; Hubbell 2001). As a result, ties between villages were weakened, which in turn impeded the formation of larger communities and broader ethnic identities. Kusimba (2004, p. 66) writes that "insecurity confined people within ethnic boundaries constructing spheres of interaction." Because of this process, the slave trades may be an important factor explaining Africa's high level of ethnic fractionalization today. This is significant for economic development given the established relationship between ethnic fractionalization and long-term economic growth (Easterly and Levine 1997).

Because of the environment of uncertainty and insecurity at the time, individuals required weapons, such as iron knives, spears, swords or firearms, to defend themselves. These weapons could be obtained from Europeans in exchange for slaves, who were often obtained through local kidnappings. This further perpetuated the slave trade and the insecurity that it caused,

which in turn further increased the need to enslave others to protect oneself (Mahadi 1992; Hawthorne 1999, pp. 108–109). Historians have named this vicious cycle the “gun–slave cycle” (e.g., Lovejoy 2000) or the “iron–slave cycle” (e.g., Hawthorne 2003). The result of this vicious cycle was not only that communities raided other communities for slaves, but also that members of a community raided and kidnapped others within the community. Well-documented examples come from the Balanta of modern day Guinea-Bissau, the Minyanka of modern day Mali (Klein 2001), and the Makua, Chikunda, and Yao of East Central Africa (Alpers 1969, pp. 413–414, 1975, p. 225; Isaacman 1989, pp. 191–192, 196).

Generally, the consequence of internal conflict was increased political instability and in many cases the collapse of preexisting forms of government (Lovejoy 2000, pp. 68–70). In sixteenth-century northern Senegambia, the Portuguese slave trade was a key factor leading to the eventual disintegration of the Joloff Confederation, which was replaced by the much smaller kingdoms of Waalo, Kajoor, Baol, Siin, and Saalum. Further south, in southern Senegambia, the same pattern is observed. Prior to the slave trades, complex state systems were in the process of evolving. However, this evolution stagnated soon after the arrival of the Portuguese in the 15th century (Barry 1998, pp. 36–59). Similar patterns of instability have also been documented in Eastern Africa (e.g., Isaacman [1989]; Mbajedwe [2000]). In the late 19th century, the slave trades resulted in the disintegration of the Shambaa kingdom, the Gweno kingdom, and the Pare states in East Africa’s Pangani valley (Kimambo 1989, p. 247; Mbajedwe 2000, pp. 341–342).

The most dramatic example may be the Kongo kingdom of West-Central Africa. As early as 1514, the kidnapping of local Kongo citizens for sale to the Portuguese had become rampant, threatening social order and the King’s authority. In 1526, Affonso, king of Kongo, wrote to Portugal complaining that “there are many traders in all corners of the country. They bring ruin to the country. Every day people are enslaved and kidnapped, even nobles, even members of the king’s own family” (Vansina 1966, p. 52). This break-down of law and order was partly responsible for the weakening and eventual fall of the once powerful state (Inikori 2003). For many of the other Bantu-speaking ethnicities, stable states also existed in earlier periods, but by the time the slave trades were brought to an end, few ancient states remained (Colson 1969, pp. 36–37).

Preexisting governance structures were generally replaced by small bands of slave raiders, controlled by an established ruler or warlord. However, these bands were generally unable to develop into large, stable states. Colson (1969, p. 35) writes that “both the bands and the new states they created retained an air of improvisation. Few band leaders were able to hand power to a legitimate successor. Even where a band leader had become the ruler of a state, succession remained a problem. Leadership was a personal role, rather than an established office.”

The slave trades also contributed to political instability by causing the corruption of previously established legal structures. In many cases, it became common to obtain slaves by falsely accusing others of witchcraft or other crimes (Koelle 1854; Northrup 1978; Lovejoy 2000). Klein (2001, p. 59) writes that “communities began enslaving their own. Judicial penalties that formerly had taken the form of beatings, payment of compensation or exile, for example, were now converted to enslavement.” Often, leaders themselves supported or even instigated this abuse of the judicial system (Mahadi 1992; Hawthorne 1999, 2003; Klein 2001). To protect themselves and their communities from being raided, leaders often chose to pay slaves as tribute, which were often obtained through the judicial system. Hawthorne (1999, 2003) provides detailed studies of this process among the Cassanga of modern day Guinea Bissau. The chief of the Cassanga used the “red water ordeal” to procure slaves and their possessions. Those accused of a crime were forced to drink a poisonous red liquid. If they vomited, then they were judged to be guilty. If they did not vomit, they were deemed not guilty. However, for those that did not vomit this usually brought death by poisoning. Their possessions were then seized and their family members were sold into slavery.

Evidence from research showing a relationship between a country’s history of state development and subsequent economic performance suggests that these effects of the slave trades may be important for current economic development (Bockstette, Chanda, and Putterman 2002; Chanda and Putterman 2005). Others have argued that Africa’s underdevelopment is a direct result of state failure, which stems from Africa’s weak and unstable precolonial political structures (Herbst 1997, 2000). Because Africa’s slave trades were an important factor affecting political underdevelopment, they may be a central reason behind Africa’s weak states today.

III. SLAVE EXPORT DATA

Because I am interested in examining the effects of the slave trades that resulted because of the procurement of slaves, my measure of interest is the total number of slaves taken from each country during the four slave trades between 1400 and 1900.²

I use two types of data to construct the slave export estimates. The first are data that report the total number of slaves exported from each port or region in Africa. I refer to these as shipping data. For the trans-Atlantic slave trade, the data are from the updated version of the *Trans-Atlantic Slave Trade Database* constructed by Eltis et al. (1999). The database records information for 34,584 voyages from 1514 to 1866. The shipping data are originally from various documents and records located around the world. Because, in most European ports, merchants were required to register their ships and declare the volume and value of goods transported for each ship and voyage, typically, there exists a number of different registers and documents. In the database, 77% of the trans-Atlantic slave voyages after 1700 have shipping information from more than one source; the average number of sources for each voyage is six. It is estimated that the database contains 82% of all trans-Atlantic slaving voyages ever attempted (Eltis and Richardson 2006).

Data for the early period of the Atlantic slave trade not covered by the *Trans-Atlantic Slave Trade Database* are from Elbl (1997). For the Indian Ocean, Red Sea, and trans-Saharan slave trades, data are from Austen (1979, 1988, 1992). The data are based on estimates from all available documents, records, and accounts by observers and government officials on the location and volume of slave exports.

With the shipping data one can calculate the number of slaves that were shipped from each coastal country. However, this does not give an accurate indication of where slaves were originally captured. Slaves shipped from the ports of a coastal country may have come from a country located further inland. To estimate the number of slaves shipped from the coast that came from inland countries, I also use a second source of data that reports the ethnic identity of slaves shipped from Africa. This information comes from a variety of sources, such as records of sale, slave registers,

2. Ideally, I would also like to include people that entered into local domestic slavery. However, the necessary data to construct these estimates do not exist.

slave runaway notices, court records, church records, and notarial documents.

There were a number of ways of identifying the ethnicity or “nation” of a slave. The easiest was often by a slave’s name. Slaves were often given a Christian first name and a surname that identified their ethnicity (e.g., Tardieu [2001]). As well, a slave’s ethnicity could often be determined from ethnic markings, such as cuts, scars, hairstyles, or the filing of teeth (Karasch 1987, pp. 4–9). Oldendorp (1777, p. 169) writes that “the people of all Negro nations are marked with certain cuts on the skin. As far as I have been able to learn from the Negroes themselves, these serve to distinguish one nation from another.”

Because slaves were legally defined as property, those engaged in the buying and selling of slaves had a strong incentive to correctly identify the birthplace or “nation” of slaves (Wax 1973). Moreno Fraginals (1977, p. 190) writes that “the slave trade was the business that involved the greatest amount of capital investment in the world during the eighteenth and nineteenth centuries. And a business of this size would never have kept up a classificatory scheme had it not been meaningful (in overall general terms, in keeping with reality) in designating in a *very precise* way the merchandise that was being traded.”

Information on the ethnicities of slaves shipped during the trans-Atlantic slave trade come from 54 different samples, totalling 80,656 slaves, with 229 distinct ethnic designations reported. Table I summarizes information about the samples used in the trans-Atlantic slave trade. The table reports the location, the years covered, the number of slaves, and the number of ethnicities that could be identified for each sample. Similar tables for the other three slave trades are reported in Nunn (2007).

The ethnicity data for the Indian Ocean slave trade come from six samples, with a total of 21,048 slaves and 80 different ethnicities reported. The data for the Red Sea slave trade are from two samples: one from Jedda, Saudi Arabia, and the other from Bombay, India. The samples provide information for 67 slaves, with 32 different reported ethnicities. For the trans-Saharan slave trade two samples are available: one from central Sudan and the other from western Sudan. The samples provide information on the origins of 5,385 slaves, with 23 different ethnicities recorded. The shipping data from Austen (1992) also provide additional information on which caravan slaves were shipped on, the city or town that the caravan originated in, the destination of the

TABLE I
SLAVE ETHNICITY DATA FOR THE TRANS-ATLANTIC SLAVE TRADE

Location	Years	Num. ethnic.	Num. obs.	Record type
Valencia, Spain	1482–1516	77	2,675	Crown records
Puebla, Mexico	1540–1556	14	115	Notarial records
Dominican Republic	1547–1591	26	22	Records of sale
Peru	1548–1560	16	202	Records of sale
Mexico	1549	12	80	Plantation accounts
Peru	1560–1650	30	6,754	Notarial records
Lima, Peru	1583–1589	15	288	Baptism records
Colombia	1589–1607	9	19	Various records
Mexico	1600–1699	28	102	Records of sale
Dominican Republic	1610–1696	33	55	Government records
Chile	1615	6	141	Sales records
Lima, Peru	1630–1702	33	409	Parish records
Peru (Rural)	1632	25	307	Parish records
Lima, Peru	1640–1680	33	936	Marriage records
Colombia	1635–1695	6	17	Slave inventories
Guyane (French Guiana)	1690	12	69	Plantation records
Colombia	1716–1725	33	59	Government records
French Louisiana	1717–1769	23	223	Notarial records
Dominican Republic	1717–1827	11	15	Government records
South Carolina	1732–1775	35	681	Runaway notices
Colombia	1738–1778	11	100	Various records
Spanish Louisiana	1770–1803	79	6,615	Notarial records
St. Dominique (Haiti)	1771–1791	25	5,413	Sugar plantations
Bahia, Brazil	1775–1815	14	581	Slave lists
St. Dominique (Haiti)	1778–1791	36	1,280	Coffee plantations
Guadeloupe	1788	8	45	Newspaper reports
St. Dominique (Haiti)	1788–1790	21	1,297	Fugitive slave lists
Cuba	1791–1840	59	3,093	Slave registers
St. Dominique (Haiti)	1796–1797	56	5,632	Plantation inventories
American Louisiana	1804–1820	62	223	Notarial records
Salvador, Brazil	1808–1842	6	456	Records of manumission
Trinidad	1813	100	12,460	Slave registers
St. Lucia	1815	62	2,333	Slave registers
Bahia, Brazil	1816–1850	27	2,666	Slave lists
St. Kitts	1817	48	2,887	Slave registers
Senegal	1818	17	80	Captured slave ship
Berbice (Guyana)	1819	66	1,127	Slave registers
Salvador, Brazil	1819–1836	12	871	Manumission certificates
Salvador, Brazil	1820–1835	11	1,106	Probate records
Sierra Leone	1821–1824	68	605	Child registers
Rio de Janeiro, Brazil	1826–1837	31	772	Prison records
Anguilla	1827	7	51	Slave registers
Rio de Janeiro, Brazil	1830–1852	190	2,921	Free africans' records
Rio de Janeiro, Brazil	1833–1849	35	476	Death certificates

TABLE I
(CONTINUED)

Location	Years	Num. ethnic.	Num. obs.	Record type
Salvador, Brazil	1835	13	275	Court records
Salvador, Brazil	1838–1848	7	202	Slave registers
St. Louis/Goree, Senegal	1843–1848	21	189	Emancipated slaves
Bakel, Senegal	1846	16	73	Sales records
d'Agoué, Benin	1846–1885	11	70	Church records
Sierra Leone	1848	132	12,425	Linguistic and British census
Salvador, Brazil	1851–1884	8	363	Records of manumission
Salvador, Brazil	1852–1888	7	269	Slave registers
Cape Verde	1856	32	314	Slave census
Kikoneh Island, Sierra Leone	1896–1897	11	185	Fugitive slave records

caravan, and in some cases the ethnic identity of the slaves being shipped.

To illustrate how I combine the ethnicity data with the shipping data to construct my estimates I use an example, which is shown in Figure I. The figure is a hypothetical map of the western coast of Africa, with each square representing a country.

From the shipping data, I first calculate the number of slaves shipped from each coastal country in Africa. In this example 100,000 slaves were shipped from Country A and 250,000 were shipped from Country C. The problem with relying on the shipping data alone is that many of slaves shipped from Country A may have come from Country B, which lies landlocked behind Country A. Then, using the ethnicity data, I calculate the ratio of slaves from each coastal country relative to any landlocked countries located inland of the coastal country. This requires that I map ethnicities to countries and aggregate up to the country level. In practice, this step relied on a great amount of past research by African historians, linguists, and ethnographers. The sources most heavily used are Koelle (1854), Murdock (1959), Curtin (1969), Higman (1984), and Hall (2005).

Assume that the ratio of slaves from Country A relative to Country B is 4 to 1. This ratio suggests that 20% of the slaves shipped from Country A were actually from Country B. Therefore, the estimated number of slaves from Country B is 20,000 and from Country A is 80,000. Assume that the ratio of slaves

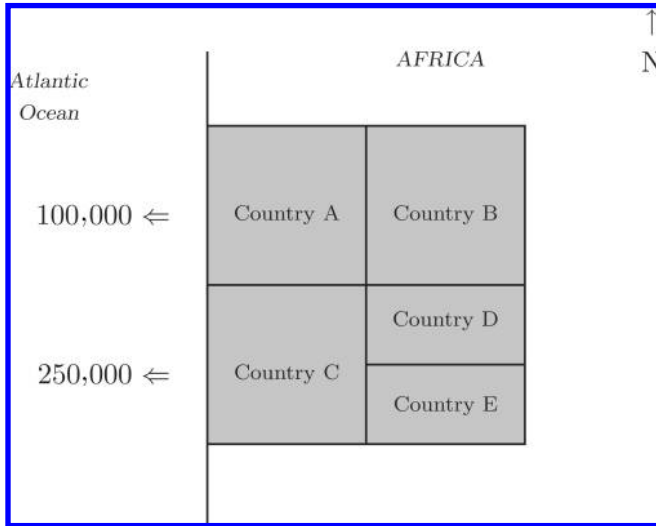


FIGURE I
An Artificial Map of the West Coast of Africa



FIGURE II
Ethnic Boundaries Defined by Murdock (1959) and Modern Political Boundaries

from Country C to D to E is 3 to 1 to 1. The same procedure then yields an estimate of 150,000 slaves from Country C and 50,000 each from Countries D and E. In practice, these calculations are performed separately for each slave trade. As well, because slaves were increasingly taken from further inland as each slave trade progressed, the calculations are also performed separately for each of the following time periods: 1400–1599, 1600–1699, 1700–1799, 1800–1900.³

Because ethnicities tended to be much smaller than countries, the mapping of ethnicities into countries generally is not problematic. This is illustrated in Figure II, which shows African ethnicities based on Murdock's (1959) classification, as well as modern political boundaries. From the figure it is apparent that ethnicities are much smaller than modern boundaries, and therefore ethnicities generally map cleanly into one country.⁴

An important assumption in this procedure is that slaves shipped from a port within a country are either from that country or from countries directly to the interior. However, in reality, some slaves shipped from a country's coast may have originated from a neighboring coastal country. In Nunn (2007), using three samples of slaves for which we know both the ethnicity of the slaves and the port that they were shipped from, I test the validity of this assumption and the overall accuracy of the estimation procedure. I find that for each of the three samples my procedure correctly identifies the origins of between 83% and 98% of the slaves in the samples.

A second source of measurement error arises because slaves from the interior will tend to be underrepresented in the ethnicity samples. This is because only slaves who survived the voyage outside of Africa are in the ethnicity samples. All else equal, the further inland a slave originated, the longer the journey was, and the more likely it was that he or she died along the way. Because the rates of mortality during the slave trades were extremely high, this form of measurement error may be significant.⁵ However, as I show formally in the Appendix, the undersampling of slaves from

3. See Nunn (2007) for all of the finer details of the construction procedure.

4. In instances where an ethnicity is located in more than one country, I map the ethnicity into the multiple countries using land area as weights. This is explained in detail in Nunn (2007).

5. Estimates of cross-Atlantic mortality rates ranged from 7% to 20% depending on the time period and the length of the voyage (Curtin 1969, pp. 275–286; Lovejoy 2000, p. 63). Death rates during the trek to the coast are known with less certainty, but estimates range from 10% to 50% (Vansina 1990, p. 218; Lovejoy 2000, pp. 63–64).

the interior results in OLS estimates that are biased toward zero. As well, one can use instruments that are uncorrelated with the measurement error to derive consistent estimates. I do this in Section V.B.

After the data have been constructed, I have estimates of the number of slaves shipped from each country in Africa during each of the four slave trades during four different time periods: 1400–1599, 1600–1699, 1700–1799, 1800–1900. Table II reports the estimated total number of slaves exported from each country, as well as the total disaggregated by slave trade. Overall, the estimates are consistent with the general view among African historians of where the primary slaving areas were. During the trans-Atlantic slave trade, slaves were taken in greatest numbers from the “Slave Coast” (Benin and Nigeria), West-Central Africa (Zaire, Congo, and Angola), and the “Gold Coast” (Ghana). All of these countries appear among the top exporting countries on the list. Ethiopia and Sudan are also among the top exporting countries because they were the primary suppliers of slaves shipped during the Red Sea and Saharan slave trades. The low number of slave exports from South Africa and Namibia confirms the view of African historians that these areas exported “virtually no slaves” (Manning 1983, p. 839). The relative magnitudes of exports from geographically close countries are also consistent with the qualitative evidence from the African history literature. Manning (1983, p. 839) writes that “some adjoining regions were quite dissimilar: Togo exported few slaves and the Gold Coast many; Gabon exported few slaves, and the Congo exported many.” The estimates are consistent with Manning’s observation. Exports from Togo are far less than from Ghana, and exports from Gabon are less than from the Republic of Congo.

IV. BASIC CORRELATIONS: OLS ESTIMATES

I begin by examining the relationship between past slave exports and current economic performance. I normalize the total number of slaves taken from each country by its size, measured by land area.⁶ Figure III shows the relationship between the natural log of the number of slaves exported in all four slave trades

6. Alternative measures of country size are also possible. As I show in Table A.2 in the Appendix, using the average population of a country between 1400 and 1900 yields nearly identical results. Similarly, using arable land area rather than land area also yields essentially identical results.

TABLE II
ESTIMATED TOTAL SLAVE EXPORTS BETWEEN 1400 AND 1900 BY COUNTRY

Isocode	Country name	Trans-Atlantic	Indian Ocean	Trans-Saharan	Red Sea	All slave trades
AGO	Angola	3,607,020	0	0	0	3,607,020
NGA	Nigeria	1,406,728	0	555,796	59,337	2,021,859
GHA	Ghana	1,614,793	0	0	0	1,614,793
ETH	Ethiopia	0	200	813,899	633,357	1,447,455
SDN	Sudan	615	174	408,261	454,913	863,962
MLI	Mali	331,748	0	509,950	0	841,697
ZAR	Democratic Republic of Congo	759,468	7,047	0	0	766,515
MOZ	Mozambique	382,378	243,484	0	0	625,862
TZA	Tanzania	10,834	523,992	0	0	534,826
TCD	Chad	823	0	409,368	118,673	528,862
BEN	Benin	456,583	0	0	0	456,583
SEN	Senegal	278,195	0	98,731	0	376,926
GIN	Guinea	350,149	0	0	0	350,149
TGO	Togo	289,634	0	0	0	289,634
GNB	Guinea-Bissau	180,752	0	0	0	180,752
BFA	Burkina Faso	167,201	0	0	0	167,201
MRT	Mauritania	417	0	164,017	0	164,434
MWI	Malawi	88,061	37,370	0	0	125,431
MDG	Madagascar	36,349	88,927	0	0	125,275
COG	Congo	94,663	0	0	0	94,663
KEN	Kenya	303	12,306	60,351	13,490	86,448
SLE	Sierra Leone	69,607	0	0	0	69,607
CMR	Cameroon	66,719	0	0	0	66,719
DZA	Algeria	0	0	61,835	0	61,835
CIV	Ivory Coast	52,646	0	0	0	52,646
SOM	Somalia	0	229	26,194	5,855	32,277
ZMB	Zambia	6,552	21,406	0	0	27,958
GAB	Gabon	27,403	0	0	0	27,403
GMB	Gambia	16,039	0	5,693	0	21,731
NER	Niger	133	0	0	19,779	19,912
LBY	Libya	0	0	8,848	0	8,848
LBR	Liberia	6,790	0	0	0	6,790
UGA	Uganda	900	3,654	0	0	4,554
ZAF	South Africa	1,944	87	0	0	2,031
CAF	Central African Republic	2,010	0	0	0	2,010
EGY	Egypt	0	0	1,492	0	1,492
ZWE	Zimbabwe	554	536	0	0	1,089
NAM	Namibia	191	0	0	0	191
BDI	Burundi	0	87	0	0	87
GNQ	Equatorial Guinea	11	0	0	0	11
DJI	Djibouti	0	5	0	0	5
BWA	Botswana	0	0	0	0	0

TABLE II
(CONTINUED)

Isocode	Country name	Trans-Atlantic	Indian Ocean	Trans-Saharan	Red Sea	All slave trades
CPV	Cape Verde Islands	0	0	0	0	0
COM	Comoros	0	0	0	0	0
LSO	Lesotho	0	0	0	0	0
MUS	Mauritius	0	0	0	0	0
MAR	Morocco	0	0	0	0	0
RWA	Rwanda	0	0	0	0	0
STP	São Tomé & Príncipe	0	0	0	0	0
SWZ	Swaziland	0	0	0	0	0
SYC	Seychelles	0	0	0	0	0
TUN	Tunisia	0	0	0	0	0

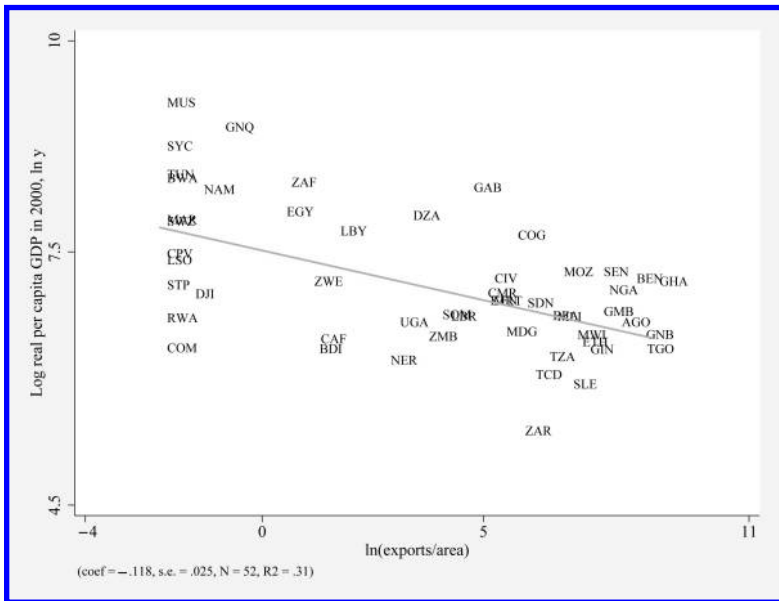


FIGURE III
Relationship between Log Slave Exports Normalized by Land Area, ln(exports/area), and Log Real Per Capita GDP in 2000, ln y

between 1400 and 1900 normalized by land area and the natural log of per capita GDP in 2000.⁷ As shown in the figure, a negative

7. Because the natural log of zero is undefined, I take the natural log of 0.1. As I show in the Appendix, the results are robust to the omission of these zero-export countries.

relationship between income and slave exports is apparent in the raw data.

I further examine this relationship by controlling for other country characteristics that are also potentially important for current income. My baseline estimating equation is

$$(1) \quad \ln y_i = \beta_0 + \beta_1 \ln(\text{exports}_i/\text{area}_i) + \mathbf{C}'_i \delta + \mathbf{X}'_i \gamma + \varepsilon_i,$$

where $\ln y_i$ is the natural log of real per capita GDP in country i in 2000, and $\ln(\text{exports}_i/\text{area}_i)$ is the natural log of the total number of slaves exported between 1400 and 1900 normalized by land area. Per capita GDP data are for the year 2000 and are from Maddison (2003). \mathbf{C}_i is a vector of dummy variables that indicate the origin of the colonizer prior to independence. These are included to control for the other significant event in Africa's past, colonial rule. \mathbf{X}_i is a vector of control variables that are meant to capture differences in countries' geography and climate.

OLS estimates of (1) are reported in Table III. The first column reports estimates of (1) with colonizer fixed effects only. In the second column, I also include controls that capture the potential importance of geography for long-term economic development: distance from the equator, longitude, minimum monthly rainfall, average maximum humidity, average minimum temperature, and proximity to the ocean measured by the natural log of coastline divided by land area. All factors, except longitude, influence whether a country has a tropical climate, which affects the prevalence of infectious disease and agricultural productivity (Kamarck 1976; Sachs et al. 2001). Longitude is also included to capture differences between the eastern and western parts of the African continent.⁸ In both specifications, the estimated relationship between slave exports and per capita income are negative and statistically significant.

One concern with the estimates in columns (1) and (2) is that they may be biased because of the inclusion of small islands and North African countries in the sample. In column (3), I omit island and North African countries, dropping Morocco, Algeria, Tunisia, Libya, Egypt, Seychelles, Mauritius, Comoros, São Tomé and Príncipe, and the Cape Verde Islands. As shown, dropping these countries makes little difference. The estimated coefficient

8. A related concern is that the slave exports variable may simply capture a West African fixed effect. I show in the Appendix that the results are robust to also controlling for region fixed effects.

TABLE III
RELATIONSHIP BETWEEN SLAVE EXPORTS AND INCOME

Dependent variable is log real per capita GDP in 2000, ln y						
	(1)	(2)	(3)	(4)	(5)	(6)
ln(exports/area)	-0.112*** (0.024)	-0.076*** (0.029)	-0.108*** (0.037)	-0.085** (0.035)	-0.103*** (0.034)	-0.128*** (0.034)
Distance from equator		0.016 (0.017)	-0.005 (0.020)	0.019 (0.018)	0.023 (0.017)	0.006 (0.017)
Longitude		0.001 (0.005)	-0.007 (0.006)	-0.004 (0.006)	-0.004 (0.005)	-0.009 (0.006)
Lowest monthly rainfall		-0.001 (0.007)	0.008 (0.008)	0.0001 (0.007)	-0.001 (0.006)	-0.002 (0.008)
Avg max humidity		0.009 (0.012)	0.008 (0.012)	0.009 (0.012)	0.015 (0.011)	0.013 (0.010)
Avg min temperature		-0.019 (0.028)	-0.039 (0.028)	-0.005 (0.027)	-0.015 (0.026)	-0.037 (0.025)
ln(coastline/area)		0.085** (0.039)	0.092** (0.042)	0.095** (0.042)	0.082** (0.040)	0.083** (0.037)
Island indicator				-0.398 (0.529)	-0.150 (0.516)	
Percent Islamic				-0.008*** (0.003)	-0.006* (0.003)	-0.003 (0.003)
French legal origin				0.755 (0.503)	0.643 (0.470)	-0.141 (0.734)
North Africa indicator				0.382 (0.484)	-0.304 (0.517)	
ln(gold prod/pop)					0.011 (0.017)	0.014 (0.015)
ln(oil prod/pop)					0.078*** (0.027)	0.088*** (0.025)
ln(diamond prod/pop)					-0.039 (0.043)	-0.048 (0.041)
Colonizer fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number obs.	52	52	42	52	52	42
R ²	.51	.60	.63	.71	.77	.80

Notes. OLS estimates of (1) are reported. The dependent variable is the natural log of real per capita GDP in 2000, ln y. The slave export variable ln(exports/area) is the natural log of the total number of slaves exported from each country between 1400 and 1900 in the four slave trades normalized by land area. The colonizer fixed effects are indicator variables for the identity of the colonizer at the time of independence. Coefficients are reported with standard errors in brackets. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

for slave exports remains negative and significant, and the magnitude of the estimated coefficient actually increases.⁹

9. One may also be concerned that the inclusion of the countries in southern Africa—namely South Africa, Swaziland, and Lesotho—may also be biasing the results. As I report in the Appendix, the results are robust to also omitting this

In column (4), I include additional control variables to account for potential differences between islands or North African countries and the rest of Africa. Two core differences between North Africa and the rest of Africa is that North African countries are predominantly Islamic and that they all have legal systems based on French civil law. To capture these differences, I also include a measure of the percent of the population that is Islamic and a French legal origin indicator variable. I also include a North Africa fixed effect and an island fixed effect. As shown, including these additional control variables does not affect the slave exports coefficient, which remains negative and statistically significant.

The final factor that I control for is differences in countries' endowments of natural resources. In column (5), I also control for the natural log of the annual average per capita production between 1970 and 2000 of gold, oil, and diamonds. As shown, controlling for countries' production of these natural resources does not alter the results.¹⁰ In column (6), I simultaneously include all control variables and drop islands and North African countries from the sample. Again the results remain robust.¹¹

The estimated magnitudes of the relationship between slave exports and income are not only statistically significant but also economically meaningful. Calculating the standardized beta coefficients of the estimates, one finds that a one-standard-deviation increase in $\ln(\text{exports/area})$ is associated with between 0.36 to 0.62 standard deviation decrease in log income. If for purely illustrative purposes one interprets the OLS estimates as causal, then according to the estimate from column (5), for a country initially with the mean level of income of \$1,249, a one-standard-deviation decrease in the slave export variable will raise income to \$1,864, which is a 50% increase in income.

V. ECONOMETRIC ISSUES: CAUSALITY AND MEASUREMENT ERROR

Although the OLS estimates show that there is a relationship between slave exports and current economic performance, it

group of countries. The table also shows that the estimates are robust to the omission of potentially influential observations.

10. Looking at Figure III, one can see that Equatorial Guinea (GNQ), which has a low value of slave exports and has recently witnessed extremely rapid economic growth because of the discovery of large offshore oil reserves, is a potential outlier. As I show in the Appendix, the results are also robust to the omission of Equatorial Guinea from the sample.

11. The island and North Africa indicator variables drop out of the equation when island and North African countries are omitted from the sample.

remains unclear whether the slave trades have a causal impact on current income. An alternative explanation for the relationship is that societies that were initially underdeveloped selected into the slave trades, and these societies continue to be underdeveloped today. Therefore, we observe a negative relationship between slave exports and current income, even though the slave trades did not have any effect on subsequent economic development. In this section, I pursue two strategies to evaluate whether there is a causal effect of the slave trades on income. First, using historic data and qualitative evidence from African historians, I evaluate the importance and characteristics of selection into the slave trades. As I will show, the evidence suggests that selection was important, but it was usually the societies that were the most prosperous, not the most underdeveloped, that selected into the slave trades. Given this evidence, it is unlikely that the strong relationship between slave exports and current income is driven by selection. Instead, selection will tend to bias the OLS estimates towards zero. Second, I use the distance from each country to the location of the demand for slaves as instruments for slave exports. The IV (instrumental variables) results confirm the OLS estimates.

V.A. Historical Evidence on Selection during the Slave Trades

A large proportion of the early trade between Africans and Europeans was in commodities other than slaves. During this time, only societies with institutions that were sufficiently developed were able to facilitate trade with the Europeans. Between 1472 and 1483, the Portuguese sailed south along the west coast of West-Central Africa, testing various points of entry, looking for trading partners. They were unable to find any societies north of the Zaire river that could support trade. Vansina (1990, p. 200) writes that “the local coastal societies were just too small in terms of people and territory; their economic and social institutions were too undifferentiated to facilitate foreign trade.” Sustained trade did not occur until the Portuguese found the Kongo kingdom, located just south of the Zaire river. Because the Kongo kingdom had a centralized government, a national currency, and well-developed markets and trading networks, it was able to support trade with the Europeans.

When European demand turned almost exclusively to slaves, the preference to trade with the most developed parts of Africa continued. Because the more prosperous areas were also the most densely populated, large numbers of slaves could be efficiently

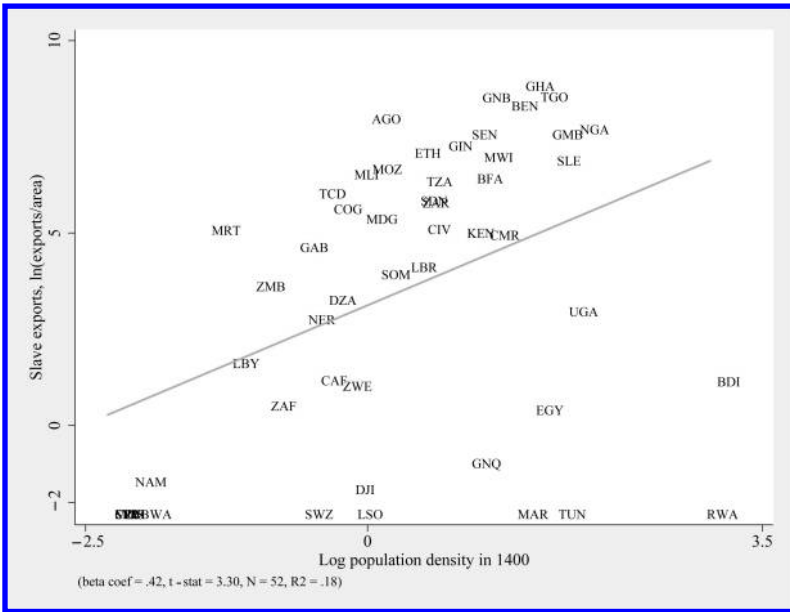


FIGURE IV

Relationship between Initial Population Density and Slave Exports

obtained if civil wars or conflicts could be instigated (Barry 1992; Inikori 2003). As well, societies that were the most violent and hostile, and therefore the least developed, were often best able to resist European efforts to purchase slaves. For example, the slave trade in Gabon was limited because of the defiance and violence of its inhabitants toward the Portuguese. This resistance continued for centuries, and as a result the Portuguese were forced to concentrate their efforts along the coast further south (Hall 2005, pp. 60–64).

Using data on initial population densities, I check whether it was the more prosperous or less prosperous areas that selected into the slave trades. Acemoglu, Johnson, and Robinson (2002) have shown that population density is a reasonable indicator of economic prosperity. Figure IV shows the relationship between the natural log of population density in 1400 and $\ln(\text{exports}/\text{area})$. The data confirm the historical evidence on selection during the slave trades.¹² The figure shows that the parts of Africa that were

12. The relationship is similar if one excludes island and North African countries, or if one normalizes slave exports by population rather than land area.

the most prosperous in 1400, measured by population density, tend also to be the areas that were most impacted by the slave trades.

A second potential source of selection may be that societies that initially had domestic slavery may have selected into the slave trades. If this is the case, then the estimates may be biased by a negative relationship between domestic slavery and subsequent economic development, similar to that documented by Engerman and Sokoloff (1997, 2002) in the Americas.

The historic evidence indicates that in the areas of Africa that were part of the older Islamic slave trades there was domestic slavery, but it is unclear whether domestic slavery was a cause or a consequence of the external slave trades. Whether the parts of Africa that were untouched by the Islamic trades had chattel slavery prior to European contact has been the subject of an old debate among African historians (e.g., Fage [1962]; Rodney [1970]). Since this debate, evidence has been brought forth suggesting that domestic slavery may not have existed prior to the trans-Atlantic slave trade. Hilton (1985) provides evidence showing that in the sixteenth century, words that originally meant "servant" or "prisoner" were altered to take on the meaning of a "traded slave." Historian and Anthropologist Jan Vansina (1989), using more detailed linguistic data, confirms Hilton's finding, showing that in West Central Africa there was no word for slave. Vansina maps the origin of the word "pika," which originally meant servant, but took on the meaning of "traded slave." The word originated at the coastal ports engaged in the slave trade and spread to the inland communities that were also involved in the trade (Vansina 1989, 1990). Recent studies of other regions also suggest that prior to the external slave trade domestic slavery did not exist (e.g., Harms [1981]; Inikori [2000]; Hall [2005, p. 16]).

V.B. Instrumental Variables

The second strategy that I pursue is to use instruments that are correlated with slave exports, but are uncorrelated with other country characteristics. This strategy has the added benefit of yielding potentially consistent estimates even though slave exports are measured with error. If the instruments are also uncorrelated with the measurement error in slave exports that arises from the undersampling of slaves from the interior, then unlike OLS, IV yields consistent estimates.

As instruments for slave exports, I use the distances from each African country to the locations where slaves were demanded. The validity of the instruments relies on the presumption that although the location of demand influenced the location of supply, the location of supply did not influence the location of demand. If sugar plantations were established in the West Indies because the West Indies were close to the western coast of Africa, then the instruments are not valid. However, if instead many slaves were taken from western Africa because it was relatively close to the plantation economies in the West Indies, then the instruments are potentially valid. According to the known history of the slave trades, it was the location of demand that influenced the location of supply and not vice versa. The location of the demand for African slaves was determined by a number of factors, all unrelated to the supply of slaves. In the West Indies and the southern United States, slaves were imported because of climates suitable for growing highly valued, globally traded commodities such as sugar and tobacco. The existence of gold and silver mines was a determinant of the demand for slaves in Brazil. In the northern Sahara, Arabia, and Persia, slaves were needed to work in salt mines, and in the Red Sea area slaves were used as pearl divers.

The instruments measure the distance from each country to the most important destinations in each of the slave trades. The four instruments are

1. The *sailing distance* from the point on the coast that is closest to the country's centroid to the closest major market of the Atlantic slave trade. I use the nine largest importers of slaves, which are Virginia, USA; Havana, Cuba; Haiti; Kingston, Jamaica; Dominica; Martinique; Guyana; Salvador, Brazil; and Rio de Janeiro, Brazil.¹³
2. The *sailing distance* from the point on the coast that is closest to the country's centroid to the closest of the two major slave destinations of the Indian Ocean slave trade: Mauritius and Muscat, Oman.
3. The *overland distance* from a country's centroid to the closest port of export for the trans-Saharan slave trade. The markets are Algiers, Tunis, Tripoli, Benghazi, and Cairo.

13. Data on slave imports are from Eltis and Richardson (2006). There is a significant drop in the volume of slave imports between the ninth and tenth largest markets. Because of this natural break, I use the top nine markets.

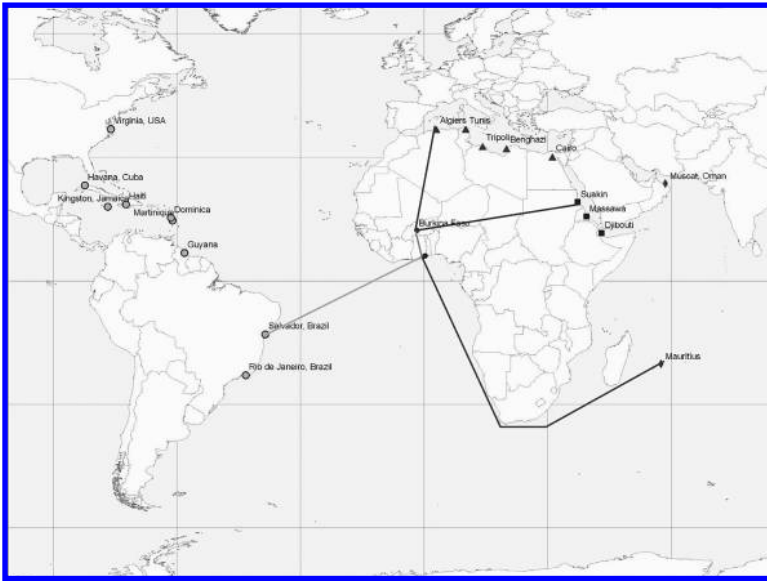


FIGURE V
Example Showing the Distance Instruments for Burkina Faso

4. The *overland distance* from a country's centroid to the closest port of export for the Red Sea slave trade. The ports are Massawa, Suakin, and Djibouti.¹⁴

The instruments are illustrated in Figure V, which shows the four distances for Burkina Faso. The ports in each of the four slave trades are represented by different colored symbols, and the shortest distances by colored lines. Details of the construction of the instruments are given in the Appendix.¹⁵

The IV estimates are reported in Table IV. The first column reports estimates without control variables, the second column includes colonizer fixed effects, and the third and fourth columns include colonizer fixed effects and geography controls. In column (4), the sample excludes islands and North African countries.

14. For island countries, one cannot reach the ports of the Saharan or Red Sea slave trades by traveling overland. For these countries I use the sum of the sailing distance and overland distance.

15. An alternative strategy is to also include the distance from the centroid to the coast (which is also shown in Figure V) as an additional instrument, since this distance is part of the total distance to the markets in the Indian Ocean and trans-Atlantic slave trades. The results are essentially identical if this distance is also included as an additional instrument.

TABLE IV
ESTIMATES OF THE RELATIONSHIP BETWEEN SLAVE EXPORTS AND INCOME

	(1)	(2)	(3)	(4)
Second Stage. Dependent variable is log income in 2000, $\ln y$				
$\ln(\text{exports/area})$	-0.208*** (0.053)	-0.201*** (0.047)	-0.286* (0.153)	-0.248*** (0.071)
	[-0.51, -0.14]	[-0.42, -0.13]	$[-\infty, +\infty]$	[-0.62, -0.12]
Colonizer fixed effects	No	Yes	Yes	Yes
Geography controls	No	No	Yes	Yes
Restricted sample	No	No	No	Yes
F -stat	15.4	4.32	1.73	2.17
Number of obs.	52	52	52	42
First Stage. Dependent variable is slave exports, $\ln(\text{exports/area})$				
Atlantic distance	-1.31*** (0.357)	-1.74*** (0.425)	-1.32* (0.761)	-1.69** (0.680)
Indian distance	-1.10*** (0.380)	-1.43*** (0.531)	-1.08 (0.697)	-1.57* (0.801)
Saharan distance	-2.43*** (0.823)	-3.00*** (1.05)	-1.14 (1.59)	-4.08** (1.55)
Red Sea distance	-0.002 (0.710)	-0.152 (0.813)	-1.22 (1.82)	2.13 (2.40)
F -stat	4.55	2.38	1.82	4.01
Colonizer fixed effects	No	Yes	Yes	Yes
Geography controls	No	No	Yes	Yes
Restricted sample	No	No	No	Yes
Hausman test (p -value)	.02	.01	.02	.04
Sargan test (p -value)	.18	.30	.65	.51

Notes. IV estimates of (1) are reported. Slave exports $\ln(\text{exports/area})$ is the natural log of the total number of slaves exported from each country between 1400 and 1900 in the four slave trades normalized by land area. The colonizer fixed effects are indicator variables for the identity of the colonizer at the time of independence. Coefficients are reported, with standard errors in brackets. For the endogenous variable $\ln(\text{exports/area})$, I also report 95% confidence regions based on Moreira's (2003) conditional likelihood ratio (CLR) approach. These are reported in square brackets. The p -value of the Hausman test is for the Wu-Hausman chi-squared test. ***, **, and * indicate significance at the 1%, 5%, and 10% levels. The "restricted sample" excludes island and North African countries. The "geography controls" are distance from equator, longitude, lowest monthly rainfall, avg max humidity, avg min temperature, and $\ln(\text{coastline/area})$.

The first-stage estimates are reported in the bottom panel of the table. The coefficients for the instruments are generally negative, suggesting that the further a country was from slave markets, the fewer slaves it exported.¹⁶ The exception is the distance

16. The specifications assume a linear first-stage relationship. The estimates are similar if one also allows for a nonlinear relationship between slave exports

from the Red Sea ports, which is never significant, and is even positive in one specification.

The second-stage estimates are reported in the top panel. Because the first stage F -statistics are low, I also report conditional likelihood ratio (CLR) confidence intervals. The estimates for $\ln(\text{exports}/\text{area})$ are all negative and statistically significant. In column (3), the confidence interval is unbounded, which is a consequence of the low first-stage F -statistic. The point estimates range from -0.20 to -0.29 . These magnitudes are significantly larger than the magnitudes of the OLS estimates. This is not surprising, because the measurement error in the slave export estimates and the selection of the initially most prosperous societies into the slave trades are both expected to bias the OLS estimates towards zero.

A potential concern with the Table IV estimates is that the distances to the slave markets may be correlated with distances to other locations that are important for economic development. The likelihood of this can be assessed by estimating the reduced form relationship between the distance instruments and income within Africa and outside of Africa.¹⁷ I find that within Africa, the four distance instruments are positively correlated with income, and all coefficients, except for the Red Sea coefficient, are highly significant. Being further from slave markets was good for growth. However, outside of Africa, there is no clear relationship between the distance instruments and income. If the results of Table IV are driven by the relationship between the distances to slave markets and distances to other locations, then one would expect to also observe a positive relationship between the distance measures and income outside of Africa. However, this is not the case.

Overall, the IV results confirm the negative relationship between slave exports and income estimated by OLS. They also suggest that the OLS estimates may even be a lower bound estimate of the strength of the slave trade–income relationship.

VI. POSSIBLE CHANNELS OF CAUSALITY

I now turn to the channels through which the slave trades may have affected economic development. I view this analysis as

and the distance instruments. The results are also similar if one uses the average or median distance to the ports in each trade, rather than the minimum distance.

17. I thank Ted Miguel for suggesting this check.

important determinant of a variety of factors necessary for economic development. Since the seminal article documenting the link between ethnic diversity and economic growth by Easterly and Levine (1997), subsequent research by La Porta et al. (1999), Alesina et al. (2003), Aghion, Alesina, and Trebbi (2004), and Easterly, Ritzan, and Woolcock (2006) looks more deeply into why ethnic fractionalization is important for development. These studies find that ethnic diversity is important for social cohesion, domestic institutions, domestic polices, and the quality of government. As well, Alesina, Baquir, and Easterly (1999), Miguel and Gugerty (2005), and Banerjee and Somanathan (2006) find that ethnic fractionalization reduces the provision of public goods, such as education, health facilities, access to water, and transportation infrastructure, all of which are important for economic development.

A second, and closely related, consequence of the slave trades was the weakening and underdevelopment of states. To examine whether the data are consistent with this channel, I consider the relationship between slave exports and the level of state development following the slave trades. To do this I use a measure of precolonial state development from Gennaioli and Rainer (2006). The measure is constructed using ethnographic data from Murdock (1967) on the indigenous political complexity of ethnic groups, measured by the number of jurisdictional hierarchies beyond the local community. The original measure ranges from 0 to 4, with 0 indicating "stateless" societies and 4 indicating societies with "large states" (Murdock 1967, p. 52). Using this data, Gennaioli and Rainer (2006) construct a measure of the proportion of a country's indigenous population that belongs to an ethnic group that falls into category 2, 3, or 4.

The relationship between slave exports and nineteenth-century state development is shown in Figure VII. The negative relationship between slave exports and state centralization shown in the figure is consistent with the historic accounts of the slave trades causing long-term political instability, which resulted in weakened and fragmented states.

Recent empirical research shows that a country's history of state development is an important determinant of current economic performance. Bockstette, Chanda, and Putterman (2002) and Chanda and Putterman (2005) find that "state antiquity," measured using an index of the depth of experience with state-level institutions, is positively correlated with real per capita GDP

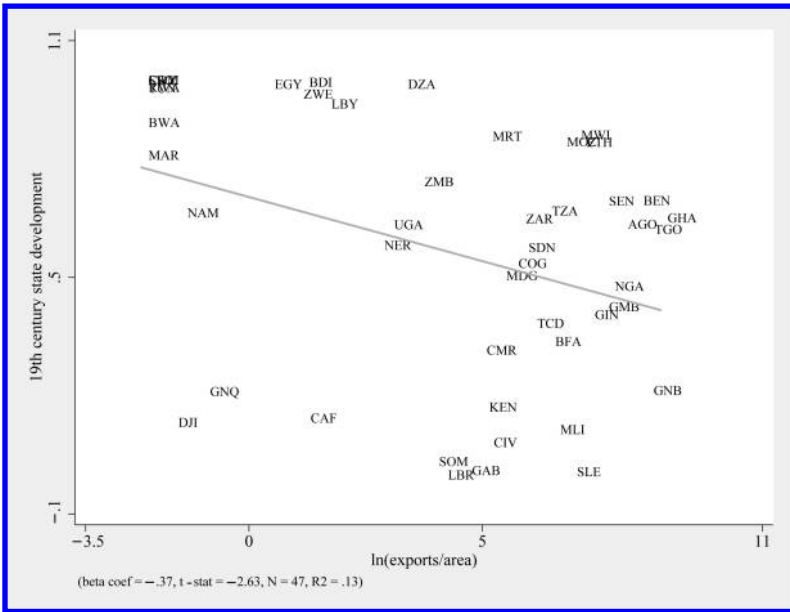


FIGURE VII

Relationship between Slave Exports and Nineteenth-Century State Development

growth between 1960 and 1995. Looking within Africa, Gennaioli and Rainer (2006) find that countries with ethnicities that had centralized precolonial state institutions today provide more public goods, such as education, health, and infrastructure.

Herbst (1997, 2000) also focuses on the importance of state development for economic success, arguing that Africa's poor economic performance is a result of postcolonial state failure, the roots of which lie in the underdevelopment and instability of precolonial polities. Herbst (2000, chaps. 2–4) argues that because of a lack of significant political development during colonial rule, the limited precolonial political structures continued to exist after independence.¹⁹ As a result, Africa's postindependence leaders inherited nation states that did not have the infrastructure necessary to extend authority and control over the whole country. Many states were, and still are, unable to collect taxes from their citizens, and as a result they are also unable to provide a minimum level of public goods and services.

19. On the continuity between Africa's precolonial and postcolonial political systems also see Hargreaves (1969, p. 200).

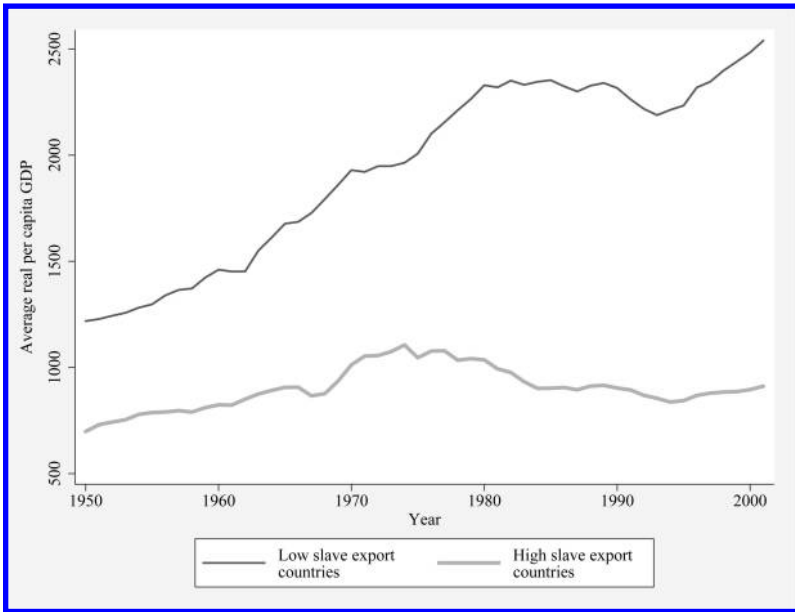


FIGURE VIII
Paths of Economic Development Since 1950

A corollary of Herbst's argument is that the impact of the slave trades may have been felt most strongly after colonial independence. This is because this is when precolonial political structures suddenly increased in importance, as they became central determinants of the success of the newly formed state. Using Figure VIII, I examine whether the evolution of incomes since 1950 is consistent with this hypothesis. The figure shows average per capita GDP between 1950 and 2000 for two groups of African countries.²⁰ One group consists of the 26 countries with the lowest measures of $\ln(\text{exports}/\text{area})$, and the other is the 26 countries with the highest measures of $\ln(\text{exports}/\text{area})$. As shown in the figure, throughout the period low-slave-export countries are richer on average than high slave export countries. Also interesting, however, is the difference in the evolution of income between the two groups of countries. Although the low-slave-export countries were richer in the early 1950s when most countries were still under colonial rule, the income gap between the two groups increased

20. The averages are weighted by each country's population in 2000.

significantly over time and became most pronounced after the late 1960s and early 1970s, when most countries had gained independence.²¹ This pattern is consistent with the slave trades affecting early state development, which may have mattered during colonial rule but mattered much more after independence. Because those parts of Africa that were most severely impacted by the slave trades tended to have the least developed political systems, after independence these countries continued to have weak and unstable states, as well as slower economic growth.

VII. CONCLUSIONS

Combining data from shipping records and data from historical documents reporting slave ethnicities, I have constructed estimates of the number of slaves exported from each country in Africa during Africa's four slave trades. I found a robust negative relationship between the number of slaves taken from a country and its subsequent economic development.

I pursued a number of strategies to better understand if the relationship is causal or spurious. If countries that were initially underdeveloped selected into the slave trades, and if these countries continue to be underdeveloped today, then this may explain the observed relationship between slave exports and current income. I first reviewed the historical evidence on the characteristics of African societies that were most affected by the slave trades. The qualitative and quantitative evidence show that it was actually the most developed parts of Africa, not the least developed, that tended to select into the slave trades. I also used the distances from each country to the locations of the demand for slaves as instruments to estimate the causal effect of the slave trades on economic development. The IV estimates confirmed the OLS results, suggesting that increased extraction during the slave trades resulted in worse economic performance.

I then examined the channels of causality underlying the relationship between slave exports and economic development. I showed that the data are consistent with historic accounts suggesting that the slave trades impeded the formation of broader ethnic groups, leading to ethnic fractionalization, and that the

21. In 1950 only four African countries were independent. Ethiopia had never been colonized, and Liberia, South Africa, and Egypt had previously gained independence. By 1969, 42 of Africa's 52 countries had gained independence, and by 1976, 48 countries were independent.

slave trades resulted in a weakening and underdevelopment of political structures.

APPENDIX

A. *Deriving the Bias from the Undersampling of Slaves from the Interior*

In this section I show that the undersampling of slaves from the interior of Africa will result in OLS estimates of the effect of slave exports on income that are biased toward zero. To see this, denote the true number of slaves taken from country i by s_i^* , the observed number of slaves by s_i , distance to the coast by d_i , and economic development by y_i . All variables are expressed as deviations from means. Assume the true relationship between the number of slaves exported and distance to the coast is given by

$$(2) \quad s_i^* = -\alpha d_i + \varepsilon_i,$$

where $\alpha > 0$ and ε_i is i.i.d. drawn from a normal distribution. The relationship between the observed number of slaves exported, s_i , and the distance to the coast, d_i , is given by

$$(3) \quad s_i = s_i^* - \gamma d_i + v_i,$$

where $\gamma > 0$ and v_i is uncorrelated with ε_i . The true relationship between slave exports and development is given by

$$(4) \quad y_i = -\beta s_i^* + \omega_i,$$

where $\beta > 0$ and ω_i is uncorrelated with all other variables.

If one estimates $y_i = b s_i + \xi_i$ by OLS, then the estimated relationship between s_i and y_i is

$$(5) \quad \hat{b} = \frac{\sum_i s_i y_i}{\sum_i s_i^2}.$$

Substituting (2) into (3) gives

$$(6) \quad s_i = -(\alpha + \gamma)d_i + \varepsilon_i + v_i.$$

Similarly, (2) and (4) give

$$(7) \quad y_i = \beta \alpha d_i - \beta \varepsilon_i + \omega_i.$$

Substituting (6) and (7) into (5) and taking the plim of \hat{b} gives

$$(8) \quad \text{plim } \hat{b} = -\beta \left[\frac{\sigma_{s^*}^2 + \gamma\alpha\sigma_d^2}{\sigma_{s^*}^2 + 2\gamma(\alpha + \gamma)\sigma_d^2 + \sigma_v^2} \right],$$

where $\sigma_{s^*}^2 = \alpha^2\sigma_d^2 + \sigma_\varepsilon^2$.

First, consider the case when the only source of measurement error is classical measurement error. Then $\gamma = 0$ and (8) reduces to the standard formula for attenuation bias: $\text{plim } \hat{b} = -\beta[\sigma_{s^*}^2 / (\sigma_{s^*}^2 + \sigma_v^2)]$.

Next, consider the measurement error introduced by the undersampling of slaves from the interior. The result of this is that the underestimation of slave exports is increasing in a country's distance from the coast: $\gamma > 0$. Looking at (8), it is apparent that $2\gamma(\alpha + \gamma) > \gamma\alpha$, and therefore the presence of nonclassical measurement error also biases the estimated coefficient toward zero, reinforcing the attenuation bias resulting from classical errors in variables.

B. Data

Real per capita GDP data are from Maddison (2003). Land area, which is used to calculate $\ln(\text{export}/\text{area})$, $\ln(\text{coastline}/\text{area})$, and population density in 1400, is measured in millions of square kilometers, and is from Parker (1997). Historic population figures, measured in thousands of people, are from McEvedy and Jones (1978). For some groups of smaller countries, population data are only disaggregated to a regional level. In these cases the data are disaggregated to the country level using the distribution of population in 1950 from the United Nations. Data on the identity of the colonizer before independence are from the *Political Regimes and Regime Transitions in Africa, 1910–1994* data set, which is described in Bratton and van de Walle (1997).

Distance from the equator is the absolute value of the latitude of each country's centroid, measured in degrees. Longitude is the longitude of each country's centroid, also measured in degrees. The centroid of each country is calculated using the Centroid Utility in ArcGIS. For five countries where the centroid falls outside the land borders of the country (Gambia, Somalia, Cape Verde, Mauritius, and Seychelles) the point within the country closest to the centroid is used. The location on the coast that is closest to each country's centroid is identified using the Proximity Utility in ArcGIS.

TABLE A.1
SUMMARY STATISTICS

Variable	Mean	Std. dev.	Min	Max	<i>N</i>
ln real per capita GDP in 2000	7.13	0.83	5.38	9.27	52
ln(exports/area)	3.26	3.89	-2.30	8.82	52
ln(exports/pop)	9.26	3.68	3.91	14.4	52
Distance from equator	13.6	9.86	0.2	36	52
Longitude	16.7	20.2	-24.0	57.8	52
Lowest monthly rainfall	8.87	16.1	0	69	52
Avg max humidity	71.7	11.9	35	95	52
Avg min temperature	8.75	7.49	-9.0	19	52
ln(coastline/area)	-0.24	3.24	-4.61	6.98	52
Island indicator	0.10	0.30	0	1	52
Percent Islamic	35.3	39.1	0	100	52
French legal origin	0.65	0.48	0	1	52
North Africa indicator	0.10	0.30	0	1	52
ln(gold prod/pop)	-7.48	5.66	-13.8	3.08	52
ln(oil prod/pop)	-6.71	4.03	-9.21	3.24	52
ln(diamond prod/pop)	-5.49	2.40	-6.91	2.19	52
Atlantic distance	7.38	3.28	3.64	16.40	52
Indian distance	6.93	4.24	0.03	16.78	52
Saharan distance	3.51	1.57	0.31	6.64	52
Red Sea distance	3.44	1.47	0.06	6.47	52

TABLE A.2
ROBUSTNESS AND SENSITIVITY CHECKS

Specification	Coef.	Std. Err.	<i>N</i>	<i>R</i> ²
Normalizing slave exports by average population from 1400 to 1900	-0.103***	(0.035)	52	0.77
Omitting zero slave export countries	-0.104**	(0.041)	41	0.84
Omitting N. Africa, islands, GNQ, LSO, SWZ, and ZAF	-0.140***	(0.040)	38	0.70
Including five region fixed effects	-0.099**	(0.036)	52	0.80
Omitting influential observations	-0.091***	(0.031)	42	0.90

Notes. The table reports OLS estimates of (1), with the full set of control variables from Table III included. The dependent variable is the natural log of real per capita GDP in 2000, ln *y*. Each row of the table reports estimates from one regression. ***, **, and * indicate significance at the 1%, 5%, and 10% levels. The "five region fixed effects" in row 4 are North, West, Central, East, and South Africa. In row 5, influential observations were omitted if Cook's distance was greater than 4/*N*, where *N* is the number of observations.

Lowest monthly rainfall is the average total rainfall, measured in millimeters, in the driest month of the year. Average maximum humidity is the average of the maximum afternoon humidity, measured in percent, during the hottest month of the year. Average minimum temperature is the lowest average monthly

temperature measured in degrees Celsius. The data are from meteorological data taken over a 30-year period and reported in Parker (1997). Countries' total coastline, which is used along with land area to calculate $\ln(\text{coastline}/\text{area})$, is measured in thousands of kilometers and is from Parker (1997).

The percent Islamic variable is the percentage of a country's population that is Islamic. The data are from Parker (1997). Data on countries' legal origins are from La Porta et al. (1999). All countries in the sample are coded as being either British common law or French civil law countries. Data on the production of diamonds, crude petroleum, and mined gold are from the British Geological Survey's *World Mineral Statistics* and *World Mineral Production*. All three variables are measured as the natural log of the average annual production per thousand inhabitants from 1970 to 2000. Diamonds include both gemstones and industrial diamonds and are measured in thousands of carats. Crude petroleum is measured in thousands of tonnes, and mined gold is measured in kilograms.

Ethnic fractionalization is from Alesina et al. (2003). The measure of nineteenth-century state development is from Genaioli and Rainer (2006).

When taking the natural log of variables that may take on the value of zero, I replace the zero observations with 1×10^n , where n is the largest integer value possible subject to 1×10^n being less than the smallest nonzero observation in the data.

The distance instruments measure the shortest sailing distances to the locations of demand in the trans-Atlantic and Indian Ocean slave trades and the shortest overland distances to the locations of demand in the Red Sea and trans-Saharan slave trades. The distances are calculated using the great circle distance between two locations. The formula for this is $d_{ij} = (\arccos\{\sin(La_i)\sin(La_j) + \cos(La_i)\cos(La_j)\cos(Lo_i - Lo_j)\}) \times 111.12/1000$, where d_{ij} is the distance in thousands of kilometers between location i and j , La_i is the latitude of location i in degrees, and Lo_i is the longitude of location i in degrees. When calculating the sailing distances, I do not allow ships to sail across land or through the Suez Canal, which was not completed until 1869. For voyages from northern Africa in the trans-Atlantic slave trade, I calculate the sailing distance through the Strait of Gibraltar to the closest market in the Atlantic Ocean. For the distance from these countries in the Indian Ocean slave trade, I calculate the sailing distance through the Mediterranean Sea, and then south

around the Cape of Good Hope. When calculating distances from East African countries during the trans-Atlantic slave trade, and from West African countries during the Indian Ocean slave trade, I calculate the sailing distance around the Cape of Good Hope.

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