The Historical Slave Trade and Firm Access to Finance in Africa

Lamar Pierce
Olin Business School, Washington University in St. Louis

Jason A. Snyder
Eccles School of Business, University of Utah

Access to finance helps explain the link between the historical African slave trade and current gross domestic product. We first present mistrust, weakened institutions, and ethnic fractionalization as plausible historical channels linking the slave trade to modern finance and development. We then show (i) the slave trade is consistently linked to reduced access to the formal and trade credit needed by modern firms, (ii) this shortage particularly reduces capital investment in smaller firms not in business groups, and (iii) the slave trade cannot explain most other business obstacles, suggesting that long-term societal shocks are exceptionally important for finance. (*JEL* G21 J15 N27 Z13 G30)

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A well-developed literature in finance shows that firms that cannot access external finance forgo profitable and welfare-enhancing investment opportunities.[1] But if external finance is so important both for firms and for economic prosperity, why do we see so much variation in financial development? While a stream of literature has suggested institutional or political economy explanations for persistent financial underdevelopment,[2] we propose an explanation that draws on the long-term persistence of historical shocks to society through both institutions and culture. In this paper, we show

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[1] See Fisman and Love (2003, 2004), Levine (1997), and Rajan and Zingales (1998) for links between access to finance and welfare and development.

[2] See Benmelech and Moskowitz (2010) or La Porta et al. (1997, 1998).

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that strong negative shocks in the past are associated with modern firms' restricted access to external finance.[3]

We use the historical slave trade in Africa to link historically persistent cross-country variation in institutions and culture to modern finance. Prior work has shown that countries with plausibly exogenous higher rates of slave extraction in the fifteenth through the nineteenth centuries have lower gross domestic product (GDP) in the twentieth century, which the authors attribute to weaker institutions, reduced cultural trust, and higher ethnic fractionalization (Nunn 2008; Nunn and Wantchekon 2011; Whatley and Gillezeau 2011).[4] While this work provides compelling evidence linking this historical shock to trust and development, the role of firms and investment in this relationship remains unclear despite a body of literature on the importance of the business environment in development (e.g., La Porta et al. 1997, 1998; Djankov, McLiesh, and Shleifer 2007). Our paper asks (i) if historically high levels of slave extraction are associated with current higher barriers to external finance, (ii) if informal credit effectively substitutes for formal access to external finance in countries that had high levels of slave extraction, and (3) if high levels of slave extraction are associated with other business obstacles, or if the relationship with finance is exceptional.

We examine these questions by combining historical data on the African slave trade with firm-level data from the World Bank Enterprise Survey (WES). The WES data measure business activities and perceptions of the business climate between 2006 and 2009 for over 15,000 firms in 38 African countries. We first apply least squares regression and instrumental variable models to show that firms in countries with high historical levels of slave extraction report access to finance to be a greater obstacle to business development than do firms in countries with low extraction.

We next show that firms in high-slave-extraction countries rely less on formal means of credit such as bank loans, lines of credit, checking accounts, and overdraft facilities. Slave extraction at the country level also correlates with a lower level of access to credit from suppliers. Although informal financial channels often act as substitutes for inaccessible formal financial channels (Fisman and Love 2003; Meltzer 1960), we find no evidence that firms in countries affected by the slave trade are able to compensate for insufficient formal finance channels with credit from suppliers and customers. This finding is particularly important because supplier credit is a key source of finance in Africa, where it has been linked to cultural factors such as ethnic networks and trust (Biggs, Raturi, and Srivastava 2002; Fafchamps 2000; Fisman 2001).

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[3] We build on an important related literature on trust and household finance. These studies have shown that variation in household financial decisions has roots in the long-term persistence of deeply held cultural beliefs such as trust (D'Acunto, Prokopczuk, and Weber 2015; Guiso, Sapienza, and Zingales 2004, 2006, 2008; McMillan and Woodruff 1999).

[4] For other examples from the historical persistence literature, see Acemoglu, Johnson, and Robinson (2001), Banerjee and Iyer (2005), Dell (2010), Feyrer and Sacerdote (2009), and Tabellini (2010).

Our results cannot be explained by reduced demand for credit because of weaker investment opportunities resulting from the slave trade. Slave exports are very strongly negatively correlated with the likelihood that firms report not needing a loan. Though not perfect, this suggests that the results are not being driven by lack of investment opportunities, but rather by firms in high-slave-extraction countries being unable to pursue identified opportunities because of financial constraints. Firms in high-extraction countries instead reported they were less likely to apply for a loan because of cumbersome applications, excessive collateral requirements, interest rates, insufficient loan size, and bribe requirements from bank officials.

Our results are robust to extensive control variables that include natural resources, political history, and the formal colonization of Africa and its associated legal systems (French or British law), which occurred after the slave trade ended. We also support our main results using a similar approach to Rajan and Zingales (1998), showing that although African economies with low slave extraction have similar cross-sector differences in sales credit to sub-Saharan Africa's best-functioning economy, South Africa (with almost no slave extraction), those countries with historically high slave extraction show significantly less cross-sector variation. We further show that the relationship between slave extraction and reduced access to finance is strongest among smaller and independent firms that are not part of a business group. More importantly, we demonstrate real effects of inhibited access to finance on capital investment. Using within-country analysis, we show that being part of a larger business entity as a subsidiary or business group member improves capital investment and access to formal credit in high slave-extraction countries.

Finally, we show that the association between access to finance and the slave trade is both large and exceptional. The slave trade explains between 5% and 25% of the cross-country variation in firm-level access to credit in our sample of African countries. Furthermore, we provide a set of descriptive facts showing that of the fifteen major business obstacles in Africa identified by the World Bank's Enterprise Survey, access to finance is one of only two that consistently correlate with historical slave extraction. The only other obstacle is access to electricity, which also requires substantial credit. This suggests that other institutional and transactional obstacles to doing business in Africa were largely shaped by other historically important forces, such as colonization, legal origins, and natural resources. Given the extensive literature linking access to finance with both economic development (Levine 1997; Gennaioli, La Porta, et al. 2013) and cultural elements such as trust (McMillan and Woodruff 1999; Guiso, Sapienza, and Zingales 2004), this set of descriptive facts further supports the role of culture in access to finance as being of first-order importance.

This paper contributes to several lines of research that suggest that the historical foundations of culture are linked to present-day firm access to finance. One line has shown a strong correlation between individual levels of trust and

financial contracting (Greif 1997; Guiso, Sapienza, and Zingales 2004, 2008; Kotkin 1993; Lyon 2000; McMillan 1997; McMillan and Woodruff 1999). The literature on trust and finance has been critical to understanding regional and national variation in financial practices, but has largely correlated individual self-reported trust with household financial decisions. We connect a known source of this cultural variation to firm-level financial barriers, suggesting the unique importance of finance in linking culture with economic growth. Additionally, in contrast to prior scholars, we are able to exploit a large, plausibly exogenous, cross-country shock within a continent. This paper thus provides unique support for finance scholars' increasing focus on trust (e.g., Sapienza and Zingales 2012).

We contribute to a second line of research that uses historical events and conditions to establish causal links to both culture and modern outcomes (Alesina, Nunn, and Giuliano 2013; Glaeser and Shleifer 2002; La Porta et al. 1998, 1999; Tabellini 2010). Most of these events involve quasi-random variation in occupying powers' use of their "possessions" as extraction states, leading in turn to present-day underdevelopment (e.g., Acemoglu, Johnson, and Robinson 2001; Banerjee and Iyer 2005; Dell 2010; Feyrer and Sacerdote 2009).[5] While this literature frequently argues that this persistent causal relationship is based in institutions (Djankov, McLiesh, and Shleifer 2007; Jappelli and Pagano 2002; La Porta et al. 1997, 2000; Stulz and Williamson 2003) or cultural mistrust transmitted across generations (Algan and Cahuc 2010; Dohmen et al. 2012; Guiso, Sapienza, and Zingales 2006, 2009; Knack and Keefer 1997), scholars have typically focused on aggregates like GDP or outcomes such as self-reported levels of trust and investment in public goods. Very little attention has been paid to how these deep-rooted cultural explanations of trust and development manifest themselves in firm behavior. Yet this is important because business practices such as finance are a principal mechanism through which variation in GDP can be explained.

Finally, we contribute to an emerging literature on the relationship between culture and business practices that economists have only recently examined. Bloom, Sadun, and Van Reenen (2012) show that trust levels in a multinational corporation's home country are associated with the decision rights given to local managers, while Bottazzi, Da Rin, and Hellman (2016) correlate national trust levels and venture capital investment decisions. Related work on bilateral national cultural differences has examined cross-border mergers (Ahern, Daminelli, and Fracassi 2015; Siegel, Licht, and Schwartz 2011), loans (Giannetti and Yafeh 2012), and trade (Guiso, Sapienza, and Zingales 2009). Perhaps most closely related to our work are Pascali's (2016) study of how historical Catholic doctrine toward Jewish communities affected modern banking practices and Brown, Cookson, and Heimer's (2017) study of credit

[5] See Nunn (2009) for a review of the multiple links between history and economic development.

on Native American reservations. To the best of our knowledge, our paper is unique in this literature in both its focus on developing countries and its use of historical shocks to explain sources of persistent differences in access to finance.

We caution the reader that although we show a consistent association between the slave trade and access to finance, we cannot confidently establish a causal link. Although cultural mistrust, ethnic fractionalization, and institutions are plausible mechanisms for this link, many other factors have shaped Africa's business environment and economic development. Access to credit is shaped by many cultural and institutional factors—all of which have numerous sources in Africa's complex history. Our results cannot provide a definitive explanation for the correlation between the slave trade and access to finance.

1. Historical and Cultural Context

In order to believe that the link between the slave trade and modern development can be partly explained through restricted access to finance, three intermediate arguments must be plausible. First, the slave trade must have dramatically changed cultural and institutional factors in the past. Second, these changes must have persisted across history. Third, these historically persistent remnants of the slave trade must plausibly affect firm access to finance in ways consistent with prior work. In this section, we address why we believe these three arguments are plausible based on prior work.

1.1 The impact of the African slave trade

Between 12 and 18 million Africans were sold into slavery between the fifteenth and eighteenth centuries (Lovejoy 2000; Nunn 2008), depopulating the continent by up to 50% of its potential population by 1850 (Manning 1990). Slaves were distributed and sold through four major trade routes: trans-Saharan, Red Sea, Indian Ocean, and transatlantic. Although the majority of slaves in the early periods were kidnapped or taken as prisoners of war, the sourcing of slaves later shifted toward internecine conflict. Africans sold family members, friends, and community members to slave traders, both for goods or money and out of fear that these personal or political rivals would betray them first (D'Almada 1984; Mahadi 1992).

Historians and economists have argued that the slave trade had several interrelated effects on societies that might link slave extraction to modern development. First, the slave trade destroyed existing institutions and then inhibited the formation of modern institutions that are critical for economic growth (Acemoglu, Johnson, and Robinson 2001; Sokoloff and Engerman 2000). Well-established and evolving kingdoms and confederations throughout Africa were undermined by kidnappings and raids by both European and African slave traders (Barry 1998; Inikori 2003; Lovejoy 2000). Furthermore, the slave trade corrupted historical institutions by transforming the legal process

into a mechanism through which one could enslave another (Lovejoy 2000; Northrup 1978). To support this argument, Nunn (2008) finds evidence that the precolonial (and post–slave trade) state development measures developed by Murdock (1967) and Gennaioli and Rainier (2006, 2007) are correlated with slave extraction.

Second, warfare and raids by competing villages not only weakened institutions, but also destroyed relationships across villages and states in ways that fractionalized larger societies into smaller ethnolinguistic groups (Azevedo 1982; Inikori 2003). This fractionalization encouraged parochialism and prevented the formation of larger societies and institutions necessary for economic development (Kusimba 2004). Both Nunn (2008) and Whatley and Gillezeau (2011) find evidence that ethnic fractionalization, broadly thought to influence economic development (Alesina, Devleeschauwer, et al. 2003; Easterly and Levine 1997), is linked with historical slave extraction.

Third, many have argued that widespread betrayal also created a culture of insecurity so severe that it undermined interpersonal trust even within ethnic groups and families. During the slave trade, people often preemptively betrayed community and family members to avoid being betrayed themselves (Piot 1996), even forming alliances with merchants and raiders against community members (Barry 1992; Inikori 2003; Klein 2001). Evidence from a nineteenth-century sample of former slaves in Sierra Leone found that while 25% had been captured in war, 40% had been kidnapped and another 20% had been sold by friends and relatives (Koelle 1854).

1.2 The historical persistence of the African slave trade on modern culture

Strong evidence exists that not only did the slave trade shape precolonial institutions, ethnic fractionalization, and cultural trust, but these effects also persisted across time to help determine modern development and culture. The persistence of precolonial institutions is supported by a robust literature linking modern development and public goods in Africa with precolonial political centralization within ethnic groups (Gennaioli and Rainier 2006, 2007; Herbst 2000; Michalopoulos and Papaioannou 2013, 2014). This suggests that any historical shock to precolonial intra-ethnic institutions from the slave trade likely survived colonialism to affect the modern business environment. Similarly, both Nunn (2008) and Whatley and Gillezeau (2011) find that ethnic fractionalization in Africa can be specifically linked to the slave trade, consistent with other studies of the historical persistence of ethnic fractionalization (Easterly and Levine 1997; Alesina, Devleeschauwer, et al. 2003; Michalopoulos 2011).

The historical persistence of shocks to cultural trust and mistrust is also supported by substantial theory and evidence. Scholars have argued that values persist across centuries through both their intergenerational transmission from parent to child (Algan and Cahuc 2010; Dohmen et al. 2012; Grosjean

2014; Guiso, Sapienza, and Zingales 2008; Tabellini 2008; Michalopoulos, Putterman, and Weil 2016) and through cultural institutions such as religion (Guiso, Sapienza, and Zingales 2003). Thus, even in the absence of institutional persistence, a severe cultural shock such as the slave trade can generate new cultural paths that span generations. Within Africa, important evidence points to a link between slave extraction and a long-term impact on culture. Nunn and Wantchekon (2011) linked ethnicity-specific slave extraction to modern trust measures in the geographic regions of 185 ethnic homelands. Importantly, they find that high exposure to the slave trade was equally powerful for predicting mistrust toward those closest to the respondent (family members) as it was for predicting mistrust of those furthest from the respondent (other tribes).

1.3 The link between culture and finance and its importance in Africa

Existing research on finance and trust suggests that firm access to finance is a likely link between the historically persistent shock of the slave trade and the lack of economic development and trust in sub-Saharan Africa. Access to finance is one of the most important elements for economic development (Bertrand, Schoar, and Thesmar 2007; Rajan and Zingales 1998). Furthermore, a substantial body of research has shown a strong correlation between individual levels of trust and finance (Bottazzi, Da Rin, and Hellman 2016; Kotkin 1993; Greif 1997; McMillan 1997; McMillan and Woodruff 1999; Lyon 2000; Guiso, Sapienza, and Zingales 2004, 2008, 2009). Guiso, Sapienza, and Zingales (2004) find that in areas of Italy where social capital is highest, individuals are more likely to participate in financial markets. For example, they are less likely to hold cash and more likely to own stock. When looking at a broader sample of data, Guiso, Sapienza, and Zingales (2008) find similar results; less trust leads to lower participation in financial markets. This literature collectively establishes a strong link between a broadly defined concept of trust and financial market participation.

There are multiple reasons why trust and the related concepts of ethnic fractionalization and precolonial centralization should be particularly important for access to finance in Africa. While over 80% of households in Western Europe and North America have banking accounts (Beck, Demirguc-Kunt, and Peria 2007), fewer than 20% in sub-Saharan Africa do (Beck, Demirguc-Kunt, and Maksimovic 2008). Banks and other formal financial institutions are underdeveloped, which limits the possibility of checking and savings accounts as well as formal institutional loans. Beck, Demirguc-Kunt, and Maksimovic (2008) note that the cost of opening an account in countries such as Cameroon and Sierra Leone exceeds the per capita GDP. Despite this scarcity of finance across Africa, there is evidence of heterogeneity across populations and countries. Private credit as a percentage of GDP ranges from 1.9% in Mozambique to 19.1% in Ethiopia (Beck, Demirguc-Kunt, and Maksimovic 2008). Honohan and Beck (2007), in a report for the World Bank, argue that sub-Saharan Africa's level of trade credit—the world's lowest—can be partially

explained by extremely low levels of trust. Given low levels of generalized trust, friends, family, and ethnic networks play critical roles in trade credit and other informal finance (Beck and Demirguc-Kunt 2006; Biggs, Raturi, and Srivastava 2002). Fafchamps (2000), La Ferrara (2002), and Fisman (2003) all found that ethnicity is a critical factor in determining which firms have access to shared resources and trade credit.

Consequently, ethnic fractionalization from the slave trade may inhibit credit networks because there are simply fewer opportunities for financial exchange with firms from the same ethnic group. This is consistent with prior work showing ethnic fractionalization to be strongly linked to lower trust, weaker development, and inhibited access to finance in developing countries (Alesina and La Ferrara 2002; Barr 2003; Glaeser, Laibson, et al. 2000).

Compounding this problem of ethnic fractionalization is that the slave trade not only reduced trust between ethnic groups, but also undermined trust within ethnic groups and families (Nunn and Wantchekon 2011). This intra-ethnic mistrust also may have inhibited the development of precolonial political centralization, given the known importance of trust in institutional development (Putnam 1993; Beck, Demirguc-Kunt, and Maksimovic 2005; Beck, Demirguc-Kunt, and Levine 2005).

2. Data

Our analysis uses two primary data sets. The first is Nathan Nunn's (2008) data set on the African slave trade between the years 1400 and 1900. Nunn constructed estimates of the number of slaves extracted from the land areas that define each present-day African country for the four slave trades (Indian Ocean, Red Sea, trans-Saharan, and transatlantic). These estimates combine historical data on slaves' ethnicities with shipping data from multiple ports and regions of Africa. Ethnicity data came from records on 80,656 slaves with 229 ethnic designations from 54 samples. Shipping data came from different sources for each of the four major slave trades, including data from Austen (1979, 1988, 1992) on the Indian Ocean, Red Sea, and trans-Saharan trades and the Trans-Atlantic Slave Trade Database built by Eltis et al. (1999).[6] Combining these data based on ethnicity produces slave extraction data for 52 African countries.

The second data set is the World Bank Enterprise Survey (WES) conducted between 2006 and 2010. The survey covers over 100,000 businesses in more than 120 countries, asking owners and managers to provide information and opinions on productivity, business practices, and business obstacles. The WES covers approximately 15,000 observations in the 38 countries in Africa for which we have historical data on slave extraction. The majority of the missing countries are in North Africa, where slave extraction was relatively low.

[6] See Nunn (2008) for a detailed description of the sourcing and building of this database.

Table 1
Country summary statistics

	Obs	Mean	SD	Min	Max
Log(Slave exports / Land area)	38	4.380	3.682	−2.303	8.818
British colony	38	0.368	0.489	0.000	1.000
French colony	38	0.368	0.489	0.000	1.000
Netherlands colony	38	0.079	0.273	0.000	1.000
Portuguese colony	38	0.105	0.311	0.000	1.000
Log(Coastline / Land area)	38	−0.780	3.052	−4.605	5.478
Log(Population 1400)	38	−1.276	2.091	−8.590	1.742
Absolute latitude	38	12.379	8.019	0.200	30.000
Longitude	38	13.941	20.368	−24.044	57.794
Min of monthly average rainfall (mm)	38	8.158	11.767	0.000	46.000
Max of monthly afternoon avg humidity	38	72.579	10.789	35.000	95.000
Min of avg monthly low temp (C)	38	8.816	7.296	−9.000	19.000
Log(Land area in millions of sq. kms)	38	−1.528	1.752	−6.287	0.854
Indicator variable for small islands	38	0.053	0.226	0.000	1.000
Percent Islamic	38	25.792	31.585	0.000	99.000
Former communist country	38	0.132	0.343	0.000	1.000
Legal origin indicator: French	38	0.605	0.495	0.000	1.000
Log(Diamond production per capita)	38	−5.137	2.603	−6.908	2.187
Log(Oil production per capita)	38	−7.268	3.600	−9.210	2.650
Log(Gold production per capita)	38	−6.309	5.393	−13.816	3.084
Minimum Atlantic distance (000s of kms)	38	6.590	2.693	3.647	12.589
Minimum Indian distance (000s of kms)	38	6.696	3.641	0.032	11.914
Minimum Saharan distance (000s of kms)	38	3.870	1.357	1.768	6.637
Minimum Red Sea distance (000s of kms)	38	3.801	1.352	0.510	6.465

See Nunn (2008) for detailed description of country-level variables and the sources for each variable.

Others, including Zimbabwe, Equatorial Guinea, and Sudan, also had low slave extraction. Within our 38 countries, WES responses are highly concentrated within ethnically diverse urban areas, and do not reveal the ethnicity of firm owners, managers, or employees. In Senegal, for example, nearly 90% of all respondents are in three major cities with ethnic ratios identical to the country as a whole. It is therefore impossible to assign firms within country to differential ethnic groups with unique slave extraction levels, as in Nunn and Wantchekon's (2011) Afrobarometer-based study of individuals.

Table 1 provides country-level summary statistics for the 38 countries covered by both data sets. We represent slave extraction by logging the number of slaves extracted divided by the geographic area in square kilometers.[7] The first set of control variables represents country-level geographic and environmental characteristics that might influence economic development or health and includes longitude, distance from the equator, lowest monthly rainfall, maximum humidity, low temperature, coastline length (logged), and a dummy indicating whether a nation is an island.[8] We also include dummy variables for important cultural and institutional factors that may also influence access to finance, including the percentage of adherence to Islam and a dummy

[7] All references to slave extraction in this paper will refer to this logged area-adjusted measure. Since the natural log of zero does not exist, for countries with no slave extraction, the 0 observation is replaced with 1.

[8] See Nunn (2009) or Nunn and Puga (2012) for a discussion of the relationship between geography and economic development.

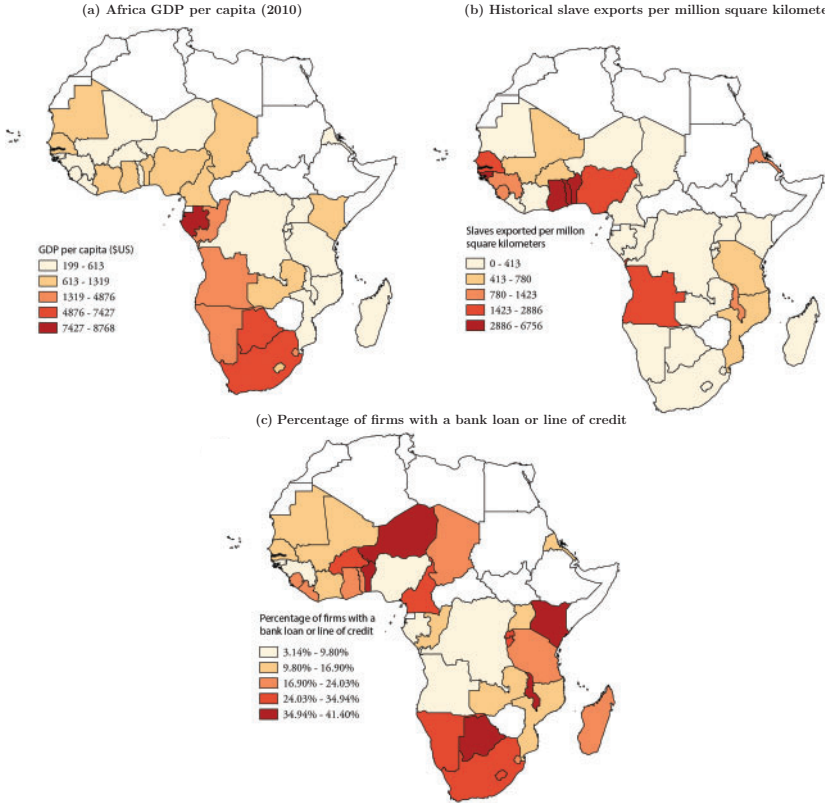

Figure 1
GDP data comes from the World Bank 2010 estimates. Slave exports data come from Nunn (2008). Credit data are from the World Enterprise Survey. Countries in white are not included in the World Enterprise data set.

for French legal origins, which arguably have the worst protection for investors (La Porta et al. 1997).[9] We also include dummies for European colonizers, which proxies for the level and nature of colonial influence. We include controls for natural resource wealth, using the average per capita production of gold, oil, and diamonds. We also include Nunn's (2008) calculation of logged population density in 1400—a reasonable measure of preexisting economic prosperity in Africa (Acemoglu, Johnson, and Robinson 2002). These control variables are the standard set for cross-country work within Africa, used by Besley and Reynal-Querol (2014) and Nunn (2008), among others. Furthermore, we present the minimum distance to the primary slave markets for the four slave trades, which will serve as instrumental variables later in the paper.

Figure 1a presents 2010 GDP per capita for each of the 38 countries in our sample, with darker shades representing higher values. Figure 1b presents

[9] See La Porta et al. (1997, 1998, 2000) for a discussion of the impact of legal origins on finance and development.

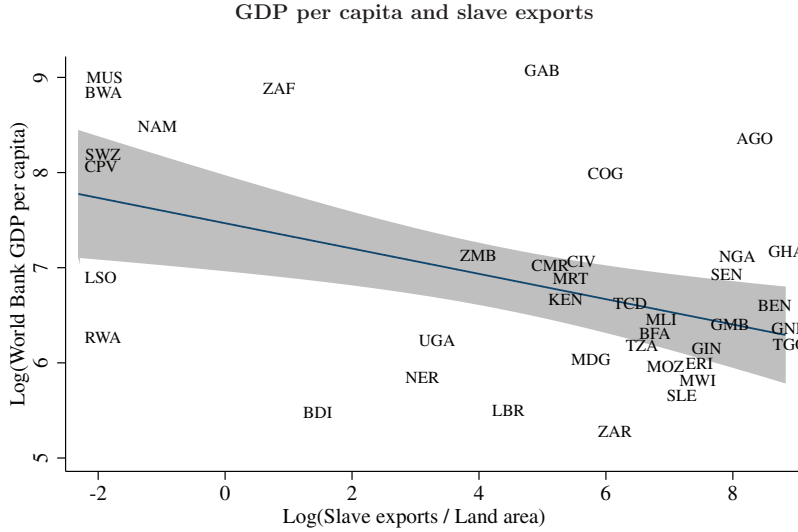

Figure 2
Data comes from Nunn (2008) and the World Bank's 2010 GDP data. Graph replicates Nunn's key result on the sample of 38 countries from the World Enterprise Survey data. Small changes to the positions of the countries were made to prevent the overlapping of the country labels.

country-level historical slave extraction per million square kilometers, with darker shades representing higher values. Those countries with higher area-adjusted slave extraction have lower per capita GDP. Since we rely heavily on Nunn (2008) to establish the economic importance of the historical slave trade, we replicate his results in Figure 2 and Appendix Table A1, using the subset of 38 countries for which we have WES data. Even with our smaller sample, slave-extraction levels are highly predictive of economic development over the twentieth century.

Table 2a presents summary statistics on firm characteristics and self-reported financial practices for the 15,276 responses from the WES for countries with slave-extraction data. The survey provides key information on firm characteristics, including ownership, organizational structure, industry sector, age, and size. Firm size is defined in the WES by three categories: less than 20 employees, 21 to 99 employees, and 100 or more employees. Financial practices include the use of checking or savings accounts, overdraft protection, bank loans or formal lines of credit, input purchases paid with trade credit, and four mutually exclusive and exhaustive sources for working capital: internal funds, formal institutional loans,[10] supply chain credit, and other sources. Internal financing is the dominant form of finance, with informal supply chain credit and formal loans being much less common. We also present whether the firm applied for or

[10] We combine two categories—bank loans and loans from non-bank institutions—into this formal institutional loans category.

Table 2a
Firm summary statistics

	Obs	Mean	SD	Min	Max
Small size firm	15,276	0.645	0.479	0	1
Medium sized firm	15,276	0.260	0.439	0	1
Large sized firm	15,276	0.095	0.293	0	1
Business group	15,272	0.169	0.374	0	1
Pct. of establishment owned by domestic	15,222	83.108	35.580	0	100
Years of top manager experience	15,069	12.934	9.374	0	75
Firm age	15,100	13.279	12.796	0	190
Self-reported: Finance is an obstacle	13,238	0.448	0.497	0	1
Line of Credit	15,141	0.202	0.402	0	1
Pct inputs purchased with trade credit	14,879	0.276	0.366	0	1
Checking	13,274	0.859	0.348	0	1
Overdraft	15,105	0.294	0.456	0	1
Pct internal credit	15,086	0.728	0.297	0	1
Pct bank credit	15,086	0.067	0.179	0	1
Pct supply chain credit	15,086	0.160	0.215	0	1
Pct other credit source	15,086	0.044	0.146	0	1
Pct offering sales credit	14,917	0.279	0.350	0	1
Apply for any loan last year?	15,079	0.216	0.412	0	1
Reason didn't apply: Did not need a loan	11,707	0.392	0.488	0	1
Reason didn't apply: Application procedures	11,707	0.179	0.383	0	1
Reason didn't apply: Collateral requirement	11,707	0.111	0.314	0	1
Reason didn't apply: Interest rates	11,707	0.178	0.383	0	1
Reason didn't apply: Insufficent size	11,707	0.022	0.145	0	1
Reason didn't apply: Informal payment	11,707	0.058	0.234	0	1
Reason didn't apply: Would not be approved	11,707	0.060	0.238	0	1

Data are self-reported responses of managers from the World Bank Business Enterprise Survey. "Finance is an obstacle" was not asked in Nigeria. "Reason didn't apply" responses are conditional on answering "no" to apply for any loan last year. *Pct internal credit, pct bank credit, pct supply chain credit,* and *pct other credit source* are mutually exclusive and exhaustive.

needed a loan, as well as the self-reported most important reasons for not applying for a loan.[11] Figure 1c presents the substantial variation in the percentage of firms with a bank loan or line of credit across the 38 countries in our sample.[12]

In Table 2b, we present self-reported access to finance as an obstacle to business, which is part of a set of 15 potential business obstacles subjectively measured on a five-point scale between 0 and 4. We define each obstacle as equal to 1 if it is reported as a major (3) or severe (4) obstacle.[13] We use this dichotomous variable in place of the ordinal scale for ease of interpretation, since directly using the ordinal scale in ordinary least squares (OLS) would restrict the marginal effect to be equivalent across the range of values. As we will explain later, our results are robust to multiple definitions of this variable. Approximately 45% of firms report access to finance as an obstacle, which is only outranked by access to electricity, which typically requires a credit-based deposit for customers and extensive credit for those building generation plants.

[11] The observations decrease by about 3,000 because the reasons for not applying for a loan are conditional on those who did not apply.

[12] Details on the 14 sectors into which the firms are categorized are available in Appendix Table A2.

[13] 0 represents no obstacle, 1 a minor obstacle, 2 a moderate obstacle, 3 a major obstacle, and 4 a very severe obstacle.

Table 2b
Further firm summary statistics

	Obs	Mean	SD	Min	Max
Self-reported: Finance is an obstacle	13,238	0.448	0.497	0	1
Self-reported: Access to electricity is an obstacle	15,240	0.527	0.499	0	1
Self-reported: Courts are an obstacle	12,881	0.129	0.336	0	1
Self-reported: Transportation is an obstacle	15,188	0.266	0.442	0	1
Self-reported: Land access is an obstacle	15,090	0.249	0.432	0	1
Self-reported: Inadequately educated workforce is an obstacle	15,097	0.185	0.388	0	1
Self-reported: Political stability is an obstacle	14,973	0.222	0.415	0	1
Self-reported: Crime is an obstacle	15,224	0.283	0.450	0	1
Self-reported: Corruption is an obstacle	14,993	0.329	0.470	0	1
Self-reported: Tax rates are an obstacle	15,052	0.344	0.475	0	1
Self-reported: Tax administration is an obstacle	15,117	0.243	0.429	0	1
Self-reported: Business licensing is an obstacle	14,953	0.168	0.374	0	1
Self-reported: Labor regulation is an obstacle	15,160	0.084	0.277	0	1
Self-reported: Trade regulation is an obstacle	14,943	0.178	0.382	0	1
Self-reported: Informal sector competition is an obstacle	15,135	0.331	0.471	0	1

Data are self-reported responses of managers from the World Bank Business Enterprise Survey. The variables are coded as 1 if the respondent reports the obstacle as major (3) or severe (4) on a scale of 0 to 4. The variables are coded as 0 otherwise. "Finance is an obstacle" was not asked in Nigeria during the survey period.

3. Empirical Analysis

3.1 Firm-level obstacles to finance

We use WES data to examine whether firms in high-slave-extraction countries report difficulty accessing external finance. We implement a series of linear probability models, where the dichotomous self-report of access to finance as a business obstacle is regressed on the logged number of extracted slaves (normalized by geographic area) and a series of country- and firm-level controls. We use firm-level analysis to control for important sector-specific differences in access to credit that could not be included as country-level averages due to the limited degrees of freedom with only 37 countries.[14] We cluster standard errors at the country level.[15] The baseline specification is:

$$y_{ik} = \beta_0 + \beta_1 \ln(\text{slave exports}_k / area_k) + \mathbf{C}_k^{'}\delta + \mathbf{X}_k^{'}\gamma + \mathbf{Z}_i^{'}\lambda + \varepsilon_{ik}, \qquad (1)$$

where y_{ik} is a dummy variable indicating that respondent i in country k views access to finance as a major or severe business obstacle and $\ln(\text{slave exports}_k/area_k)$ is the natural log of the number of slaves extracted from country k between 1400 and 1900 normalized by land area. $\mathbf{C}_k$ is a vector of dummy variables representing the European colonizer prior to independence; $\mathbf{X}_k$ is a vector of geographic, climate, and cultural control variables; and $\mathbf{Z}_i$ is a vector of industry-sector dummies interacted with each of the three firm-size dummies as well as a linear term for firm age.

[14] There are no data for self-reported access to finance as an obstacle from Nigeria.

[15] Simulations from Cameron, Gelbach, and Miller (2008) conclude that our 37 clusters are sufficient to produce asymptotically unbiased standard errors. An explanation of problems with block-bootstrapping is presented in the Appendix along with results from these models.

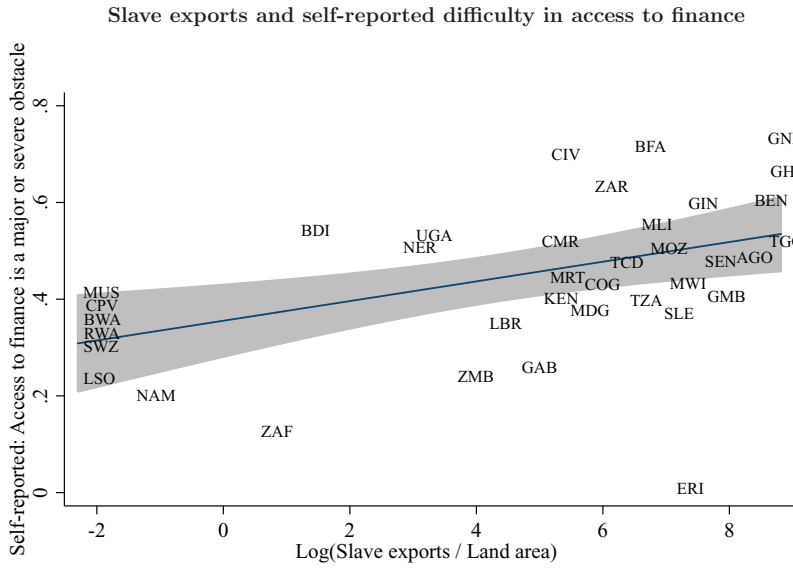

Figure 3
Data come from Nunn (2008) and the World Enterprise Survey. Small changes to the positions of the countries were made to prevent the overlapping of the country labels.

Figure 3 presents raw country-level data showing the positive relationship between area-adjusted slave extraction and access to finance as an obstacle. Coefficients for area-adjusted slave extraction from our regression models are presented in Table 3, with standard errors clustered at the country level in parentheses. The first column reports estimates without any control variables, while the second column adds the industry and firm-size controls. The baseline results suggest that approximately 28% of firms in the lowest slave-extraction countries describe access to finance as a major or severe obstacle. In the highest slave-extraction countries, the frequency increases to 57%. Furthermore, these results remain unchanged by the inclusion of extensive firm-level control variables in column (2), suggesting that the effect is not driven by the composition of firms across these countries. The third column adds colonizer, coastline, and preexisting population density controls, while the fourth column presents the fully controlled model. Again, the results remain unchanged, suggesting that colonizer identity, legal origins, and geography are not the underlying explanatory factors.[16]

Although our firm-level specifications are important because they control for sector-specific differences in access to finance, we collapse the data to the country level in columns (5) and (6), where self-reported access to finance as an obstacle is the average of all firm data. We rerun the uncontrolled and

[16] Coefficients for all control variables in each model in the paper are available in the online appendix.

Table 3
Historical slave exports and modern self-reported access-to-finance obstacle

	Dependent variable: Self-reported access to finance							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(Slave exports / Land area)	0.026***	0.024***	0.030***	0.052***	0.020***	0.061***	0.039	0.028
	(0.007)	(0.006)	(0.010)	(0.007)	(0.005)	(0.015)	[.021, .104]	[.01, .188]
Firm Controls	No	Yes	Yes	Yes	No	Yes	No	Yes
Sector Controls	No	Yes	Yes	Yes	No	No	No	No
Colonizer Controls	No	No	Yes	Yes	No	Yes	No	Yes
Log(Coastline / Land area)	No	No	Yes	Yes	No	Yes	No	No
Log(Population in 1400)	No	No	Yes	Yes	No	Yes	No	No
Other Country Controls	No	No	No	Yes	No	Yes	No	No
Unit of Analysis	Firm	Firm	Firm	Firm	Country	Country	Country	Country
Standard Errors	Clustered	Clustered	Clustered	Clustered	Robust	Robust	Robust	Robust
Clusters	37	37	37	37				
First-stage F-statistic							4.66	2.93
Specification	OLS	OLS	OLS	OLS	OLS	OLS	IV	IV

*, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively. Parentheses contain standard errors clustered at the country level (self-reported access-to-finance question not asked in Nigeria). *Slave exports / Land area* is measured as slaves exported per million square kilometers. *Firm controls* include sector indicators, size indicators, firm age, part of business group, % domestically owned, and manager experience in years. *Colonizer controls* include British, French, Portuguese, and Belgium indicators. *Country controls* include longitude, absolute latitude, lowest month rainfall, maximum humidity, coastline area, island indicator, % Islamic, French legal origins, population in 1400, former communist country, diamond production per capita, gold production per capita, and oil production per capita. Specifications 7-8 report the Moreira conditional likelihood ratio intervals for the 95% confidence level for instrumental variables with weak instruments. The F-statistics on the first-stage regressions are consistently less than 10, which implies that we have a weak-instruments problem. We use the Moreira's (2003) conditional likelihood ratio test that provides a set of parameter estimates that would not be rejected at the 95% percentile confidence level. The actual value of the parameter estimate is ambiguous in this case, so we use a limited information maximum likelihood point estimate from Moreira's (2003) Stata code. See Murray (2006) for a comprehensive explanation of this problem and the various approaches to solving it.

fully controlled models. In both, country-level slave extraction is positively related to managers reporting access to finance as a major obstacle. Results using alternative definitions of major obstacle produce consistent results and are available in Table A3 of the online appendix.

As a robustness test, columns (7) and (8) implement the instrumental variables approach from Nunn (2008) to address the potential endogeneity of slave extraction.[17] The principal concern is that the people historically living within current national boundaries may have endogenously selected into the slave trade based on preexisting culture or institutions and that these persistent preexisting cultural or institutional differences also affect modern access to finance. Nunn (2008) presents historical evidence that conflicts with this alternative argument. The slave trade was more prevalent in wealthier societies (as measured by population density). Similarly, Africa is the only place in the world where more rugged, agriculturally inhospitable terrain is positively associated with wealth (Nunn and Puga 2012). We use the distance from each African country to the external demand market location for each of the four major slave trades. For these four instruments to be valid, they must be correlated with slave extraction but uncorrelated with other uncontrolled country characteristics that might predict access to finance. The instruments must also be determinant of slave extraction and not the opposite. Historical analysis shows that local demand for slaves was determined by local natural resources, including pearl diving in the Red Sea, salt mines in the Middle East, precious metals in South America, and agricultural plantations in the Caribbean and North America.

We implement the IV model using all four instrumental variables. First-stage results (Table A4 in the Appendix) show F-statistics that are equivalent to Nunn (2008). Because the instruments are weak, with only 37 observations ($3 < F\text{-stats} < 5$), we implement Moreira's (2003) conditional likelihood correction of confidence intervals (Andrews, Moreira, and Stock 2006). This correction provides the set of parameter estimates that cannot be rejected at the 95% confidence level. We present the second-stage results for the IV models in columns (7) and (8) of Table 3, with 95% confidence intervals. The IV models are consistent with the base OLS models, finding a positive relationship between slave extraction and access to finance as a business obstacle. In unreported results, we find that when we control for country-level characteristics beyond colonizer effects, the standard errors become undefined, given our small sample of only 37 countries and the weakness of the instruments. However, the parameter estimate stays approximately the same. Given the weakness of the

[17] The description of these instruments closely follows from Nunn (2008), 160–61). These four instruments are: (i) The sailing distance from the country's coastline to the closest major slave markets on the Atlantic slave trade. These markets are in the southern United States, Cuba, Haiti, Jamaica, Dominica, Martinique, Guyana, and Brazil. (ii) The sailing distance from the country's coastline to the closest major slave markets on the Indian Ocean slave trade. These markets are in Mauritius and Oman. (iii) The overland distance between the center of the country and the major slave markets on the trans-Saharan slave trade. These markets are in Algeria, Tunisia, Libya, Iraq, and Egypt. (iv) The overland distance between the center of the country and the major slave markets on the Red Sea slave trade. These markets are in Djibouti, Eritrea, and Sudan.

instruments, we are cautious in claiming causal inference from these models, but believe they provide further confidence in our primary regression specifications.

3.2 Access to formal and informal credit

The results from Table 3 suggest that slave extraction is related to reduced access to finance. To further investigate this hypothesized link, we next investigate specific financial channels that might be affected by this history. More specifically, we want to understand if the slave trade affected finance through both formal and informal financial channels.

To do so, we repeat our OLS models from columns (1) through (6) of Table 3 using self-reported financial practices as our dependent variables. Table 4 reports the coefficients and standard errors for slave extraction in each regression, with columns representing different specifications and rows representing different dependent variables.[18] The first row provides coefficients from Table 3 for comparison. Rows (2) through (5) use four dependent variables that indicate either a formal institutional or trade credit source: a bank loan or line of credit, the percentage of input purchases paid for with credit (which reflects access to trade credit), the use of a checking or savings account, and the availability of overdraft protection. The results for each of these models indicate that area-adjusted slave extraction is related to lower access to both formal credit from banks and to informal trade credit. In the baseline model in row (2), column (1), of Table 4, the results suggest that in the countries with the lowest levels of slave extraction, approximately 38% of firms have access to lines of credit, while in the countries with the highest levels of slave extraction, that number drops to approximately 10%. Likewise, in column (1) of row (3), firms in countries with the lowest levels of slave extraction pay for approximately 48% of their input purchases with credit, while this is true for only 16% of firms in the highest-slave-extraction countries.

As an alternative measure of access to finance, we investigate whether firms in high-slave-extraction countries acquire their working capital from different sources than those in low-extraction countries. Rows (6)–(9) of Table 4 examine the percentage of working capital from four mutually exclusive and exhaustive sources: internal funds, loans from banks and other institutions, supply chain credit, and other sources (money lenders, friends, and family). Since these four categories mechanically sum to 1, the effect sizes are relative to one another. The strongest prediction, therefore, is that high-extraction countries will have more reliance on internal funds (such as retained earnings) relative to other external sources, indicating that access to finance from the three external sources is restricted. Indeed, Table 4 shows that firms in high-slave-extraction countries are more likely to rely on internal funds (row (6)) and less likely to rely on bank loans (row (7)), consistent with our earlier results. From column (1) of

[18] Instrumental variable models for each dependent variable in Tables 4 and 5 are presented in Table A5a and A5b in the Appendix.

Table 4
Coefficients for slave exports in regressions predicting different firm financial constraints

	Independent variable: Log(Slave exports / Land area)					
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Self-reported: Finance	0.026***	0.024***	0.030***	0.052***	0.020***	0.061***
is an obstacle	(0.007)	(0.006)	(0.010)	(0.007)	(0.005)	(0.015)
Line of credit	−0.025***	−0.022***	−0.014***	−0.029***	−0.019***	−0.019
	(0.005)	(0.004)	(0.005)	(0.009)	(0.004)	(0.012)
Pct inputs purchased	−0.029***	−0.024***	−0.028***	−0.011	−0.016**	−0.014
with trade credit	(0.007)	(0.006)	(0.009)	(0.007)	(0.006)	(0.013)
Checking	−0.016***	−0.013***	−0.016***	−0.027***	−0.013***	−0.022
	(0.004)	(0.003)	(0.004)	(0.007)	(0.004)	(0.014)
Overdraft	−0.030***	−0.023***	−0.018*	−0.038***	−0.014*	−0.020
	(0.008)	(0.006)	(0.010)	(0.012)	(0.008)	(0.013)
Pct internal credit	0.012***	0.011***	0.007	0.021***	0.013***	0.009
	(0.003)	(0.003)	(0.006)	(0.006)	(0.002)	(0.011)
Pct bank credit	−0.008***	−0.007***	−0.001	−0.009***	−0.008**	−0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Pct supply chain credit	−0.003	−0.003	−0.006	−0.008	−0.005	0.002
	(0.005)	(0.004)	(0.004)	(0.006)	(0.004)	(0.011)
Pct other credit source	−0.000	−0.000	−0.000	−0.005*	−0.001	−0.005
	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.004)
Pct offering sales credit	−0.025***	−0.021***	−0.021***	−0.009*	−0.016***	−0.003
	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)	(0.006)
Firm Controls	No	Yes	Yes	Yes	No	Yes
Sector Controls	No	Yes	Yes	Yes	No	No
Colonizer Controls	No	No	Yes	Yes	No	Yes
Log(Coastline / Land area)	No	No	Yes	Yes	No	Yes
Log(Population in 1400)	No	No	Yes	Yes	No	Yes
Other Country Controls	No	No	No	Yes	No	Yes
Unit of Analysis	Firm	Firm	Firm	Firm	Country	Country
Standard Errors	Clustered	Clustered	Clustered	Clustered	Robust	Robust
Specification	OLS	OLS	OLS	OLS	OLS	OLS

*, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively. Parentheses contain standard errors clustered at the country level (self-reported access-to-finance question not asked in Nigeria). *Slave exports / Land area* is measured as slaves exported per million square kilometers. *Firm controls* include sector indicators, size indicators, firm age, part of business group, % domestically owned, and manager experience in years. *Colonizer controls* include British, French, Portuguese, and Belgium indicators. *Country controls* include longitude, absolute latitude, lowest month rainfall, maximum humidity, coastline area, island indicator, % Islamic, French legal origins, population in 1400, former communist country, diamond production per capita, gold production per capita, and oil production per capita.

row (6), the model predicts that for firms in countries with the lowest level of slave extraction, approximately 65% of working capital will come from internal funds. For firms in countries with the highest levels of slave extraction, that percentage jumps to 78%. Furthermore, row (8) suggests that in the absence of formal credit such as bank loans, firms appear to be less likely to have access to informal credit through supply chain credit, although these last results are only statistically significant in the fully controlled firm-level models. Row (9) suggests that other sources such as family and friends do not make up for credit shortfalls. The weak results on supply chain credit are most likely attributable to the fact that this measure confounds credit from both suppliers and buyers. We address this in row (10), which uses a separate question on whether firms are less likely to offer trade credit. The response to this question is clearly lower in high-slave-extraction countries.

Table 4 is consistent with slave extraction having a long-term impact on access to multiple finance channels. Firms in high-slave-extraction countries are far more likely to rely on internal funds for investment, since they have less access to credit from both financial institutions (loans, credit lines, checking accounts) and trade relationships (supplier and customer credit).

3.3 Reasons for finance obstacles

While our results are consistent with a story that the supply of financing is restricted by cultural or institutional factors, it is possible that the lower use of financing reflects reduced demand due to lack of economic development in these countries (Bigsten et al. 2003). We next show that the use of credit is indeed restricted by the supply of credit, not by the demand for credit. The slave trade is associated not with lack of investment opportunities, but instead with the inability to access the capital necessary to pursue those opportunities.

We first repeat our OLS models from Tables 3 and 4, regressing a dummy variable indicating that the firm applied for credit in the previous year on area-adjusted country-level slave extraction and our full set of control variables. The results for these regressions are presented in Table 5, using the same format as Table 4, and suggest lower levels of credit applications in countries with high slave extraction. Column (1) of row (1) implies that 26% of firms in the lowest slave-extraction countries applied for a loan, compared with only 19% in the highest slave-extraction countries. These results should be interpreted cautiously, however, since the statistical significance varies across specifications. To test whether this decrease reflects decreased demand rather than the availability—or futility—of loan applications, we next examine the self-reported reasons for those 11,707 firms that chose not to apply for a loan. Each of these possible reasons was represented by a dummy variable indicating whether it was the primary reason for not having a loan; this dummy was then regressed on slave extraction and our full set of controls. It is important to note that because firms were asked to choose only the most important reason, these answers are mutually exclusive and coefficients should therefore be interpreted relative to one another.

Row (2) of Table 5 shows cross-country differences in firms declaring that they had no need for a loan. In the lowest-slave-extraction countries, 70% of firms that didn't apply for a loan said the reason was that they didn't need one. In the highest-slave-extraction countries, this rationale drops to 22%. This suggests that the decreased number of applications is not due to lower demand but rather to expectations that loans will not be granted or that they would cost too much. This conclusion is further supported by the fact that among firms that did not list access to finance as difficult (see Table 2b), 57% reported no need for a loan, compared with 21% of those reporting finance as a business obstacle.

Since approximately 40% of firms that did not apply for a loan reported not needing one, we examined several other reasons for not applying: if applications

Table 5
Coefficients for slave exports in regressions predicting reasons for not applying for a loan

	Independent variable: Log(Slave exports / Land area)					
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Apply for any	−0.007	−0.004	−0.001	−0.014**	−0.005	−0.010
loan last year?	(0.004)	(0.003)	(0.005)	(0.006)	(0.003)	(0.005)
Reason didn't apply:	−0.044***	−0.037***	−0.030***	−0.036***	−0.036***	−0.039**
Did not need a loan	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)	(0.013)
Reason didn't apply:	0.018***	0.016***	0.011**	0.020***	0.017***	0.016
Application procedures	(0.002)	(0.002)	(0.004)	(0.007)	(0.003)	(0.011)
Reason didn't apply:	0.010***	0.008***	0.008**	0.011***	0.006**	0.012**
Collateral requirement	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.004)
Reason didn't apply:	0.009***	0.007**	0.002	0.001	0.005	0.002
Interest rates	(0.003)	(0.003)	(0.005)	(0.005)	(0.003)	(0.006)
Reason didn't apply:	0.002**	0.002**	0.001	0.003***	0.001***	0.003
Insufficent size	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Reason didn't apply:	0.006***	0.005***	0.004*	0.010***	0.005***	0.011***
Informal payment	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)
Reason didn't apply:	−0.001	−0.000	0.004*	−0.008*	0.001	−0.005
Would not be approved	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.005)
Firm Controls	No	Yes	Yes	Yes	No	Yes
Sector Controls	No	Yes	Yes	Yes	No	No
Colonizer Controls	No	No	Yes	Yes	No	Yes
Log(Coastline / Land area)	No	No	Yes	Yes	No	Yes
Log(Population in 1400)	No	No	Yes	Yes	No	Yes
Other Country Controls	No	No	No	Yes	No	Yes
Unit of Analysis	Firm	Firm	Firm	Firm	Country	Country
Standard Errors	Clustered	Clustered	Clustered	Clustered	Robust	Robust
Specification	OLS	OLS	OLS	OLS	OLS	OLS

*, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively. Parentheses contain standard errors clustered at the country level (self-reported access-to-finance question not asked in Nigeria). *Slave exports / Land area* is measured as slaves exported per million square kilometers. *Firm controls* include sector indicators, size indicators, firm age, part of business group, % domestically owned, and manager experience in years. *Colonizer controls* include British, French, Portuguese, and Belgium indicators. *Country controls* include longitude, absolute latitude, lowest month rainfall, maximum humidity, coastline area, island indicator, % Islamic, French legal origins, population in 1400, former communist country, diamond production per capita, gold production per capita, and oil production per capita.

were too cumbersome, if loans required excessive collateral, if interest rates were too high, if loans were too small, if loans required informal payments (that is, bribes to bank officers), or if the firm never applied because it anticipated rejection. We present these regressions in rows (3)–(8) of Table 5. Rows (3)–(5) suggest that loan applications in high-slave-extraction countries are perceived to be too cumbersome or require too much collateral, and that the interest rates are too high. Row (6) suggests that loans that were offered in high-slave-extraction countries were also too small, although the fully controlled model shows no correlation. Rows (7) and (8) indicate a relationship between slave extraction and the need to bribe bank officers (informal payment), but no consistent relationship with the expectation of rejection. The specific rationales for not applying for a loan should be interpreted cautiously, since some of these reasons are not altogether conceptually distinct. For example, if the collateral requirement is too high, it is likely that the interest rate is also too high for loans without sufficient collateral. However, the economic and statistical significance for firms having no need for a loan is strong. This result suggests that supply-side

factors—not demand-side factors—are raising the cost of accessing credit. The evidence is consistent with the availability of investment opportunities in the high-slave-extraction countries and the unavailability of the finance necessary to exploit them.

3.4 Business groups and access to finance in high-slave-extraction countries

We next examine whether the relationship between the slave trade and access to finance is reduced for firms that are part of a larger corporate entity such as a business group. Business groups are widely believed to ease finance constraints in developing countries (Khanna and Palepu 2000; Fisman and Khanna 2004; Siegel and Choudhury 2012), such that they may provide access to formal and informal credit in high-slave-extraction countries where it is otherwise scarce. To examine these heterogeneous effects, we interact area-adjusted exports with a variable indicating that the manager reported the firm as part of a business group. We present the coefficients and standard errors for this interaction term in Table 6 using the same format as Tables 4 and 5. The first six columns mirror those of Table 5, while column (7) includes country fixed effects. The direct effects of slave exports from these regressions are reported in Appendix Table A6.

Although firms in business groups in high-export countries show no difference in their perception of access to finance as a major obstacle (row 1), their actual access to formal credit in these countries is higher. The interaction coefficients show that in high export countries, they are more likely to have checking accounts, overdraft protection, and a line of credit, and they rely more on bank credit and less on internal capital. We see weak evidence that they rely less on sales credit in rows (3) and (6), likely because of their improved access to formal credit. These results persist within-country in our fixed effect models.

3.5 Firm supply of trade credit

Up to this point, we have examined WES respondents' reported access to finance, but we are also interested in their provision of trade credit to other firms. Table 7 provides models that regress the percentage of sales that the company made to customers on credit on area-adjusted exports and the same set of control variables used previously. Column (1) shows that in the lowest-slave-extraction countries, credit is provided for 45% of all sales, while in the highest-slave-extraction countries, credit is provided for only about 17% of all sales.

In columns (2) and (3), we examine the relationship between finance and the slave trade across different sectors, using the approach from Rajan and Zingales (1998). In this approach, we first identify sector-level effects on specific financial channels in the most frictionless financial market in sub-Saharan Africa, South Africa, which had virtually no history of slave extraction.

Table 6
Coefficients for the interaction of slave exports with business group membership

	Independent variable: Log(Slave exports / Land area) * Business group				
Dependent variable	(1)	(2)	(3)	(4)	(5)
Self-reported:	0.003	0.004	−0.001	−0.000	0.001
Finance is an obstacle	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Line of credit	0.020***	0.017***	0.017***	0.015***	0.014***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Pct inputs purchased	−0.008	−0.010*	−0.007*	−0.005*	−0.007**
with trade credit	(0.006)	(0.005)	(0.004)	(0.003)	(0.003)
Checking	0.010***	0.008**	0.011***	0.009***	0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Overdraft	0.017**	0.012**	0.013**	0.012**	0.009*
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Pct internal credit	−0.006*	−0.005*	−0.007**	−0.006**	−0.007***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Pct bank credit	0.009***	0.008***	0.008***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Pct supply chain credit	−0.007***	−0.006***	−0.003	−0.002	−0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pct other credit source	0.003**	0.003***	0.003**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Pct offering sales credit	−0.005	−0.007	−0.005	−0.003	−0.004
	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
Firm Controls	No	Yes	Yes	Yes	Yes
Sector Controls	No	Yes	Yes	Yes	Yes
Colonizer Controls	No	No	Yes	Yes	No
Log(Coastline / Land area)	No	No	Yes	Yes	No
Log(Population in 1400)	No	No	Yes	Yes	No
Other Country Controls	No	No	No	Yes	No
Country Effects	No	No	No	No	Yes
Unit of Analysis	Firm	Firm	Firm	Firm	Firm
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered
Specification	OLS	OLS	OLS	OLS	OLS

*, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively. Parentheses contain standard errors clustered at the country level (self-reported access-to-finance question not asked in Nigeria). *Slave exports / Land area* is measured as slaves exported per million square kilometers. *Firm controls* include sector indicators, size indicators, firm age, part of business group, % domestically owned, and manager experience in years. *Colonizer controls* include British, French, Portuguese, and Belgium indicators. *Country controls* include longitude, absolute latitude, lowest month rainfall, maximum humidity, coastline area, island indicator, % Islamic, French legal origins, population in 1400, former communist country, diamond production per capita, gold production per capita, and oil production per capita.

We do so by regressing the WES access-to-finance variables on interactions between the sectors listed in Table 2a and a dummy for firm size:[19]

$$y_{ik} = \beta + \mathbf{Z}_i^{'}\lambda + \varepsilon_{ik}, \tag{2}$$

where y_{ik} is a variable indicated in Table A7 and $\mathbf{Z}_i$ is a vector of industry-sector dummies interacted with each of the three firm-size dummies and a linear term for firm age. The observations and adjusted R^2 values are listed in Table A7. In order to use sector-specific measures, there must be sufficient

[19] We use South Africa because it has the lowest reported level of access to finance as a business obstacle in the WES data. Furthermore, its size provides sufficient observations in the WES data to estimate sector-specific effects on access to finance. We note that we could not use the United States, as in Rajan and Zingales (1998), because the WES does not cover the United States. Furthermore, sector-specific trade credit in South Africa is more likely to be similar to other African countries than would sectors from the United States.

Table 7
Slave exports and the extension of sales credit

	Dependent variable: Pct of sales provided on credit				
	(1)	(2)	(3)	(4)	(5)
Log(Slave exports / Land area)	−0.025***	−0.021***	0.000	0.015*	Absorbed
	(0.005)	(0.005)	(0.008)	(0.008)	
Predicted industry dependence on sales credit		0.243***	0.489***	Absorbed	Absorbed
		(0.080)	(0.127)		
Log(Slave exports / Land area) * Predicted industry dependence on sales credit			−0.044**	−0.049***	−0.048***
			(0.018)	(0.015)	(0.015)
Firm Controls	No	No	No	Yes	Yes
Sector Controls	No	No	No	Yes	Yes
Colonizer Controls	No	No	No	Yes	No
Log(Coastline / Land area)	No	No	No	Yes	No
Log(Population in 1400)	No	No	No	Yes	No
Other Country Controls	No	No	No	Yes	No
Country Fixed Effects	No	No	No	No	Yes
Unit of Analysis	Firm	Firm	Firm	Firm	Firm
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered
Specification	OLS	OLS	OLS	OLS	OLS

*, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively. Parentheses contain standard errors clustered at the country level (self-reported access-to-finance question not asked in Nigeria). *Slave exports / Land area* is measured as slaves exported per million square kilometers. *Firm controls* include sector indicators, size indicators, firm age, part of business group, % domestically owned, and manager experience in years. *Colonizer controls* include British, French, Portuguese, and Belgium indicators. *Country controls* include longitude, absolute latitude, lowest month rainfall, maximum humidity, coastline area, island indicator, % Islamic, French legal origins, population in 1400, former communist country, diamond production per capita, gold production per capita, and oil production per capita.

variation in differences across sectors. Of the many access-to-finance variables used in earlier regressions, the provision of trade credit used in Table 7 is most significantly explained by sectoral factors, with more than double the R^2 of all others. For example, while sector explains only 3% of the variation in bank loans or lines of credit, it explains approximately 14.4% of the variation in sales credit provided to a buyer. Because sales credit provision therefore provides the best variation across sectors within a country, we use it to estimate industry-specific effects of the slave trade across Africa.

Column (2) in Table 7 presents the basic model without interaction, while columns (3)–(5) interact sector-specific dependence with slave extraction. The sector dummies in column (4) absorb the main effect of industry dependence on trade credit, while country fixed effects in column (5) absorb area-adjusted slave exports. Not surprisingly, columns (2) and (3) show that South African sectors where sales credit is more common predict sales credit in other countries. More importantly, the interacted models in columns (3)–(5) show that the negative relationship between slave extraction and access to sales credit is entirely explained by those sectors that heavily supply trade credit. This is true even when country fixed effects are added in column (5).

3.6 Real effects on firm investment

We next use country fixed-effect models to examine how reduced access to finance in high slave-extraction countries might differentially affect actual firm

investment within countries. We focus on the log of capital expenditures (which is only reported for manufacturing firms) as our dependent variable, which we log in order to evaluate percentage changes, since capital expenditures are reported in local currency. We focus on two firm characteristics: business group membership and workforce size.

In column (1) of Table 8, we regress logged capital expenditures on area-adjusted slave extraction, business group membership, and the three levels of workforce size reported in Table 2a. Not surprisingly, column (1) shows that within country, larger firms and those associated with business groups have higher capital expenditures. Column (2) adds an interaction between business group membership and slave exports. Consistent with Table 6, membership in a business group is associated with higher capital investment in high-slave-export countries. Column (3) alternatively interacts workforce size with slave exports, and finds a similar positive interaction between firm size and high-slave-export countries, although the parameter estimates are imprecise. Column (4) includes both interactions. Both business group membership and workforce size continue to be associated with capital expenditure in high-slave-export countries.

Finally, columns (5) and (6) use alternative measures of real effects: capital expenditures as a percentage of sales and whether or not the firm purchased an asset last year. Column (5) reports a higher capex/sales ratio among business groups in high-slave-export countries, but no relationship with firm employment size. Column (6) similarly reports a higher likelihood of asset purchase, but no relationship with firm employment size. Overall, these results consistently show that a firm's business group membership suffers fewer access-to-finance barriers in high-slave-trade countries. Capital expenditures measures suggest that larger firms suffer less as well.

3.7 Is finance exceptional?

Given the many obstacles to business in Africa indicated by WES respondents (see Appendix Table A2), one might question if access to finance is just one of many ways in which the historical slave trade influences modern development. We show an exceptional and economically important relationship between finance and the historical slave trade in two ways. First, we show that among all the important business obstacles in Africa, access to finance is exceptional in its relationship with the historical slave trade. We implement our models from columns (1) through (4) of Table 3 to test whether the 14 other self-reported business obstacles in the WES survey listed in Table 2c are also predicted by historical slave extraction. We present the coefficients and standard errors clustered at the country level for area-adjusted slave exports for each of these 14 dependent variables in Table 9, in addition to our original access-to-finance models from Table 3.

The results show that only access to finance and access to electricity are consistently linked to historical slave extraction. Compare, for example, the

Table 8
Real effects of the slave trade on capital expenditures

	Dependent variable: Log(Capital expenditures)				Capex/Sales	Purchased an asset last year
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Slave exports / Land area)	Absorbed	Absorbed	Absorbed	Absorbed	Absorbed	Absorbed
Medium sized firm	2.076***	2.054***	1.849***	1.907***	−0.001	0.118***
	(0.155)	(0.152)	(0.312)	(0.300)	(0.007)	(0.025)
Large sized firm	4.869***	4.854***	4.235***	4.366***	−0.008	0.281***
	(0.409)	(0.405)	(0.413)	(0.412)	(0.009)	(0.031)
Business group	0.320	−0.298	0.317	−0.218	−0.012**	−0.017
	(0.237)	(0.187)	(0.233)	(0.187)	(0.006)	(0.020)
Log(Slave exports / Land area) * Business group		0.175***		0.151***	0.003**	0.011***
		(0.049)		(0.045)	(0.001)	(0.004)
Log(Slave exports / Land area) * Medium sized firm			0.053	0.035	−0.000	−0.004
			(0.060)	(0.058)	(0.002)	(0.005)
Log(Slave exports / Land area) * Large sized firm			0.185*	0.143	0.000	−0.006
			(0.103)	(0.104)	(0.002)	(0.006)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Unit of Analysis	Firm	Firm	Firm	Firm	Firm	Firm
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Specification	OLS	OLS	OLS	OLS	OLS	OLS

*, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively. Parentheses contain standard errors clustered at the country level (self-reported access-to-finance question not asked in Nigeria). *Slave exports / Land area* is measured as slaves exported per million square kilometers. *Firm controls* include sector indicators, size indicators, firm age, part of business group, % domestically owned, and manager experience in years. *Colonizer controls* include British, French, Portuguese, and Belgium indicators. *Country controls* include longitude, absolute latitude, lowest month rainfall, maximum humidity, coastline area, island indicator, % Islamic, French legal origins, population in 1400, former communist country, diamond production per capita, gold production per capita, and oil production per capita.

Table 9
The slave trade and other self-reported obstacles to business

	Independent variable: Log(Slave exports / Land area)			
Dependent variable	(1)	(2)	(3)	(4)
Self-reported: Finance is an obstacle	0.026***	0.024***	0.030***	0.052***
	(0.007)	(0.006)	(0.010)	(0.007)
Self-reported: Access to electricity is an obstacle	0.035***	0.034***	0.042***	0.032**
	(0.009)	(0.009)	(0.015)	(0.016)
Self-reported: Courts are an obstacle	0.007*	0.009**	0.005	0.008
	(0.004)	(0.004)	(0.006)	(0.009)
Self-reported: Transportation is an obstacle	0.010	0.012**	0.014	0.001
	(0.006)	(0.006)	(0.011)	(0.008)
Self-reported: Land access is an obstacle	0.006	0.004	0.011	0.002
	(0.006)	(0.006)	(0.008)	(0.007)
Self-reported: Inadequately educated workforce is an obstacle	−0.009	−0.006	0.001	0.003
	(0.006)	(0.006)	(0.007)	(0.009)
Self-reported: Political stability is an obstacle	0.008	0.011	0.008	0.053**
	(0.009)	(0.008)	(0.014)	(0.023)
Self-reported: Crime is an obstacle	−0.006	−0.004	−0.020**	0.009
	(0.005)	(0.005)	(0.008)	(0.013)
Self-reported: Corruption is an obstacle	0.009	0.012*	0.000	0.007
	(0.007)	(0.006)	(0.011)	(0.018)
Self-reported: Tax rates are an obstacle	0.008	0.009	0.016	0.000
	(0.009)	(0.008)	(0.012)	(0.009)
Self-reported: Tax administration is an obstacle	0.011*	0.013**	0.012	0.008
	(0.006)	(0.006)	(0.009)	(0.011)
Self-reported: Business licensing is an obstacle	0.004	0.005	0.008	−0.003
	(0.005)	(0.005)	(0.007)	(0.009)
Self-reported: Labor regulation is an obstacle	−0.001	0.001	0.001	−0.005
	(0.003)	(0.003)	(0.003)	(0.005)
Self-reported: Trade regulation is an obstacle	0.004	0.009*	0.015***	0.000
	(0.006)	(0.005)	(0.005)	(0.008)
Self-reported: Informal sector competition is an obstacle	0.007	0.007	0.009	0.001
	(0.008)	(0.007)	(0.009)	(0.013)
Firm Controls	No	Yes	Yes	Yes
Sector Controls	No	Yes	Yes	Yes
Colonizer Controls	No	No	Yes	Yes
Log(Coastline / Land area)	No	No	Yes	Yes
Log(Population in 1400)	No	No	Yes	Yes
Other Country Controls	No	No	No	Yes
Unit of Analysis	Firm	Firm	Firm	Firm
Standard Errors	Clustered	Clustered	Clustered	Clustered
Specification	OLS	OLS	OLS	OLS

*, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively. Parentheses contain standard errors clustered at the country level (self-reported access-to-finance question not asked in Nigeria). *Slave exports / Land area* is measured as slaves exported per million square kilometers. *Firm controls* include sector indicators, size indicators, firm age, part of business group, % domestically owned, and manager experience in years. *Colonizer controls* include British, French, Portuguese, and Belgium indicators. *Country controls* include longitude, absolute latitude, lowest month rainfall, maximum humidity, coastline area, island indicator, % Islamic, French legal origins, population in 1400, former communist country, diamond production per capita, gold production per capita, and oil production per capita.

consistently significant results in the first two rows to those in the third row, where firms were asked if the courts are an obstacle. In the first two columns, the regressions suggest a correlation between the slave trade and judicial efficacy. However, when we include the controls for colonizer effects in column (3), the parameter estimate drops by 70% and becomes insignificant. This suggests that for judicial efficacy, the relationship is primarily driven by the identity of the colonizer rather than by the slave trade. Other institutional obstacles

(such as political stability and licensing) and human capital obstacles (such as an educated workforce) are almost certainly important obstacles for business overall (see Table 2c), but they are not the ones through which the historical slave trade appears to be inhibiting business development. The variation for these is primarily driven by colonial history, geography, or natural resources.

Second, we implement country random-effects models to identify how much of the country-level variation in access to finance can be explained by the slave trade. Table A8 in the Appendix presents the standard deviation of country random effects for models that either include or exclude slave exports as an explanatory variable, with each row representing a different access-to-finance dependent variable. These models show that including slave exports significantly reduces the unexplained country-level variation in access to finance. Depending on the access-to-finance measure, the slave trade explains between 5% and 25% of country-level variation—additional evidence for the economic significance of our findings.

We can only speculate whether, in the absence of other major historical influences such as colonialism and legal origins, the slave trade would have played a much larger role in shaping many of the other business obstacles in Table 9. For them, the impact of the slave trade on the other obstacles to business may simply have been overshadowed by the impact of these other later and significant forces. The descriptive evidence from this table, however, remains clear: the deep historical impact of the slave trade acutely affects present-day access to finance. While, on its own, this may seem like an anomalous result, our evidence helps reinforce the well-substantiated link between trust and finance in the existing literature by revealing its historical roots.

4. Conclusion

Our results suggest that firms play a critical role in tying historically based societal shocks to economic development. While development is influenced by a number of factors, access to finance seems to play a critical role linking it with the historical slave trade. Although we cannot definitively establish a causal relationship, our historical persistence approach suggests a causal link between culture and finance that is helpful in interpreting previously observed correlations.

We are also able to show that the historic slave trade is associated with access to both formal and informal channels of finance. Formal channels such as bank loans and lines of credit are inaccessible to the firms that need them. Low use of credit in countries with histories of high slave extraction is a function of supply-based shortages, not of a lack of demand. In informal trade channels, neither customers nor suppliers are willing to extend credit, requiring payment-on-delivery that might reduce the frequency of transactions and the magnitude of investment. Consequently, supplier and customer credit does not substitute

for formal credit shortages in ways that might support critical investment in developing countries.

While we cannot isolate the historically persistent mechanisms that link the historical slave trade with access to finance, evidence from Nunn (2008), Whatley and Gillezeau (2011), and Nunn and Wantchekon (2011) suggests three related channels in ethnic fractionalization, destruction/inhibition of institutions, and intergenerational trust transmission. These three culturally linked and historically persistent channels seem plausible for explaining the sizable variation in access to finance in Africa explained by the slave trade, given the extensive evidence linking them to finance. The co-determination and feedback between these mechanisms, however, makes them difficult to separate, and there are two reasons that we are unable to exploit ethnic variation within country (as in Nunn and Wantchekon 2011) that might isolate trust or fractionalization. First, the firm-based data such as the WES do not identify owner or employee ethnicity nor cultural values such as trust. Second, the vast majority of the WES firm observations are in the ethnically diverse major cities, such that we cannot infer ethnicity from location. Consistent with this urban concentration, far more variation in access to finance in our data is explained at the country level than at the regional level. In nested three-level random effects models predicting bank loans or lines of credit, country random effects explain over three times the variance as do region random effects.[20] Although Tables 6–8 show substantial within-country variation in access to finance, this variation is based on organizational structure, industry sector, and size—not region. Even if we had sufficient variation in firm location within a country, most formal credit is likely flowing from large national banks located in only a few places in each country. Our paper suggests that integrating the type of cultural and values-based questions used in the Afrobarometer and World Values surveys into surveys of firms will help identify the relative importance of both cultural and institutional factors in business practices as well as their historical sources.

Given the extensive literature detailed earlier, the link between access to finance and the slave trade should not be surprising. If the slave trade indeed destroyed trust, fractionalized ethnic groups, and inhibited institutions, these mechanisms are likely to hurt finance. A folk critique of the trust and finance literature argues that since trust affects every transaction (e.g., Arrow 1972; Granovetter 1985), finance is not exceptional. But our descriptive finding that finance appears to be one of the only identifiable links in Africa between a historical shock to culture and institutions and modern business obstacles emphasizes its importance as a driver of economic growth and exchange, and also highlights the important role of firms in the development process.

[20] Our three-level models include all firm-level control variables and nested country and regional random effects. The intraclass correlation (ICC) at the country level, or the amount of loan variance explained by country, is 0.061, while region-level ICC is only 0.020. See Gelman and Hill (2007) for details on this calculation.

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