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Does trade cause detrimental specialization in developing economies? Evidence from countries south of the Suez Canal[☆]

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ABSTRACT

When opening up to trade, countries specialize according to their comparative advantage. However, developing countries are often disadvantaged in production that requires contract enforcement or other institutions. Such specialization could be detrimental, as it might eliminate the demand for property rights in developing countries. I examine the development of product trade patterns in East-African countries that suffered longer trade routes during the war-induced closure of the Suez Canal (Feyrer, 2009), to identify a causal impact of trade costs on specialization patterns. Detrimental specialization does not occur: by contrast, contract-intense exports and production declined in the developing countries of this sample when they were isolated.

1. Introduction

How do the economies of developing countries change, when they open up to international trade? Trade liberalization might expose institutional vulnerabilities. As developing countries open up to world markets, they specialize in the sectors in which they perform comparatively well. However, the sectors and products of comparative advantage in developing countries are often adapted to poor institutional environments: they withstand contract imperfections, occasional expropriation, or land tenure uncertainty, for instance. International trade could act as a substitute for contract-intensive production, as it encourages production that does not require contract enforcement, and allows imports of contract-intensive products. This article examines whether product exports from African countries during a trade cost shock are conditional on the contract intensity of the product.

The specialization of a developing country into products that do not require good contracting is arguably detrimental, as it could eliminate the demand for contract enforcement (Levchenko, 2013). Hence, opening up to trade might delay institutional development in countries that have comparative disadvantages in contract environments. If detrimental specialization occurs, that runs against many of the substantial development programs tied to international trade. International organizations such as the UN and the OECD (OECD/WTO, 2013) support aid-for-trade programs, originally pioneered by the World Trade Organization. Aid-for-trade programs often finance infrastructure that supports international trade and encourages the development of local sectors of comparative advantage (Lederman and Maloney, 2012; OECD/WTO, 2015). Aid for trade is also a mainstay of the European Union's development programs, and the United States Trade and Development Agency extensively pairs development aid with the promotion of exports. In 2013, the UK government concluded that "ultimately, trade is the most important driver of growth".[1]

This article examines whether product level export changes following a trade cost shock are consistent with detrimental specialization. It tests whether the exports of products that rely intensively on contracts (measured as up-front costs in production, or as the differentiation of

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[1] Secretary of State for International Development Greening in July, 2013 (see https://www.gov.uk/government/speeches/justine-greening-global-trade-can-help-us-end-the-need-for-aid).

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output or inputs) developed faster than other products, when faced with trade isolation. For a quasi-experimental shock to trade costs, the analysis exploits the fact that a war between Israel and Egypt sealed the Suez Canal over the years 1967–1975, isolating countries on the Eastern coast of Africa from Europe (Feyrer, 2009). The unanticipated closure of the Canal led to substantially longer shipping routes for some countries and to declines in trade. Using a sectoral approach (Nunn, 2007), the analysis identifies the differential effects of the trade cost shock, depending on the contract intensity of the product. An advantage of the export analysis by product types is that country-specific shocks can be differenced out, eliminating several alternative explanations for changes in exports at the national level.

In Eastern Africa, detrimental specialization from international trade is plausible. Eastern African countries suffered poor contract enforcement and ill-defined property rights, both in- and outside the agricultural sector (as argued at more length below). Moreover, the agricultural sector accounted for the lion's share of production and international trade. Together, that suggests that if detrimental specialization occurs, it would apply to Eastern Africa in and after the 1960s. Additionally, despite its reliance on agriculture, Eastern Africa was not particularly competitive on agricultural world markets. The case may be exemplary for developing countries that are vulnerable to world market shocks. The results also expose how trade affects food production patterns in countries with less than resilient food systems, which has considerable consequences for diets and health outcomes (Giuntella et al., 2019; Friel et al., 2015).

The results, however, show no evidence that contract-intensive products benefited from trade isolation in Eastern Africa. If anything, the isolated countries exported less of the products that require better contract enforcement. For example, the export of beef, which requires large, long-term investments such as pasture land, shelter and costly animals, grew around 15% more slowly in countries for which the shortest route to Europe was through the Suez Canal, as compared to other countries. The export of hogs, by contrast, requires comparatively few up-front investments and relies far less on contract quality. In countries affected by trade isolation, exports of pork grew around 37% faster than elsewhere.[2] This trade pattern – documented more formally below – suggests that lower trade costs do not favor the wrong production types in developing countries, as detrimental specialization would imply. This result holds for various definitions of the contract-intensity of products, across different samples, and controlling for various potentially confounding developments.

The specialization patterns found here are at odds with several empirical examples that point to detrimental specialization effects of trade. Trade enabled British West Indies sugar colonies to sustain coerced labor, for instance (Dippel et al., 2015); world mineral price hikes caused increased violations of political checks and balances and conflicts over resource-related property rights (Robinson et al., 2006; Berman et al., 2017), and incentivize "rent-seeking" jobs, such as those in law, over constructive jobs (Ebeke et al., 2015). Likewise, trade liberalization undermines the development of financial institutions in countries with a comparative disadvantage in financially intense goods (Do and Levchenko, 2009). In spite of these examples, there is no consensus on whether lagging countries suffer detrimental specialization in institutions with trade liberalization – Nunn and Trefler (2014) argue that the lack of evidence on comparative advantage effects in institutions is a shortcoming of the literature and conclude that, potentially, "trade's confusingly diverse impacts on domestic institutions [can be] explained by comparative advantage".

Indirectly, the results may help to understanding how international trade contributes to economic development. It needs to be mentioned straight away, however, that this paper focuses on specialization patterns, and does not test for development outcomes per se. First, Levchenko (2007, 2013) suggests that when trade empowers the sectors that do not need property rights, those sectors grow more influential and convince the state to turn a blind eye to expropriations. A larger literature argues that for developing countries with a comparative advantage in agriculture, trade liberalization could end the development of more complex sectors, slowing down growth in the long run (Rodrik, 2016; Matsuyama, 1992). Second, the results help to understand how trade might amplify the consequences of country's natural specialization for its long-run development. A substantial literature argues that local agricultural advantages determine institutional development. Incentives for inclusive institutions and property rights arise with small-scale production, as with grain (Sokoloff and Engerman, 2000; Bruhn and Gallego, 2012); with soil suitability for storable crops, with scarcity of fertile land, and with ecological diversity that fosters product diversity and trade, for instance (Mayshar et al., 2015; Fenske, 2011, 2013). In this literature, agricultural trade magnifies the role of local agricultural conditions, if trade allows countries to specialize. While shedding light on that specific argument of specialization, this paper does not focus directly on broader measures of long run income or institutional development.

The paper proceeds by outlining the context of the Suez Canal closure, the contract-intensity of agricultural production during the sample, and the resulting identification strategy. It presents the main results and robustness checks for different definitions of the contract sensitivity of different products, for different output measures and non-agricultural products.

2. The Suez Canal and the contract intensity of production

Detrimental specialization for developing countries happens when opening up to trade harms the sectors that rely intensively on contract enforcement or other institutions. Or, vice versa, detrimental specialization implies growth in contract-intensive sectors in developing countries after they are isolated from world trade. This section evaluates whether that mechanism of detrimental specialization occurs. It examines which sectors declined fastest when trade costs rose due to the closing of the Suez Canal, following the suggestion of Nunn and Trefler (2014). This section briefly describes the context of the Suez Canal closure as a source of exogenous trade cost variation and lays out the difference-in-difference identification of impact.

2.1. The Suez Canal and context of the trade shock

The Suez Canal was shut from 1967 to 1975. In 1955, after the Egyptian rapprochement with the Soviets, the UK withdrew its financial support for the construction of the Aswan (high) Dam, and the US followed in 1956 (Louis and Shlaim, 2012). In response, Egyptian president Nasser nationalized the Suez Canal, earlier held by the British, to finance the Aswan Dam construction. To avert an Israeli (backed by the British and French) dispute with Egypt, in 1956, the United Nations passed the Pearson resolution, which left the Suez Canal freely navigable under UN control. It was not until the Six-Day War with Israel that Egypt closed the canal again. During the Six-Day War, Israeli forces took control of the Sinai Peninsula, turning the Suez Canal into a warfront. Egypt closed down the canal by sinking ships and, by the end of the war, had placed a substantial number of mines in the canal. The closure of the canal was unexpected. In fact, a group of ships (the "Yellow Fleet") were caught in the canal after its closure and were not released until 1975. In 1973, the canal was once again the scene of a war, this time the Yom Kippur war. By 1974, the UN had regained control over the Suez Canal, but the wartime debris and mines still left the canal unnavigable. After the canal was finally cleared, it was formally reopened on June 5, 1975.

The closing of the Suez Canal poses a possible quasi-experiment in trade costs as first described in Feyrer (2009). It is applied to the

[2] In the USDA historical commodity cost data, in cow farming, 63% of costs are fixed, while in hog farming, only 37% of costs are fixed.

countries south of the Suez Canal in this paper. Egypt was clearly involved in the conflict that led to the closing of the canal, but many coastal countries south of the canal were only bystanders of the conflict. They exported mainly agriculture and resources by ship, and the Suez conflict obstructed the sea routes. By contrast, passenger and air travel between Europe and the African countries in the sample did not become much slower, and flows of news and other information were not vulnerable to the barred sea routes. Thus, the Suez Canal shutdown posed a trade costs shock with little contamination from barriers to information flows or the mobility of people. Moreover, as Feyrer (2009) argues, the conflict broke out unexpectedly and continued over the duration of the canal closure, so the change in transport costs was neither anticipated nor avoidable.

To proxy for the change in transports costs, I exploit the change in kilometers of sea navigation required for a set of African countries to reach a European port. For countries on the East coast of Africa, the closing of the Suez Canal implied a shipping route around the South Cape. For countries on the West coast (that is, South Africa and countries located more West), shutting down the eastern route had no consequences for the shortest path. To quantify these changes, I took sea route data from searates.com for shipping to the largest port in Europe, Rotterdam. I compared the length of the sea route in kilometers via the Suez Canal with the route via South Africa.[3] For coastal countries, I use the largest port as a point of departure. For landlocked countries, I assign the nearest major port as the point of departure.[4] Fig. 1 summarizes the percentage change in shipping distance to Rotterdam. The mean distance over sea of African ports in the sample to the port of Rotterdam before 1967 was around 13,700 kilometers. For the affected countries, the mean distance increased from 10,900 kilometers to 14,900 kilometers after the closure.

The closing of the Suez Canal had substantial effects on trade. These have been established broadly in Feyrer (2009). The closure of the Canal has led to rerouting of shipments via South Africa. The existing (colonial) rail infrastructure was port-focused and had little capacity to cross the Sahara or to reach the Western Coast of Africa. Shipping statistics show that the Suez Canal was mostly used by British, Norwegian and Liberian (flag-of-convenience) ships, hailing from or destined to Europe (Jeula, 1872).[5] Accordingly, the British Ministry of the Foreign Office reports that from 1967 to 1968, the number of British ships calling at South African ports tripled.[6] A simple difference-in-difference regression of the log of total agricultural exports on the interaction of dummies for being affected and for the years 1967–1975, as well as for country and time fixed effects, confirms that trade from Eastern African countries was substantially hit: the interaction term suggests that affected countries had just under 40% lower exports than could be expected under the same circumstances as in the unaffected countries. In the main results, conditional on more detailed fixed effects, I find similar declines (of about 20%–30%).

If the basic forces of specialization do not operate in the economies in the sample, it may be difficult to identify whether or not the predicted detrimental specialization occurs. Trade responses could be muted if there were no functioning (international) markets or if production was fully planned in the sample countries during the years of the sample. That is not the case, for two reasons. First, I find modest evidence that capital-intensive industries thrived with the closure of the Suez Canal—consistent with forces of neoclassical trade theory acting in the sample. Second, much of the available historical evidence for African countries suggests that more or less functioning markets were present, despite relatively many government interventions and occasional extreme outcomes following droughts. There is evidence that workers chose to work in different industries according to pay and risk. Layoffs of workers are not easy to detect in some countries in the sample, but competitive prices were prevalent: wages reflect human capital and urban premia in many parts of Africa (Boissiere et al., 1985). Countries relied on tariffs and taxes on exporting industries, but that did not stop trade; with the exception of Somalia, exports to OECD countries grew in sub-Saharan Africa (Dercon, 1993; Collier, 1991; Rodrik, 1998, and the discussion above). A possible explanation for this relative responsiveness is that most African agricultural labor is flexible: workers often work several jobs, possibly to diversify sectoral climatic risk (Davis et al., 2014; Reardon et al., 1992). Agriculture saw outside pressure from large urbanization movements in all decades in my sample, and rural areas likely provided competitive (i.e., non-subsistence) alternative sectors of employment (Lanjouw and Lanjouw, 2001). Price controls were largely ineffective (Collier, 1991), and robustness checks confirm that they play a limited role in the results.

2.2. *Contract frictions in Eastern Africa*

In Eastern African agriculture between the 1960s and 1980s, contracts on capital and output are less than perfect. The use of machinery is less prevalent than in other parts of the world, but animal power is more extensively used. Machinery and animals are subject to expropriation and theft, and are used to a lesser extent in favor of manual labor when contract enforcement is weak. In the countries and years covered by the sample, machinery and capital was not easily transferred across producers: few firms use second-hand equipment and used capital goods sell at large discounts (Fenske, 2011; Collier and Gunning, 1999; Gunning and Pomp, 1995, survey different African countries). Products and materials suffered imperfect contracting too. Bigsten et al. (2000) show that for the several African countries that they study (including Cameroon and Kenya), contracts are renegable; court settlement functions imperfectly, and breaches of agreements are often solved by negotiations outside the courts.

In Eastern African agriculture between the 1960s and 1980s, land as a production factor also poses difficulty in contracting. Expropriation, non-transferable rights, and imperfect titles are fairly common. As a consequence, farmers invest little in the up-front assets that would make the soil more productive. Farmers faced with land tenure uncertainty use seeds with lower and shorter revenue spans, invest little in the quality of the soil and its nourishment for next crop cycles, and pursue cropping strategies that quickly degrade the soil (e.g. Besley, 1995 on Ghana, Ali et al., 2014 on Rwanda, and a survey in Rakotoarisoa et al., 2011). Similarly, farmers with limited prospect of retaining their land or transferring it, make fewer landscape adjustments such as terracing (Deininger and Jin, 2006, for Ethiopia) and reduce investments in cattle as assets (see e.g. the African survey of Collier and Gunning, 1999). Additionally, in the face of tenure insecurity, farmers invest less

[3] The second route is the sum of two parts, shipping to South Africa and subsequently shipping to Rotterdam. To infer the cost of the stop in South Africa, I compared the kilometers shipping from Mozambique to Botswana to the kilometers shipping from Mozambique to South Africa to Botswana. The results do not change whether subtracting this “South Africa stopover” difference from the imputed length of the southern route. I also used the shipment time, but as it is highly correlated to the kilometers, the results do not change between using time or kilometers. The relative shock is very similar to travel time increases in passenger transport quoted in historical leaflets of P&O.

[4] I calculate for 100 random points in each country what the nearest port is, allowing speed of travel via rail to be 5 times as fast as other travel. I use the port that appears most often as nearest port as the main port of the country. I employ only railroads that were present in 1960 (Jedwab and Moradi, 2016). For Zimbabwe, it is uncertain what the nearest port is, as the 1960 railroad network of South Africa is not digitized. Given the large trade of Zimbabwe and South Africa, I opted for Durban (South Africa) over Beira (Mozambique) as the main port for Zimbabwe. The choice does not have qualitative implications for the results. The results are the same when taking regular grid points or geographical centroids as reference point to select the port.

[5] These statistics stem from the document "General Comparative Statistics: Panama and Suez Canals" that the Panama Canal Museum published in 1971.

[6] Lord Chalfont, House of Lords debate July 6, 1969, vol 303 c892WA

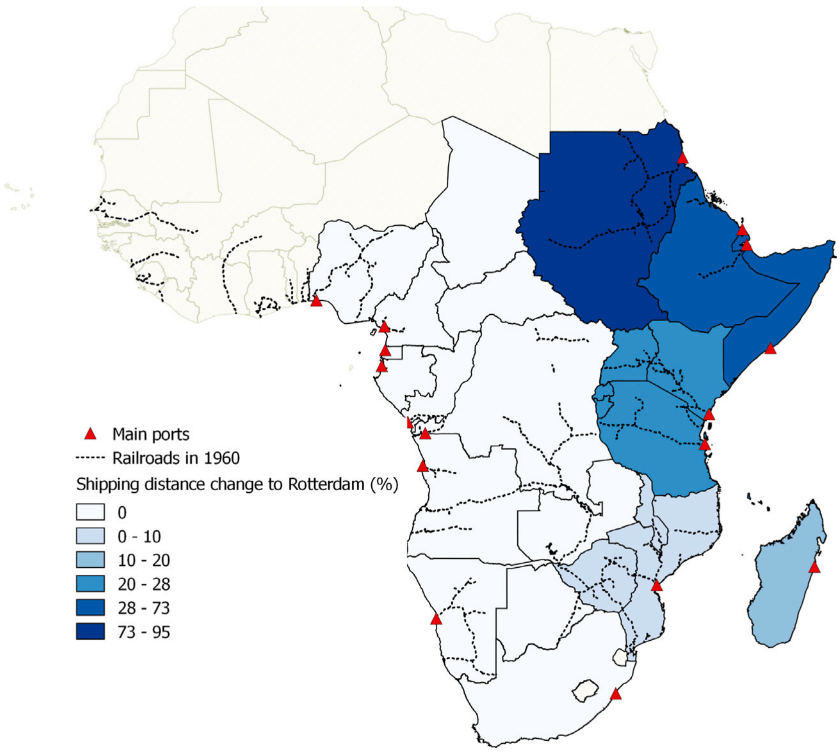

Fig. 1. Shipping distance changes to Rotterdam due to the Suez Canal closing, by country. Notes. The change in shipping of distance is reasoned from the main port of the country to Rotterdam. Shipping distances are from searates.com. Railroads are from Jedwab and Moradi (2016). For a list of the ports, see the Appendix.

in public goods such as fencing and irrigation systems and more quickly extract shared resources. Accordingly, farmers who face higher output prices increase their demand for titled land, in particular if investing in the land yields higher returns (Perego, 2019, for Uganda).

External finance is generally unable to remedy the frictions of up-front investment required for delayed output value. As a direct barrier to finance, financial contract are not always upheld, and as an indirect barrier, the value of collateral is lower in developing economies (Heltberg, 2002). As a consequence, farmers face credit constraint that lead them to produce at lower than efficient scales (Bigsten et al., 2003, surveying African economies), and to underemploy productive capital and animals (Dercon, 1996; Kinsey et al., 1998, for Ethiopia and Zimbabwe). Informal finance within communities is prevalent for small-scale investment, but obstacles in formal finance often inhibit larger production scales (Bigsten et al., 2003, surveying African economics). There is little to no market to insure against contractual risks in agricultural production, which leads to a failure to specialize in profitable but comparatively risky products (Dercon, 1998, on Tanzania).

2.3. Contract frictions and the fixed costs of production

As a main proxy for the institutional sensitivity of the production of a given export product, I use the share of a producer's up front-investment costs in total costs. The use of up-front investment has a twofold motivation. First, contract uncertainty over the value of output leads to a Hart and Moore (1988) hold-up problem when investments are tied to a contract, reducing a farmer's investment in quality or productivity in many agricultural production processes (e.g., Schiefer and Wu, 2006). If large shares of the investments are made far in advance of sales, contract uncertainty amplifies: investment in a tractor, plows or cows requires better contracting than a day's labor, in particular if the assets have little value outside the farm. Second, larger and longer-term assets are at higher risk of direct expropriation. Often, fixed cost investments are tied to the land (tilling, fertilizing, irrigation or long-term crops), and imperfect contracting on land tenure leads the products that require such investment to become risky (e.g., Rakotoarisoa et al., 2011). These observations are also established for various non-agricultural production types: poor institutions may make entry costs insurmountable (Do and Levchenko, 2009), add risk to transactions for a production factor that requires delayed payment (Levchenko, 2007, 2013), prevent the adoption of technology (Amaral and Quintin, 2010), raise the costs of entering a market per se (Kletzer and Bardhan, 1987; Beck, 2002), form barriers to financing size-conducive investments (Ponticelli and Alencar, 2016) and prevent access to long-term finance (Gopalan et al., 2016; Brown et al., 2017). An advantage of the proxy is that up-front costs can be measured easily and that they are prevalent in African agriculture. The proportion of up-front costs also has no correlation with capital intensity, so that potentially correlated shocks in capital prices do not explain why fixed-cost intensity affected the Suez Canal closure response.

Products with high fixed costs shares might respond to trade cost shocks for other reasons than their sensitivity to contract quality. I control for potentially confounding explanations related to capital intensity and higher transport costs. In addition, I check whether the results hold for other definitions of contract sensitivity of products. They include the level of differentiation of the product, the level of differentiation of inputs (focusing on manufacturing products), the required use of heavy machinery which is difficult to contract in Africa, longer-term financing needs (so there is a larger horizon for uncertainty over the typical contract) and the use of formal financing in the good's production (i.e. where finance with informal punishment strategies falls short).

In the main regression, I use the shares of fixed costs in total costs by product, calculated from accounting data in the Costs of Production Surveys from the US Department of Agriculture in 1975 (or for some industries, the earliest possible date). I use the crosswalk reported in Appendix B to match animals and crops from the USDA classification with the trade classification of the FAO. The U.S. is relatively isolated from local African shocks that might affect production data, so that product characteristics shared between the same crop on different

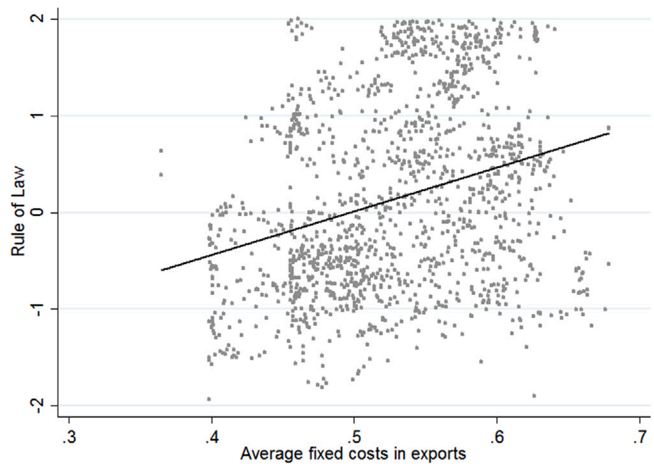

Fig. 2. Rule of Law and the average fixed costs involved in exports. Note: see Appendix A for data sources.

continent explain the proxy. This requires the assumption that if the production of a crop or animal requires more up-front investment than other products in the U.S., it also requires more up-front investment in Africa. Differences between the technologies used in the U.S. and Africa may lead to measurement errors that prevent fixed costs measures from quantifying contract sensitivity, or in the worst case, to reversed conclusions if the technologies correlate sufficiently negatively. Similarly, within each product classification, the specialization into specific crops may differ between the continents: Africa and the U.S. might specialize in different varieties of corn, for instance. Hence, to verify the similarity to the African context, I also estimate the regression equation using fixed costs estimates from a more recent survey in African farming.

As a check that fixed costs make agricultural production sensitive to institutional sensitivity, I employ the proxy as used in the main analysis in a dataset of bilateral agricultural export flows. The test is whether the countries that have stronger institutional quality are specialized in products that require more fixed costs. Fig. 2 illustrates the result that Appendix A establishes and details more rigorously: it scatters the average fixed costs in agricultural exports (based on FAO data) against the World Bank's Rule of Law indicator in a panel of 156 countries over the years 1996–2011. A one standard deviation increase in the Rule of Law score is associated with higher fixed cost shares in exports of around a third of the sample standard deviation.

2.4. *Empirical strategy*

The key question of this paper is whether trade isolation leads to relative growth in sectors that rely on contract enforcement – following the argument of detrimental specialization. To examine detrimental specialization during the Suez Canal lockdown, I consider sectoral variation in export responses, in line with Nunn (2007). I estimate a trade equation for the exports of agricultural products in which I allow the effect of the trade cost shock to vary with the product's dependence on institutional quality.

The following estimating equation allows the impact of the closure of the Suez Canal to vary with the fixed cost intensity of the export product. In the detrimental specialization argument, products that required high fixed costs for production would have grown disproportionately in affected countries during the canal lockdown. I use a standard log–log formulation for the estimating equation for trade flows, as it consistent with the vast majority of empirical and theoretical models of international trade (Arkolakis et al., 2012). The equation includes a triple difference term to allow the trade cost shock to affect product exports by fixed cost intensity differently by the exposure to the shock:

$$\ln \text{exports}_{pct} = \beta_0 + \beta_1 \text{fixed costs}_p \times \Delta \ln \text{distance}_c^{1967--1975} \times \text{Year}(\,1967\text{–}1975) + \alpha_{pc} + \mu_{ct} + \varepsilon_{pct} \tag{1}$$

The variable $\Delta \ln$ distance$_c^{1967--1975}$ reflects the increase in log shipping distance caused by the Suez Canal closure, and Year (1967–1975) is zero for years in which the Suez Canal was open. The individual arguments of the interaction (the product fixed costs level, the distance shock and the years of closure) are collinear with the country–product fixed effects and the country–year fixed effects.

The coefficient of interest in the regression is β_1. Coefficient β_1 shows how the exports of a specific product respond to the shock in transport costs, depending on whether that product relies heavily on fixed costs of production.

Some products show larger distance decays than others, which might explain their different response to a shock in trade costs. That difference could conflate with the difference in export response attributed to contract sensitivity, if a product's distance decay correlates with its fixed costs share. In supportive analyses, I find no significant differences in sensitivity to trade costs associated to my measures of institutional sensitivity. Additionally, when accounting for the per-product estimated distance decay elasticities, I find that they have little impact on the main results.

The fixed effects α_{pc} and μ_{ct} control for product–country and country-time-specific explanations of trade. Countries may have different initial conditions and comparative advantages—for instance, in Ricardian advantages or in the constitutional environment. In as far as these could correlate with the geography of the trade cost shock impact, they are absorbed in α_{pc}. Similarly, the trade cost shock could have incited policy responses or unsettled local politics that equally explain exports such as a coup attempts (Kenya in 1978), centralization (Tanzania in 1977) or in rarer case independence (Djibouti in 1977) that change macroeconomic policies on exchange rates or the protection of agriculture or other sectors, for instance. A potential correlation between the trade cost shock and such national shocks is controlled for by the country–year fixed effects, as long as such events do not systematically affect products differently according to their fixed cost intensity.[7] The comparison across different products within a country complements the more direct identification of tracing the response of average fixed costs in local production to the trade cost shock, which is arguably more prone to biases due to unobserved national shocks. Yet, they yield similar results. The average fixed costs in local production are unconditionally about 1.2 percentage point lower in affected countries during the trade cost shock, and in a dif-in-dif setting, they are about 0.7 percentage points lower.[8] Fig. 3 in Appendix also shows the development of exports, split by affected and unaffected countries, and by products with larger or smaller than median fixed cost shares.

[7] Many of the major political events relevant to this geography and time frame do not coincide with the Suez closure: for most countries, independence occurred between 1940 and the early 1960s. In Mozambique, war started in 1964, resulting in independence in 1975. Dropping Mozambique from the sample does not change the results. Sub-Saharan African countries also saw waves of trade liberalizations, but they took place predominantly in the 1980s; and most major trade agreements date from after the Canal's reopening. There are few tariff adjustments following the Canal closure. The 1970 Lomé convention was instated in the treatment period, but it did not differentiate among ACP countries, so that countries affected and unaffected by the closure were similarly influenced (nor does splitting the sample pre-1970 change the results).

[8] This compares to a sample standard deviation of 2.6 percentage points. Both impacts are significantly different from zero (p<0.05) in a regression with clustered standard errors at the country-treatment spell. The latter regression conditions on country and year fixed effects. The data sources are described below.

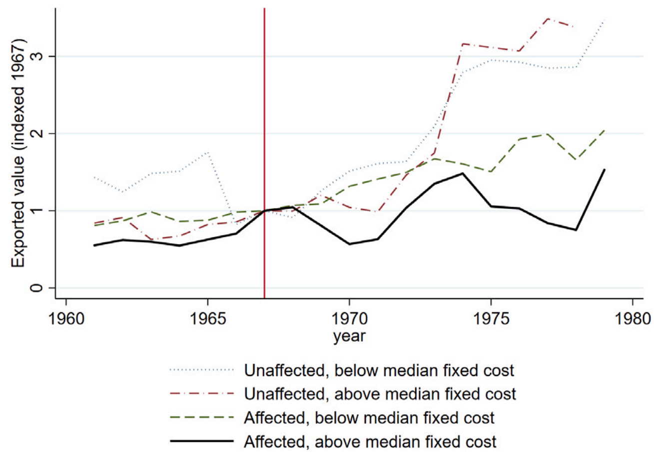

Fig. 3. The evolution of exports of agricultural products for products with above and below median fixed cost shares, split by countries where the shortest route to Rotterdam was unaffected or affected by the Suez Canal closure.

Up to 1975, products with low fixed costs share in affected countries develop similarly to products in unaffected countries, while products with high fixed costs share in affected countries show more strongly declining exports. Exports from unaffected countries still develop faster after 1975.

The export data, taken from the FAO, reflect goods flows from the respective country to the entire world, from 1960 to 1985. Data for bilateral agricultural product-level trade are not available for the sample countries during the Suez Canal closure. In the 1960s, around 70% of all African exports were destined to Europe. Exports to other African countries trailed far behind, at around 8% (Fouquin and Hugot, 2016). In the UN definition of Eastern African countries, Europe accounted for two thirds of exports at the time, with some diversification towards the U.S. and Japan in the 1990s. The pattern is still evident in the earliest agricultural trade data of bilateral data collected by the FAO. In 1992, for instance, Western Europe is still the destination for well over half of the agricultural exports of affected countries in the sample, with the U.K, Germany and the Netherlands alone accounting for 34% of trade. Japan and the U.S. account for about 8% each. Trade between African countries is minimal with South Africa (3%), Somalia (2%) and Sudan (1%) topping as destinations of exports of Eastern African countries. A possible reason is that much of the infrastructure connects hinterlands to the coast, leading to ocean shipping as a relatively cheap channel of sales. Agricultural exports account for the majority of exports in the sample countries. In 1962, they accounted for 75% of exports in affected Eastern African countries covered in UN Comtrade and 60% in Sub-Saharan Africa (comparing to respectively 3% and 12% mineral exports).

For the estimation of Eq. (1), I employ a Poisson quasi-maximum likelihood estimator with country-clustered standard errors. As these are export data for different products, around 60% of the possible country-year-product export observations are zero. A model using a regular log-transformation of the trade flow would lead to a substantial and non-random neglect of observations. I employ a pseudo-Poisson estimator to account for the observed values of zero in product export flows (Silva and Tenreyro, 2006).

3. Exports developments when the Suez Canal closed

Table 1 presents the results of the main regressions. Most importantly, the coefficient on the interaction between fixed cost shares and the trade cost shock is negative. The negative coefficient suggests that products that required larger up-front investments were hit significantly harder by the increased transport costs than products that required little up-front investment. The estimate implies that the average transport distance shock led to around a 29% lower export if a product required one standard deviation (about 10% point of total costs) more fixed costs. Thus, the results imply that institutionally intense products suffered most from the rise in transport costs.[9]

Capital intensity may also determine the product reallocation when trade costs change. Neoclassical trade theory predicts that when trade costs rise, a country with scarce capital experiences an expansion of its capital intensive sectors. The regression in column 2 controls for the capital cost share, interacted with the trade cost shock. Its coefficient is positive and significant, suggesting that capital-intensive industries expanded under trade isolation. The coefficient of the fixed cost interaction hardly changes. That is not surprising because the capital cost shares and the fixed cost shares have no significant correlation across products (see the scatter plot in Appendix).

The trade shock is not independent across products from the same country: although the products have different sensitivities, they are affected by the same increase in distance to Europe. For this reason, standard errors are clustered at the country level. In addition, I perform a pseudo wild bootstrap on the results reported in columns 1 and 2, to account for the fact that the number of clusters is limited.[10] The *p*-value remains under 5%. I also compare the estimates to a placebo distribution by means of a randomization inference approach. I repeatedly randomly reassign the trade cost shock in the sample across countries or across years and re-estimate regression Eq. (1) to generate a distribution of *z*-scores (e.g. MacKinnon and Webb, 2018). The *p*-values is under 5% when randomizing over countries, and under 10% when randomizing over years. The score distributions are included in Appendix E.

The fixed effects for country–product combinations and country–year combinations control for local (comparative) agricultural advantages and country-specific developments. They do not control for the swings in agricultural prices on the world market. Moreover, they imply that identification comes from the differential sensitivity of products within country–year combinations only, not exploiting the substantial cross-country variation. The other columns in Table 1 vary the fixed effect structure in order to identify from different parts of the sample. Column 3 reports a regression in which the country–product fixed effects are substituted for product-year-specific fixed effects. That fixed effects structure accounts for any global impacts on product prices caused by the Suez Canal closing. The results on fixed-cost shares are more pronounced, and the effects on capital intensity are large, too. A potential explanation is that countries may differ considerably in their natural suitability to fixed cost intensive products. Column 4 reports the regression with the strictest possible set of fixed effects (country–year; country–product; product–year). Its coefficient estimates are very similar but the standard errors are larger (the p-value for the coefficient of the fixed cost interaction is now 0.12). As an alternative control for world-level product price fluctuations, column 5 introduces the log of the FAO reported yearly producer price of the product across European economies (which represent the largest export market of the countries in the sample). Conditional on the fixed effects, the export

[9] As the maximum likelihood model is non-linear, the regression coefficients may not accurately reflect the interaction effect as an OLS regression does. To check this possibility, I explore the interaction graphically in Appendix E.

[10] I follow the strategy of Cameron and Miller (2015) in the Poisson setting. I take the errors from a constrained model ($\beta_1 = 0$); randomly multiply them per cluster by 1 or -1; predict the export flows based on those updated cluster errors; and rerun the unconstrained regression using updated exports as the dependent variable flows to get a z-score. I repeat that process 1,000 times to construct a bootstrapped z-score distribution for $\hat{\beta}_1$. Note that in the Poisson functional form, multiplying the errors by -1 implies multiplication of the exports with the inverse of the error (rather than the negative, as in a linear model).

Table 1
Impact on the log exports of agricultural products.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel a: impact on exports							
Fixed cost share × shock ln KM	−8.68**	−8.55*	−17.62**	−9.79	−7.11*	−13.05**	−13.76**
	(4.17)	(4.58)	(8.19)	(6.87)	(4.28)	(5.13)	(6.34)
Capital cost share × shock ln KM		20.77**	158.17***	18.55	5.92	91.05***	110.73***
		(9.63)	(29.48)	(14.35)	(11.01)	(16.96)	(18.16)
Ln price					0.48*		
					(0.25)		
Shock ln KM						−4.43*	−6.19***
						(2.42)	(2.36)
Panel b: impact on transformed exports							
Fixed cost share × shock ln KM	−8.23**	−8.27*	−16.37**	−8.57	−6.71*	−12.45***	−13.13**
	(3.93)	(4.30)	(7.27)	(7.07)	(4.00)	(4.78)	(5.97)
Capital cost share × shock ln KM		20.95**	160.98***	19.44	5.01	95.51***	114.34***
		(8.86)	(28.97)	(13.96)	(10.46)	(16.26)	(18.84)
Ln price					0.48*		
					(0.25)		
Shock ln KM						−4.82**	−6.49***
						(2.11)	(2.11)
Observations	5838	5838	6890	5838	4679	7290	7290
Country–Product FE	yes	yes		yes	yes		
Country–Year FE	yes	yes	yes	yes	yes		
Product–Year FE			yes	yes			yes
Country FE						yes	yes
Product FE						yes	
Year FE						yes	
# Countries	24	24	25	24	24	25	25
# Products	11	11	11	11	11	11	11
# Years	25	25	25	25	25	25	25

Estimated by Pseudo-Poisson maximum likelihood. Robust standard errors clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

elasticity to the price is around 0.5. After controlling for the log price, the interaction effect of the trade cost shock and the fixed costs share is significant at the 10 percent level. Columns 6 and 7 introduces a less restrictive set of fixed effects that does not control for country–year specific shocks, but only for country-level fixed effects joint with either product and year fixed effects, or with product-year-specific fixed effects. These regressions do not control for the most likely source of confounders, such as countries' time-varying macroeconomic policies. However, they do include a comparison to unaffected countries in the identification; and they allow checking the impact of the trade costs shock on trade per se. The results of columns 6 and 7 suggest that including comparisons to the group of unaffected countries somewhat amplifies the main results.[11]

A potential bias in the results arises if the sectors with higher fixed costs are simply more sensitive to distance. In supporting regressions reported in Table 5 in Appendix G, I find no evidence to suggest that this explains the findings. First, in a regression explaining bilateral trade (from a later sample that includes bilateral export flows), the interaction coefficient between fixed cost intensity and distance suggests that the difference in distance decay is small. Neither does Europe, the most affected destination, import significantly different shares of fixed-cost intensive products than other destinations. Second, I re-estimate the main regression using a transformed export variable. Based on the distance elasticities estimated by product from bilateral data, I predict how much the export flow has fallen during the closure of the Suez Canal due to the distance increase to Rotterdam for every country–product pair (assuming that all exports go the Rotterdam, to be conservative). I add these predicted declines back to the observed export flow and rerun the original regressions on these transformed export data, to account for declines in exports simply driven by product differences in distance decay. The results based on the transformed export variable are presented in panel b of Table 1. The changes in the estimated coefficients are slight, and in no case do they lead to different conclusions. That suggests that distance decay differences are too small to account for the specialization patterns.

To examine the trends leading up to the closure of the Suez Canal, as well as the ensuing dynamics, I also examine the development over time of the interaction coefficient between the distance difference and the fixed costs of the product. I estimate the model:

$$\ln exports_{pct} = \beta_0 + \sum_t \beta_t \times \text{fixedcosts}_p \times \Delta \ln \text{distance}_c^{1967--1975} \times I(t) + \alpha_{pc} + \mu_{ct} + \varepsilon_{pct}, \tag{2}$$

where $I(t)$ is an indicator variable by year. The coefficient β_t measures, by year, the expected additional log exports associated with a product exhibiting higher fixed costs in countries that were exposed to the Canal closure at some point. The results are visualized in Appendix H, Fig. 8. They show no significant differences in export associated with fixed cost intensity across affected and unaffected countries before the Canal closure in 1967. The export decline associated with higher fixed costs shows in the coefficients starting from 1967, but it is only significantly lower than the 1960 baseline by the year 1970. Towards the re-opening of the Suez Canal in 1975, the coefficients are not significantly different from zero. It is possible that the re-opening was anticipated at least in 1974, when mine-clearing started.

The difference-in-difference approach may produce an overestimate of the impact of trade costs, if producers of different products compete for inputs: some products may benefit from the export decline of other products. To examine this possibility, I consider whether a higher substitutability for other crops on a country's soil amplifies the estimated impact of trade costs. I map each crop's suitable soil from georeferenced soil suitability rasters and calculate what share of that crop's suitable soil is also suitable for other crops. This produces a country-crop specific measure of how easily production switches to another crop, based on overlap in suitable land. Appendix I details the calculation and the results. In line with experiencing higher substitutability, if a crop

[11] For intuition, the distance shock coefficient suggests trade decline in the order of 36% for an affected country with average exposure, when assuming both zero capital and fixed costs shares of the product.

is grown on soil that is suited for other crops too, its exports are more responsive to international price fluctuations. However, the estimated additional decline in exports for products with higher fixed costs is not significantly larger if those products see stronger competition for their soil.

3.1. African data on institutional sensitivity

The baseline regression considers up-front investment requirements as a measure of contract, using contemporaneous cost shares from the United States. If U.S. cost structures are not representative for African cost structures in relative terms, the baseline regressions will not identify institutional sensitivity.

As an alternative, I draw on African agricultural microdata dated after the shock. The benefits are twofold: first, these data reflect African circumstances, and second, the detail in the surveys allows considering other definitions of institutional sensitivity. The drawbacks are i) that African data may reflect production characteristics as well as the local circumstances (while arguably U.S. data reflect production characteristics but not African circumstances); and ii) that the data on beef and hog production are not comparable to those of other products, so they are dropped. I use the farm household survey questionnaire from the Center for Environmental Economics and Policy in Africa (Waha et al., 2016) carried out in 11 African countries in 2003. I employ three definitions of sensitivity to contract enforcement, drawing on frictions in the factor market. The first, much in line with the U.S. product data, is the cost share of heavy machinery, assuming that the rental and asset value of machinery, more than, for instance, day labor, is subject to contract imperfections. Second, I use the share of credit supplied by commercial suppliers, relative to informal sources of finance. Commercially supplied loans are used for production structures that require larger and longer borrowing – in which case informal finance may fall short – and has less informal or social punishment strategies in case of default or contract breach. Third, I consider the average time horizon of borrowing by product. Longer times to repayment signal that farmers have a longer production cycle and/or that their assets have longer time horizons. Both can increase risks of expropriation or contract uncertainty.

Appendix J, Table 8 reports the results using the same methodology as the baseline, and the results are qualitatively similar. Products that required more heavy machinery in their production; production associated with more credit from formal suppliers relative to informal suppliers, and production that had longer time-to-repayment horizons saw exports decline relatively strongly when the trade costs increased (columns 1, 2 and 3). Adding capital cost shares interacted with the trade cost shock as a control shows no noteworthy changes to the coefficients, although unlike in the baseline regression, capital intensity does not predict significant export expansions during trade isolation (columns 4, 5 and 6).

3.2. Impacts on local production and imports

Does the specialization of the export pattern reflect specialization of production? The regressions in Appendix K, Tables 9 and 10 employ the same methodology to look at the impacts of the Canal closure on local production and imports. While production data are slightly less complete and potentially less reliable than trade data (because production data stem from local sources rather than from international reporting), the adjustment of production shows the same pattern as the adjustment of exports. Products that require more up-front investment are hit harder by isolation; and capital-intense production saw relative growth. The similarity between export and production developments suggests that trade shocks drive changes in production strategies, rather than stocking, for instance. The results on imports show no impacts significantly different from zero, across all constellations of fixed effects. This is consistent with very limited differences in distance decay across goods with different fixed cost shares, as also established in the bilateral data. From the argument of detrimental specialization, the unresponsiveness of imports is also interesting, as these results show no evidence that imports of contract-intensive goods act as a substitute to local contract-intensive production.

3.3. Price assistance

Governments' responses to the trade cost shock can affect the estimate of the trade cost impact, if government support is selective across products. If a government or marketing board specifically supports products with low fixed costs during trade isolation, then the decline of products with high fixed costs due to trade costs is overstated. Anecdotal evidence suggests that marketing boards did not selectively support industries based on the characteristics of their production processes, but rather focused on local (urban) demand for products to guide assistance (Bates, 2014). For a subset of the sample, product-level price assistance data are available, enabling closer examination of assistance by product. Appendix L provides an analysis explaining price assistance choices from product characteristics. The overall change in assistance measures shows no jump in 1967 but develops strongly in 1975, when the canal was reopened. There is modest evidence, if evidence at all, that governments in affected countries supported the products with high fixed costs, rather than those with low fixed costs (Table 12). Hence, if price assistance affected the main results, it has attenuated them.

3.4. Evidence from manufacturing goods

A large recent literature quantifies a good's institutional dependence by its level of differentiation and the complexity of its inputs. In this subsection, I use export data on manufactured goods to check whether the results are robust to using definitions of institutional sensitivity based on product characteristics, instead of relying on institutional frictions on the factor market. Manufacturing products represent a far smaller share of total exports (about 8% in 1962, according to UN Comtrade), but there is substantial export variation across such products.

In the following regressions, I proxy for a product's contract intensity by using the Rauch (1999) classification of differentiated and homogeneous goods (i.e., goods that have reference prices or goods sold on organized exchanges). This primarily follows Ranjan and Lee (2007) and Berkowitz et al. (2006), who argue that a good's degree of differentiation determines how intensively its sales rely on institutions. Homogeneous goods are easily sold to a third party if a trade partner cannot be held to his contractual obligations and, therefore, run less risk when contract enforcement is poor. Differentiated goods, which cannot easily be substituted and are often tailored to the buyer, require larger relationship-specific investments, which have high exposure if contracts fail. Both Ranjan and Lee (2007) and Berkowitz et al. (2006) show that good institutions are conducive to trade in differentiated goods. I also follow Nunn (2007), who argues that the contractual intensity of a good depends on the type of goods that it requires as inputs: firms that need differentiated products from upstream suppliers rely more heavily on contract enforcement. Nunn similarly shows that institutional quality works as a comparative advantage, as high indexes of institutional quality in a country lead to relative specialization into production that uses differentiated inputs.

The export-to-world data for these regressions are from the COMTRADE database, based on an SITC4 classification. These are matched with the Rauch classification and the upstream product characteristics from Nunn (I follow the crosswalk of James Markusen). The empirical strategy is the same as described in the previous subsection.

Table 2 presents the results using product differentiation as a measure of the dependence on contract enforcement. The negative coefficient of the interaction shows that during the Suez Canal closure,

Table 2
Impact on exports of manufacturing products.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Shock ln KM × differentiated	−7.83**			−12.02**			−11.15**	−13.99***
	(3.30)			(5.41)			(5.57)	(4.87)
Shock ln KM × reference		5.40***			6.11***			
		(0.10)			(0.55)			
Shock ln KM × inputs diff.			−20.32***			−13.90***		
			(0.41)			(3.45)		
Shock ln KM × capital int.							54.73***	61.40***
							(4.86)	(16.53)
Shock ln KM × skill int.							4.04	24.47
							(8.58)	(19.30)
Observations	4738	4738	3876	4709	4709	3850	4293	4293
Country–Product FE	yes	yes	yes	yes	yes	yes	yes	yes
Country–Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Product–Year FE				yes	yes	yes		yes
# Countries	10	10	10	10	10	10	10	10
# Products	33	33	33	33	33	22	32	32
# Years	24	24	24	24	24	24	24	24

Estimated by Pseudo-Poisson maximum likelihood. Robust standard errors clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

firms that produced differentiated goods in affected countries were particularly hit. The coefficient suggests that in affected countries, the trade cost shock reduced exports in differentiated products around 26% more on average than in non-differentiated products. The second column of Table 2 shows a regression for reference-priced goods, which are least sensitive to contract enforcement. It shows that these goods saw a relative upswing when trade costs increased (the complementary group, consisting of goods sold on organized exchange, is argued to be between the other two in terms of dependence on institutional context). Following the argumentation of Nunn (2007), the third column considers an industry's dependence on differentiated inputs, rather than differentiation of its final product. The coefficient implies that a product's trade decline was on average 7% stronger relative to its unaffected counterpart, if those products have 8% (one sample standard deviation) more differentiated inputs. Hence, the impact is comparable across definitions of a product's institutional sensitivity. Columns 4, 5, and 6 repeat the exercise, including the full set of twoway fixed effects. They confirm the earlier results. Finally, to control for potentially confounding shocks related to capital or skill intensity, columns 7 and 8 introduce interactions between the distance shock and capital and skill intensity. Capital and skill intensity are calculated from the EU Klems database for the year 1970, based on SITC 3 digit industries. Capital intensity is measured as the output share not attributed to labor or inputs (capital imputations have slightly lower coverage but do not materially change the conclusions). Skill intensity is measured the medium and high skilled share of employment in the industry. The capital and skill interactions show positive coefficients, suggesting that these industries expanded during trade isolation. Only the capital interaction is significant, however. The estimated negative impact of the trade cost shock in differentiated industries is slightly larger when accounting for capital and skill interactions with the trade costs.

3.5. Possible explanations for the decline in contract-intensive production

The empirical results point to the opposite of detrimental specialization. When countries were isolated from trade, their production and exports declined rather than grew for the products with high upfront costs, for differentiated products, and for products that require contract-intensive inputs or more external finance. This paper offers no evidence on the mechanisms by which this specialization occurs, but the literature offers some possible explanations.

First, a sizable literature demonstrates that contract-intensive exports and production vary with the quality of local contract enforcement. Imperfect property rights reduce producers' investments in productive assets, as they might underprepare land plots or accept lower plot productivity in exchange for more tenure security, thus reducing output (Goldstein and Udry, 2008; Ali et al., 2014; Goldstein et al., 2018; Perego, 2019). Similarly, imperfect property rights lead producers and exporters to specialize towards the sectors that use contracts less intensively (Dercon, 1998; Nunn, 2007; Nunn and Trefler, 2014).

Hence, if local contract enforcement suffers from trade isolation, that can explain the reported decline in contract-intensive production. A central question is, then, whether local contract quality responds to changes in trade costs. Several empirical and theoretical results indicate that possibility. First, for rationally expropriating rulers in the fashion of Besley and Ghatak (2010), trade isolation might increase the incentives to expropriate. The risk of expropriation drives up output prices through risk or compensatory premia, and limits production. Hence, risk premia cause decreasing returns to expropriation for the local ruler, as more expropriation erodes the stock of expropriable assets or output. However, such decreasing returns are plausibly weaker during trade isolation: for a small country, autarkic demand is less price-elastic than world demand, so risk-premia in output prices cause only limited contractions of production. If producers become less responsive to expropriation risk under trade isolation, a check on expropriation vanishes when trade costs rise. Likewise, trade isolation could eliminate international competition for producers that require good institutions, hence removing an incentive to maintain good local institutions (Levchenko, 2013). However, this latter result holds when trade partners are relatively similar, and might not apply in the case of Eastern African countries that predominantly exported to Europe. Second, formal contract enforcement is efficient, relative to informal enforcement, for sufficiently large markets and for markets with more non-local traders (Dixit, 2003). If trade isolation leads to smaller markets with more local traders, formal enforcement may decline. Third, trade isolation in developing countries may reduce the local wages and increase the local stock of expropriable assets in capital-intensive sectors, both of which encourage expropriation (dal Bó and dal Bó, 2011). Moreover, if local conflict is punished by the loss of the benefits of trade, then trade isolation removes a penalty to conflict incited by breach and expropriation (Martin et al., 2008).

Anecdotal evidence suggests – but does not prove – that Eastern Africa saw institutional deteriorations during the Suez Canal closure. Several countries in Eastern Africa experienced drops in land tenure security: with direct expropriation of land (Tanzania, 1967) and land reform that reduced access and entitlement (Tanzania in 1973, Malawi in 1969, Uganda in 1975). Farmers experienced expropriation, collectivization of farms and equipment, and abolition of cooperatives. Examples include the large-scale rural reorganization programme in Madagascar in 1973, the nationalizations in Ethiopia in 1974, and in

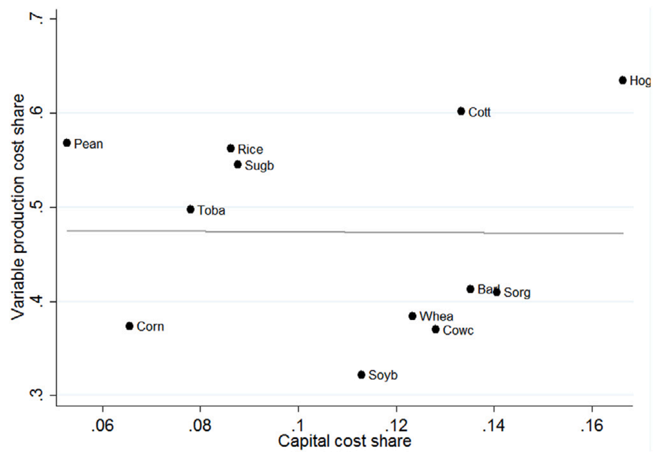

Fig. 4. Capital cost share and variable input cost share for different products.

agricultural reforms in the early 1970s in Tanzania. Contracts on output prices and marketing channels were frequently less strictly enforced, for instance in Uganda and Zambia in the early 1970s, and farmers faced increased price insecurity, payment delays and monopsony power in marketing boards (Carr, 1993; Baffes, 2009; Bates, 2014). Additionally, Bates (2014) notes the importance of political connections in state-led agricultural development, for instance in Sudan, Ethiopia and Kenya. Quantifications for the rule of law or contract enforcement do not exist for Eastern Africa in the 1960s. Nevertheless, related institutional measures point to decline: on average, indicators for democracy, constraints on political leadership and openness in political representation from the Polity V (Marshall and Gurr, 2020) database declined in affected Eastern African countries around the year 1967, both in absolute terms, and relative to unaffected African countries in the sample. Autocracy scores rose at the same time. These developments are summarized in Fig. 5.

Second, explanations for the decline in contract-intensive production may derive from the direct reduction in market size caused by trade isolation. The reduction in market size might have more substantial consequences for fixed-cost intensive products. When the scale of production shrinks, entry costs and up front investments may become insurmountable: investments in machinery and land preparation cannot be covered, or credit constraints become binding (Kinsey et al., 1998; Bigsten et al., 2003). Similarly, if the demanded level of quality rose with trade isolation, farmers may have needed to incur additional investment, thus complicating production in contract-intensive sectors, even without changes in the local level of contract quality. Frictions in credit markets may also have increased under trade isolation. That could explain increased barriers to entry, although it does not explain the relative growth in capital-intensive production and exports.[12]

4. Conclusions

This paper examines whether developing countries specialize in contract intensive products when they are isolated from international trade. Such specialization is the basis of a detrimental effect of trade, often argued to plague developing countries: the local demand for good institutions might stall, as the country specializes in production that does not require good contract enforcement, land tenure security or other property rights (e.g. Levchenko, 2013; Stefanidis, 2010; Do and Levchenko, 2009).

The analysis traces the exports of different agricultural goods from Eastern African countries over the years 1960 to 1985. During those years, the Suez Canal closed unexpectedly due to a war that Eastern African countries had no part in, but which generated a substantial shock to trade costs with the main trade partners (Feyrer, 2009). Eastern Africa was a plausible setting for detrimental specialization to occur. The countries specialized in agricultural trade and their institutional levels were far poorer than those of their main trade partners. The analysis employs a product-by-country level difference-in-difference approach to examine whether products that rely on local institutions expanded relative to other products. The approach allows ruling out confounding explanations of shifts in exports, including countries' long-term natural advantages and country-level political and macroeconomic developments.

The evidence is not consistent with detrimental specialization, however. Trade isolation slowed down the exports of institutionally intensive products relative to other products, instead of bolstering them. The declines occur for several measures of a product's reliance on local contract quality, including its required up-front investments, its need for complex production factors, and its need for formal or long-term contract financing. Similarly, manufacturing products saw relative decline if they have higher differentiation levels of output and of inputs. The reported declines also persist conditional on the good's capital intensity (which is associated with more production and exports during trade isolation), and conditional on differences in goods' sensitivities to distance per se.

Data availability

Data have been shared and will be made public.

Appendix A. Institutional sensitivity by product

An important identifying assumption drawn from the theory is that fixed costs pose barriers if institutions are poor. Because there is little measurement of institutional quality in African countries in the 1960s, it is hard to confirm the correlation between fixed costs and institutions directly. Yet, it is desirable to verify whether fixed costs indeed pose institutional barriers.

To check whether fixed costs are indeed more of a barrier in institutionally poor countries, I check the predictions in a sample with more information on institutions. I compare the FAO trade data to the institutional indexes of the Worldwide Governance Indicators by the World Bank. The "Rule of Law" variable is a widely used measure of institutional quality and aligns with interpretations of contract quality: it comprises the enforcement of contracts and property rights, the quality of police and courts, and the likelihood of crime. I match the indicator with bilateral trade data from the FAO that follows the same product classification as the data used earlier. The overlap produces a dataset of 156 countries over the years 1996–2011.

Fig. 2 in the main text shows a positive association between an exporter country's Rule of Law and its average fixed costs embedded in exported products. The association between institutional indicators and exports' fixed costs shares may be driven by confounders, however. To exclude that country- and product-level variables explain the association, I also estimate a gravity equation. The gravity equation uses bilateral product-level data from the FAO—the data of the above scatterplot in their bilateral version. To control for any effects at the product-level and the country-level, I introduce product–year and origin and destination country–year fixed effects.

Table 3 present the results from estimating the gravity in the larger sample. The first column shows coefficients consistent with most

[12] If shocks to demand explain the decline in contract-intensive production, one might expect the relative price of contract-intensive products to fall. Unfortunately, domestic price data for this sample are incomplete. In the available observations, however, the relative price of contract-intensive products shows significant increases or no significant change, rather than reductions (as does the price of capital intensive products—in line with comparative advantage dynamics). The regression is reported in Appendix K, Table 11.

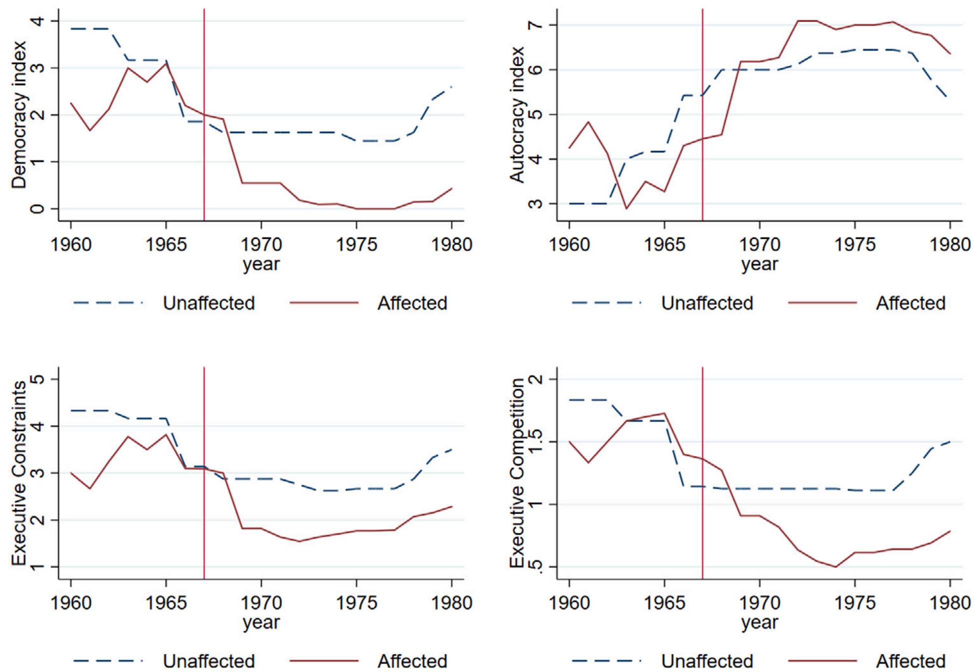

Fig. 5. Development of averages of institutional indexes for countries unaffected and affected by the Suez Canal closure. Notes. Indexes are an unweighted average across groups of countries ever or never affected by the closure of the Suez Canal in terms of distance to Rotterdam. Democracy and Autocracy indexes are the country averages across the affected and unaffected countries in the baseline sample.

other estimates from gravity equations: an estimated distance elasticity around minus unity and significant border effects. In column 2, there is an interaction between the institutional index (Rule of Law) of the origin country and the fixed costs share involved in the production being exported. The individual arguments of this interaction are absorbed by the fixed effect: the institutional indicator by the origin–year fixed effect and the fixed costs share by the product–year fixed effect. Thus, the interaction suggests that conditional on any country and product level characteristics, fixed costs intensive products are exported more often from institutionally advanced countries.

Further regressions confirm the result that fixed-costs intensive industries rely on institutions. To exclude capital sensitivity as an explanation, column 2 shows the interaction between capital shares and institutional quality in addition to the fixed costs share interaction. Conforming to intuition, better institutions foster capital intense exports. Importantly, this does not affect the estimated effects of fixed costs qualitatively. That adding capital intensity does not change the results regarding fixed costs is no surprise, as fixed costs share and capital intensity show no strong correlation. The last columns repeat the analysis for the other institutional indexes from the World Governance Indicators, each confirming the earlier result.

Appendix B. Products by category

See Table 4.

Appendix C. Figures

See Figs. 4–6.

Appendix D. Countries in the sample and their main ports

Angola (Luanda); Cameroon (Douala); Congo (Pointe Noire); Democratic Republic of the Congo (Matadi); Djibouti (Djibouti); Equatorial Guinea (Bata); Eritrea (Assab); Ethiopia PDR (Djibouti); Gabon (Libreville); Kenya (Mombasa); Madagascar (Toamasina); Mozambique (Beira); Namibia (Walvis Bay); Nigeria; Somalia (Mogadishu); South Africa (Durban); Sudan (former) (Port Sudan); United Republic of Tanzania (Dar Es Salaam).

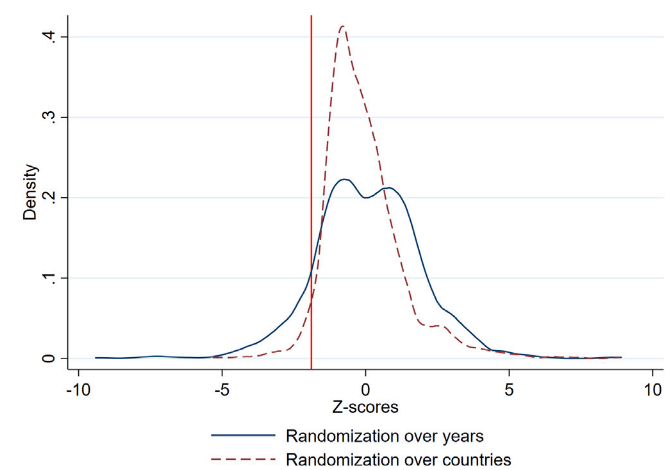

Fig. 6. *Z*-score distribution for the interaction coefficient of shock trade costs and the fixed cost share, conditional on the interaction of shock trade costs and capital cost share. Notes: based on 1000 draws. See discussion of Table 1. The kernel density functions indicate the distribution of 1000 simulated *z*-scores when randomizing over countries (red-dash) or over years (blue). The vertical red line indicates the estimated z-score from the actual sample. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Appendix E. Z score distributions in a randomization inference framework

See Fig. 6.

Appendix F. Interaction coefficient in the Poisson maximum likelihood estimates

The interaction coefficient between transport costs and fixed cost shares could mask a positive interaction effect on subsegments, because the model relies on the Poisson distribution. To check for such nonlinearities, I plot the predicted marginal means of exports by levels

Table 3
Institutional sensitivity: Effects on log exports.

	(1)	(2) RL	(3) RL	(4) CC	(5) GE	(6) PV	(7) RQ	(8) VA
Distance (log)	−0.85***	−0.85***	−0.87***	−0.87***	−0.87***	−0.87***	−0.87***	−0.86***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Border	0.80***	0.81***	0.82***	0.81***	0.82***	0.81***	0.81***	0.81***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Fixed × IQ		1.10***	1.44***	1.37***	1.61***	2.27***	1.53***	1.65***
		(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
Cap. × IQ			8.79***	8.32***	8.37***	10.44***	8.90***	8.33***
			(0.19)	(0.17)	(0.20)	(0.22)	(0.22)	(0.20)
Observations	243,228	243,228	243,228	243,228	243,228	243,212	243,228	243,228
Origin–year	yes	yes	yes	yes	yes	yes	yes	yes
Destination–year	yes	yes	yes	yes	yes	yes	yes	yes
Sector–year	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. IQ: institutional quality of the exporter—measure reported in column title code. Column title codes: RL: Rule of Law; CC: Control of Corruption; GE: Government Effectiveness; PV: Political Stability and Absence of Violence; RQ: Regulatory Quality; VA: Voice and Accountability.

Table 4
FAO products class by USDA category.

Category (USDA)	Product	Fixed cost share
Barley	Barley; Barley (pearled)	0.58
Corn	Sweet corn (frozen); Sweet corn (preserved); Flour (maize); Maize; Oil, maize; Cake, maize	0.62
Cotton	Cotton lint; Cotton waste; Cottonseed; Cotton, carded, combed; Oil, cottonseed; Cake, cottonseed	0.39
Cow/Beef	Butter (cow milk); Cheese (whole cow milk); Milk, skimmed cow; Milk, whole fresh cow; Skins, calve; Meat beef preparations; Meat, cattle boneless (beef and veal)	0.63
Hogs	Meat, pig; Meat, pig sausages; Meat, pig, preparations; Meat, pork	0.37
Rice	Rice—total (Rice milled equivalent); Bran, rice	0.44
Sorghum	Sorghum; Flour, mixed grain; Grain, mixed	0.59
Soybeans	Oil, soybean; Soya sauce; Soybeans; Cake, soybeans	0.67
Sugar	Sugar beet; Sugar Raw Centrifugal; Sugar refined; Sugar, nes	0.45
Tobacco	Tobacco, unmanufactured; Tobacco products nes	0.50
Wheat	Wheat; Bran, wheat; Buckwheat; Flour, wheat	0.62

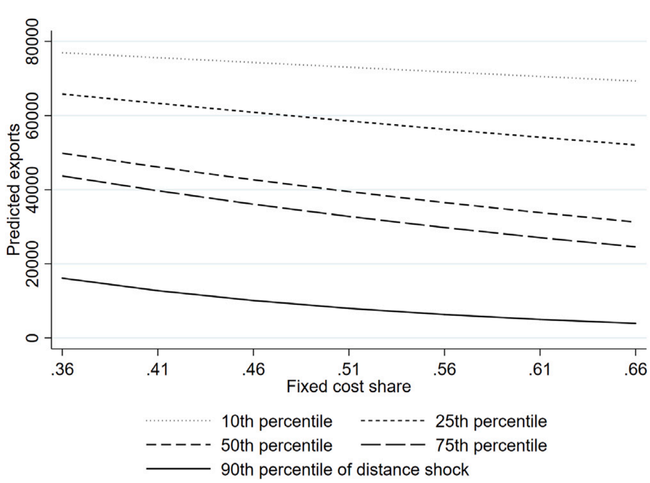

Fig. 7. Interaction effect in the pseudo Poisson model. Expected exports plotted against product fixed cost share, at different points of exposure to trade cost shock (conditional on covariates).

of the distance shock over different fixed cost shares (at average of the estimation sample). Fig. 7 shows that larger increases in the trade distance are associated with lower export flows. This effect is stronger conditional on higher fixed cost share (the scale runs from the 10th percentile to the 90th percentile). Together, there is no evidence to suggest that the negative interaction coefficient obscures any positive interaction effects.

Appendix G. Distance decay and fixed costs

The baseline regressions require the assumption that a sector's higher up-front costs imply higher sensitivity to poor contracting. If goods that embody high upfront costs also face higher transport costs, or if they are exported disproportionately to affected destinations, that could explain their relative decline—apart from the institutional sensitivity. I examine this possibility in bilateral flows of agricultural products. These are available from the FAO from 1989 onward, but I use the year 2001 for its increased coverage of African countries. The results do not change between these two years, however.

The regressions in Table 5 show no evidence for the alternative interpretation that products with larger up-front costs are more sensitive to distance. The first column provides a standard gravity equation for global flows of trade in the agricultural products classified in the baseline analysis. The interaction between the product's fixed cost share and the (log) distance shows no significant coefficient. Column 2 repeats the same regression, focusing on flows that originate from countries that were affected by the Suez Canal closure before. The coefficients are still insignificant. As this column offers the largest estimate of larger distance decay in high-fixed costs products, I use its coefficient to be conservative in the accounting exercise in Table 1b.

Another concern could be that European countries more than proportionately demand agricultural products that exhibit high fixed costs in production. In that case, isolation from Europe could represent a relative decline in demand for high-fixed costs products in particular. From columns 3 and 4, there is no evidence that imports into Europe are significantly more fixed-cost intensive, however, whether they are imported from the rest of the world or from affected African countries.

Appendix H. Pre-shock export differences for high fixed costs share sectors

See Fig. 8.

Table 5
Fixed costs, distance and destinations.

	(1) PPML World	(2) PPML Affected origins	(3) PPML world	(4) PPML Affected origins
ln Distance	−1.36***	0.51	−1.49***	0.63
	(0.42)	(1.83)	(0.45)	(1.68)
Contiguity	0.78***	−0.53	0.78***	−0.54
	(0.12)	(1.15)	(0.12)	(1.16)
ln Distance × Fixed share	0.97	−1.21	1.21	−1.45
	(0.86)	(1.80)	(0.89)	(2.04)
European dest. × Fixed share			1.27	0.95
			(1.58)	(4.26)
Observations	20,791	378	20,791	378
Origin country FE	yes	yes	yes	yes
Destination country FE	yes	yes	yes	yes
Product FE	yes	yes	yes	yes

Robust standard errors clustered at the product level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

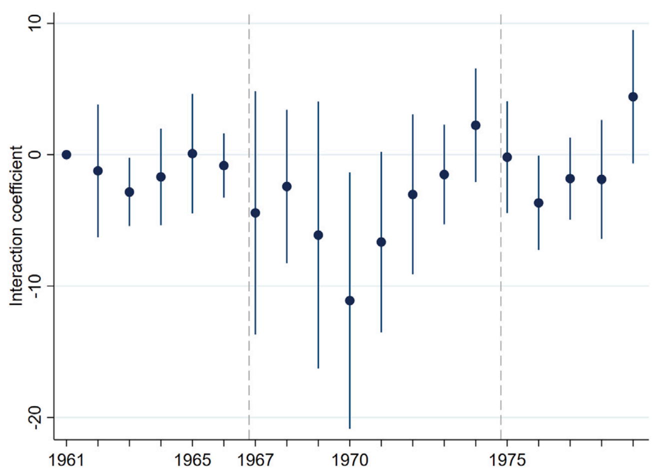

Fig. 8. Interaction coefficient of product fixed cost share and the log difference of shipment kilometers between an opened and closed Suez Canal, by year.

Appendix I. Coefficient estimates for different levels of product substitutability on soil

This Appendix examines whether higher substitutability on soil for a product leads to a larger estimated decline associated with fixed costs during the trade costs shock.

First, I construct a measure of the degree to which a product's soil is contested. In brief, I calculate for every crop in every country what share of its suitable soil is also suited for other crops. The data do not cover cattle. The construction is as follows. I use the FAO GAEZ climatological model that calculates the suitability of soil for different products. I rasterize the soil data and I extract the area for a given crop which is classified as medium suitability or better under rainfed circumstances and low levels of agricultural input. Next, I calculate what share of this suitable area is also suited (at least medium level) for other crops. Thus, I construct the share of suitable soil for each crop in each country that could be used for other crop production. The share of substitutable soil is 84% on average, with a standard deviation of 28%.

To examine whether products with more contested soil, and hence easier substitutability, show more sensitive export changes when prices change, I regress a product's exports from all African countries in the sample on the European producer prices. These data are available from 1971 onward. Table 6 shows that crop exports respond to the price, but more so if the crop's soil can be contested by (substituted for) other crops. Column 3 shows that the interaction coefficient of price and the share of soil contested is positive, implying that contested crops' exports decline more sharply in prices declines and vice versa. A 10% price decline leads to about 4% stronger decrease in export volume, when the contested soil share is a sample standard deviation higher.

Table 6
Effects of European prices on log exports conditional on soil substitutability.

	(1)	(2)	(3)
ln price ($)	0.603**	0.276**	−1.284***
	(0.252)	(0.135)	(0.344)
ln price ($) × soil contested			1.539***
			(0.422)
Observations	4697	4697	4697
Country–Year FE		yes	yes
Country–Product FE		yes	yes

Estimated by Pseudo-Poisson maximum likelihood. Twoway clustered at the crop and country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7 presents regressions in which the interaction between fixed costs and the trade cost shock (FCxShock) is multiplied with the share of contested land of the crop. The results show no significantly stronger decline of high fixed cost products in the trade shock, when the product is more contested on its soil (column 1), nor when the product is more contested than the median level (column 2), or any significant differences across tertiles of contested soil. When calculating the median and tertile shares of contested soil within countries, rather than across the sample, the more contested products respond less sharply (column 4), but that effect concentrates in the middle tertile (column 5). Column 6 confirms the baseline result of Table 1 in the sample analyzed here, which does not contain animals or animal products. Finally, columns 7 and 8 show regressions in which the suitability of soil for animals is also considered. This allows beef and hog production to compete with crops in the measure of substitutability. In column 7, to proxy animal suitability, I use FAO's FGGD pasture suitability raster data, using pixels of 7,000 out of 10,000 for pasture or higher to denote suitable soil surface. As an alternative, I employ the Beck and Sieber (2010) raster data for husbandry, and denote soil suitability for livestock by the 85th percentile of the index or higher. The results in column 7 and 8 show that no material differences arise in the conclusions when allowing animal products to compete for land use with crops.

Appendix J. Production measures based on african data

See Table 8.

Appendix K. Impact of the trade cost shock on imports, local production, and local prices

See Tables 9–11.

Table 7
Effects of log exports conditional on soil substitutability.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Suitability index used	crop	crop	crop	crop	crop	crop	crop + pasture	crop + husbandry
Fixed cost share × shock ln KM	−25.57	−13.57***	−13.48***	−13.15***	−13.60***	−12.44***	−9.99***	−7.15***
	(16.40)	(1.53)	(1.402)	(1.517)	(1.28)	(2.41)	(4.01)	(3.56)
Fixed cost share × shock ln KM x SC	10.96						−6.09	−3.16
	(13.39)						(8.55)	(2.59)
Capital cost share × shock ln KM	−2.911	13.51	11.98	8.07	11.82	7.26	23.30*	20.01
	(10.86)	(18.54)	(16.84)	(14.25)	(17.82)	(12.99)	(12.38)	(11.70)
Fixed cost × shock ln KM interacted with ...								
SC above median		4.92						
		(4.23)						
SC 2nd tertile			5.77					
			(4.12)					
SC 3rd tertile			2.49					
			(5.76)					
SC above within-country median				5.01**				
				(2.51)				
SC within-country 2nd tertile					5.86***			
					(2.14)			
SC within-country 3rd tertile					5.90			
					(3.85)			
Observations	3371	3371	3371	3371	3371	3371	4201	3818
Country–Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Country–Product FE	yes	yes	yes	yes	yes	yes	yes	yes

SC refers to the share of suitable soil of a crop competed by other crops. Suitability indexes refer to crop (FAO GAEZ), crop + pasture (FAO GAEZ combined with FAO FGGD for beef and hogs) and crop + husbandry (FAO GAEZ combined with Beck and Sieber (2010) for beef and hogs). Estimated by Pseudo-Poisson maximum likelihood. Standard errors clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8
Effects on log exports. Contract-sensitivity from African survey data.

	(1)	(2)	(3)	(4)	(5)	(6)
Heavy machine cost share × shock ln km	−0.39***			−0.39**		
	(0.14)			(0.16)		
Average loan maturity × shock ln KM		−3.96***			−4.21***	
		(0.99)			(0.98)	
Share of finance commercial × shock ln KM			−6.11**			−7.40**
			(3.02)			(3.31)
capital cost share × shock ln km				14.95	23.49	−26.35
				(9.12)	(18.55)	(27.07)
Observations	10,566	11,399	11,399	10,566	11,399	11,399
Country–Year FE	yes	yes	yes	yes	yes	yes
Country–Product FE	yes	yes	yes	yes	yes	yes

Estimated by Pseudo-Poisson maximum likelihood. Robust standard errors clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 9
Effects on log production.

	(1)	(2)	(3)	(4)	(5)	(6)
Fixed cost share × shock ln km	−3.93***	−3.81***	−5.11	−1.36	−5.85**	−7.41**
	(0.82)	(0.79)	(7.16)	(1.08)	(2.48)	(3.26)
Capital cost share × shock ln km		1.61*	44.83*	6.51***	31.49**	41.56**
		(0.88)	(25.72)	(1.19)	(13.95)	(19.30)
Observations	3495	3495	3498	3495	3552	3552
Country–Product FE	yes	yes		yes		
Country–Year FE	yes	yes	yes	yes		
Product–Year FE			yes	yes		yes
Country FE					yes	yes
Product FE					yes	
Year FE					yes	

Estimated by Pseudo-Poisson maximum likelihood. Robust standard errors clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix L. Price assistance

Many African countries in the 1960s and 1970s supported agricultural production by pricing instruments or marketing boards. The effective support by product is available for a subset of the data in the paper. For the product classification used in the main results, there are observations on price assistance on the countries Cameroon, Ethiopia, Kenya, Madagascar, Mozambique, and Tanzania (Anderson and Valenzuela, 2013). These allow a comparison of changes in price assistance to changes in export patterns.

To examine overall changes in the assistance patterns, I first examine how often they change. Figure K1 tracks the changes in nominal assistance rates. Nominal rates of assistance are the effective estimated price supports in percentage terms. The nominal rates of assistance

Table 10
Effects on log imports.

	(1)	(2)	(3)	(4)	(5)	(6)
Fixed cost share × shock ln km	−1.66	−4.19	−3.40	−3.09	0.65	2.28
	(1.98)	(3.61)	(4.99)	(3.05)	(2.27)	(2.81)
Capital cost share × shock ln km		16.26	−16.61	−10.92	3.23	−5.66
		(16.08)	(13.12)	(17.19)	(10.35)	(13.10)
Observations	12,628	12,628	13,578	12,628	13,620	13,620
Country–Product FE	yes	yes		yes		
Country–Year FE	yes	yes	yes	yes		
Product–Year FE			yes	yes		yes
Country FE					yes	yes
Product FE					yes	
Year FE					yes	

Estimated by Pseudo-Poisson maximum likelihood. Robust standard errors clustered at the country level. *** $p < .01$, ** $p < 0.05$, * $p < 0.1$.

Table 11
Effects on log domestic prices.

	(1)	(2)	(3)	(4)	(5)	(6)
Fixed cost share × shock log km	3.00	11.48*	−3.06	15.01***	6.26	−4.55
	(5.18)	(5.37)	(5.36)	(4.69)	(5.58)	(3.90)
Capital cost share × shock log km		11.65**	8.47	13.76***	−36.80	6.56
		(4.52)	(6.88)	(3.86)	(26.83)	(5.51)
Observations	461	461	461	461	461	461
R-squared	0.99	0.99	0.99	0.99	0.17	0.99
Country–Product FE	yes	yes		yes		
Country–Year FE	yes	yes	yes	yes		
Product–Year FE			yes	yes		yes
Country FE					yes	yes
Product FE					yes	
Year FE					yes	

Estimated by OLS. Robust standard errors clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

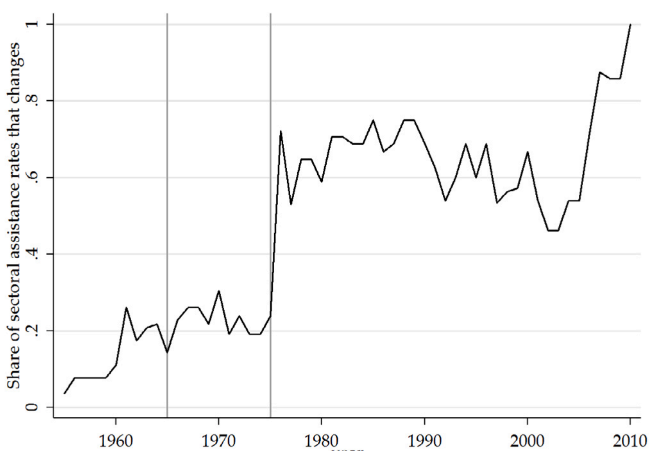

Fig. 9. Share of the country-crop pairs that experienced a changing assistance pattern by year.

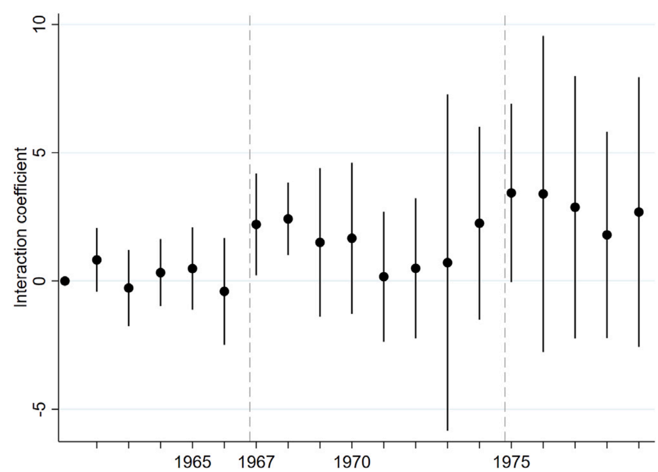

Fig. 10. Differential impact of trade shock on price assistance by fixed cost intensity, by year. The estimate is $\hat{\beta}_t$ obtained from estimating Eq. (3).

measures include border price strategies, and could effectively be negative. The Figure shows for what share of all products in all countries in the sample, price assistance rates changed. There is an upward trend: in the 1960s, on average, one in five sectors (in a given country) saw changes in assistance, but that number has risen towards 80 percent in the 1980. There is no clear change in the years around the closure of the Suez Canal, but the number of changes triples around the re-opening of the Suez Canal (see Fig. 9).

To examine whether government support to sectors with lower or higher fixed costs structurally differed in affected countries, I run the following regression:

$$\text{rate of assistance}_{pct} = \beta_0 + \sum_t \beta_t \times \text{fixed cost}_p \times \left(\ln \text{distance}_c^{1967--1975} - \ln \text{distance}_c^{1967--1975}\right) + \alpha_{pc} + \mu_{ct} + \varepsilon_{pct}, \quad (3)$$

in which β_t measures whether the assistance to production with higher fixed costs relative to production with lower fixed costs was stronger in a given year, when the country is ever affected by trade isolation. Graphically, the development of the estimate for β_t is as follows:

Fig. 10 suggests that immediately after the shock, governments in affected areas shifted their support towards production that requires large up front investment, more than other governments did. While the coefficient remains elevated, it is not significantly different within two years after the Canal closure. Surprisingly, perhaps, the large changes in assistance around 1975 are less specifically targeted towards or away from production with high fixed costs.

Table 12
Government assistance and fixed costs.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Rate of assistance				ln Exports	
Estimation	OLS	OLS	OLS	OLS	PPML	PPML
Years		64–70		64–70		
Rate of assistance						−0.99***
						(0.10)
Fixed cost share × shock ln KM	0.45***	2.14***	−0.15	−0.37	−14.94***	−14.96***
	(0.13)	(0.26)	(0.30)	(0.21)	(1.38)	(1.12)
Observations	670	94	630	86	566	566
Country–Product FE	yes	yes	yes	yes	yes	yes
Country–Year FE	yes	yes			yes	yes
Product–Year FE			yes	yes		

Estimated by Pseudo-Poisson maximum likelihood. Robust standard errors clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The regressions reported in Table 12 further explore the role of price assistance in accommodating the trade cost shock. The regression in column 1 shows that product with high fixed cost shares in their production were significantly more likely to receive assistance in affected countries during the closure of the Suez Canal. Column 2 shows the result of the same regression, ran for the years 1964–1970. It confirms that the focus of price assistance on fixed-cost intensive sectors associated with the Canal closure was particularly strong around the closure of the Canal in 1967, as Fig. 10 suggests. In part, this may be explained by a reorientation on products across all countries in the sample. Columns 3 and 4 show that there is no evidence that the canal closure affected the support for products with high fixed costs, once product–year fixed effects are accounted for. Columns 5 and 6 repeat the main regressions, now including the rate of assistance explicitly. Column 5 shows that baseline regression in the sample for which price assistance data is observed (and ruling out singleton observations conditional on the fixed effects). It shows qualitatively similar but slightly stronger declines in the export of products that show high fixed costs in their production. Column 6 adds the rate of assistance, which has little impact on the main result. The coefficient for rate of assistance is negative. A potential explanation is that assistance is targeted towards the sectors that suffer strongly under the increase in trade costs.

Overall, these responses of assistance indicate that the results are not generally affected by price assistance responses. If anything, support is targeted towards sectors that are institutionally more intense, so that these might have collapsed even further without assistance. In unreported regressions, I used border market price supports instead of general price supports. The correlation between the two price measures is very high (0.97) and the results show no change.

References

Ali, D.A., Deininger, K., Goldstein, M., 2014. Environmental and gender impacts of land tenure regularization in Africa: Pilot evidence from Rwanda. J. Dev. Econ. 110, 262–275.

Amaral, P.S., Quintin, E., 2010. Limited enforcement, financial intermediation, and economic development: a quantitative assessment. Internat. Econom. Rev. 51 (3), 785–811.

Arkolakis, C., Costinot, A., Rodriguez-Clare, A., 2012. New trade models, same old gains? Amer. Econ. Rev. 102 (1), 94–130.

Baffes, J., 2009. The "full potential" of uganda's cotton industry. Dev. Policy Rev. 27 (1), 67–85.

Bates, R.H., 2014. Markets and States in Tropical Africa: The Political Basis of Agricultural Policies, third ed. University of California Press, California.

Beck, T., 2002. Financial development and international trade: Is there a link? J. Int. Econ. 57 (1), 107–131.

Beck, J., Sieber, A., 2010. Is the spatial distribution of mankind's most basic economic traits determined by climate and soil alone? PLoS One 5 (5), e10416.

Berkowitz, D., Moenius, J., Pistor, K., 2006. Trade, law, and product complexity. Rev. Econ. Stat. 88 (2), 363–373.

Berman, N., Couttenier, M., Rohner, D., Thoenig, M., 2017. This mine is mine! How minerals fuel conflicts in Africa. Amer. Econ. Rev. 107 (6), 1564–1610.

Besley, T., 1995. Property rights and investment incentives: Theory and evidence from Ghana. J. Political Econ. 103 (5), 903–937.

Besley, T., Ghatak, M., 2010. Property rights and economic development. In: Handbook of Development Economics. Vol. 5, Elsevier, pp. 4525–4595.

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J.W., Oduro, A., Oostendorp, R., Patillo, C., Soderbom, M., Teal, F., Zeufack, A., 2000. Contract flexibility and dispute resolution in African manufacturing. J. Dev. Stud. 36 (4), 1–37.

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J.W., Oduro, A., Oostendorp, R., Patillo, C., Soderbom, M., Teal, F., Zeufack, A., 2003. Credit constraints in manufacturing enterprises in Africa. J. Afr. Econ. 12 (1), 104–125.

Boissiere, M., Knight, J.B., Sabot, R.H., 1985. Earnings, schooling, ability, and cognitive skills. Amer. Econ. Rev. 75 (5), 1016–1030.

Brown, J.R., Cookson, J.A., Heimer, R.Z., 2017. Law and finance matter: Lessons from externally imposed courts. Rev. Financ. Stud. 30 (3), 1019–1051.

Bruhn, M., Gallego, F.A., 2012. Good, bad, and ugly colonial activities: Do they matter for economic development? Rev. Econ. Stat. 94 (2), 433–461.

Cameron, A.C., Miller, D.L., 2015. A practitioner's guide to cluster-robust inference. J. Hum. Resour. 50 (2), 317–372.

Carr, S.E., 1993. Improving cash crops in Africa: factors influencing the productivity of cotton, coffee and tea grown by smallholders. In: World Bank Technical paper 216.

Collier, O., 1991. Africa's external economic relations: 1960 - 90. Afr. Affairs 90 (360), 339–356.

Collier, P., Gunning, J.W., 1999. Explaining African economic performance. J. Econ. Lit. 37 (1), 64–111.

dal Bó, E., dal Bó, P., 2011. Workers, warriors, and criminals: social conflict in general equilibrium. J. Eur. Econom. Assoc. 9 (4), 646–677.

Davis, B., Di Giuseppe, S., Zezza, A., 2014. Income diversification patterns in rural Sub-Saharan Africa: reassessing the evidence. In: World Bank Policy Research Working Paper 7108.

Deininger, K., Jin, S., 2006. Tenure security and land-related investment: Evidence from Ethiopia. Eur. Econ. Rev. 50 (5), 1245–1277.

Dercon, S., 1993. Peasant supply response and macroeconomic policies: Cotton in Tanzania. J. Afr. Econ. 2 (2), 157–194.

Dercon, S., 1996. Risk, crop choice, and savings: Evidence from tanzania. Econom. Dev. Cult. Chang. 44 (3), 485–513.

Dercon, S., 1998. Wealth, risk and activity choice: cattle in western tanzania. J. Dev. Econ. 55 (1), 1–42.

Dippel, C., Greif, A., Trefler, D., 2015. The rents from trade and coercive institutions: Removing the sugar coating. In: Working Paper Series 20958, National Bureau of Economic Research.

Dixit, A., 2003. Trade expansion and contract enforcement. J. Political Econ. 111 (6), 1293–1317.

Do, Q.-T., Levchenko, A.A., 2009. Trade, inequality, and the political economy of institutions. J. Econom. Theory 144 (4), 1489–1520.

Ebeke, C., Omgba, L.D., Laajaj, R., 2015. Oil, governance and the (mis) allocation of talent in developing countries. J. Dev. Econ. 114, 126–141.

Fenske, J., 2011. Land tenure and investment incentives: Evidence from West Africa. J. Dev. Econ. 95 (2), 137–156.

Fenske, J., 2013. Does land abundance explain african institutions? Econ. J. 123 (573), 1363–1390.

Feyrer, J., 2009. Distance, trade, and income - the 1967 to 1975 closing of the suez canal as a natural experiment. In: Working Paper Series 15557, National Bureau of Economic Research.

Fouquin, M., Hugot, J., 2016. Two centuries of bilateral trade and gravity data: 1827-2014. Technical report, CEPII.

Friel, S., Hattersley, L., Townsend, R., 2015. Trade policy and public health. Annu. Rev. Public Health 36 (1), 325–344.

Giuntella, O., Rieger, M., Rotunno, L., 2019. Weight gains from trade in foods: Evidence from Mexico. J. Int. Econ. 103–277.
Goldstein, M., Houngbedji, K., Kondylis, F., O'Sullivan, M., Selod, H., 2018. Formalization without certification? Experimental evidence on property rights and investment. J. Dev. Econ. 132, 57–74.
Goldstein, M., Udry, C., 2008. The profits of power: Land rights and agricultural investment in ghana. J. Political Econ. 116 (6), 981–1022.
Gopalan, R., Mukherjee, A., Singh, M., 2016. Do debt contract enforcement costs affect financing and asset structure? Rev. Financ. Stud. 29 (10), 2774–2813.
Gunning, J.W., Pomp, M., 1995. Growth, adjustment and resource allocation. In: The Manufacturing Sector in Zimbabwe: Industrial Change Under.
Hart, O.D., Moore, J., 1988. Incomplete contracts and renegotiation. Econometrica 56 (4), 755–785.
Heltberg, R., 2002. Property rights and natural resource management in developing countries. J. Econ. Surv. 16 (2), 189–214.
Jedwab, R., Moradi, A., 2016. The permanent effects of transportation revolutions in poor countries: evidence from Africa. Rev. Econ. Stat. 98 (2), 268–284.
Jeula, H., 1872. Some statistics relating to the traffic through the suez canal; to merchant vessels touching at St. Helena; and to losses posted on "Lloyd's loss book". J. Stat. Soc. London 35 (3), 327–333.
Kinsey, B., Burger, K., Gunning, J.W., 1998. Coping with drought in Zimbabwe: Survey evidence on responses of rural households to risk. World Dev. 26 (1), 89–110.
Kletzer, K., Bardhan, P., 1987. Credit markets and patterns of international trade. J. Dev. Econ. 27 (1–2), 57–70.
Lanjouw, J.O., Lanjouw, P., 2001. The rural non-farm sector: issues and evidence from developing countries. Agric. Econ. 26 (1), 1–23.
Lederman, D., Maloney, W.F., 2012. Does What You Export Matter? in Search of Empirical Guidance for Industrial Policies. World Bank, Washington.
Levchenko, A.A., 2007. Institutional quality and international trade. Rev. Econom. Stud. 74 (3), 791–819.
Levchenko, A.A., 2013. International trade and institutional change. J. Law Econ. Organ. 29 (5), 1145–1181.
Louis, W.R., Shlaim, A., 2012. The 1967 Arab-Israeli War: Origins and Consequences. Vol. 36, Cambridge University Press, Cambridge.
MacKinnon, J.G., Webb, M.D., 2018. Randomization inference for difference-in-differences with few treated clusters. In: Queens Economic Department Working Paper no. 1355.
Marshall, M.G., Gurr, T.R., 2020. Polity5: Political regime characteristics and transitions, 1800-2018 dataset users' manual. Center for systemic peace. Center for Systemic Peace, http://www.systemicpeace.org/inscr/p5manualv2018.pdf.
Martin, P., Mayer, T., Thoenig, M., 2008. Civil wars and international trade. J. Eur. Econom. Assoc. 6, 541–550.
Matsuyama, K., 1992. Agricultural productivity, comparative advantage, and economic growth. J. Econ. Theory 58 (2), 317–334.
Mayshar, J., Moav, O., Neeman, Z., Pascali, L., 2015. Cereals, appropriability and hierarchy. In: Working Papers DP 10742. CEPR.
Nunn, N., 2007. Relationship-specificity, incomplete contracts, and the pattern of trade. Q. J. Econ. 122 (2), 569–600.
Nunn, N., Trefler, D., 2014. Domestic institutions as a source of comparative advantage. Handb. Int. Econ. 4, 263–315.
OECD/WTO, 2013. Aid for Trade at a Glance 2013. WTO/OECD Publishing.
OECD/WTO, 2015. Aid for Trade at a Glance 2015: Reducing Trade Costs for Inclusive, Sustainable Growth. WTO, Geneva/OECD publishing, Paris.
Perego, V., 2019. Crop prices and the demand for titled land: Evidence from Uganda. J. Dev. Econ. 137, 93–109.
Ponticelli, J., Alencar, L.S., 2016. Court enforcement, bank loans, and firm investment: evidence from a bankruptcy reform in Brazil. Q. J. Econ. 131 (3), 1365–1413.
Rakotoarisoa, M., Iafrate, M., Paschali, M., et al., 2011. Why Has Africa Become a Net Food Importer. FAO Trade and Markets Division Rome.
Ranjan, P., Lee, J.Y., 2007. Contract enforcement and international trade. Econ. Polit. 19 (2), 191–218.
Rauch, J.E., 1999. Networks versus markets in international trade. J. Int. Econ. 48 (1), 7–35.
Reardon, T., Delgado, C., Matlon, P., 1992. Determinants and effects of income diversification amongst farm households in Burkina Faso. J. Dev. Stud. 28 (2), 264–296.
Robinson, J.A., Torvik, R., Verdier, T., 2006. Political foundations of the resource curse. J. Dev. Econ. 79 (2), 447–468.
Rodrik, D., 1998. Trade policy and economic performance in sub-saharan africa. In: Working Paper Series 6562, National Bureau of Economic Research.
Rodrik, D., 2016. Premature deindustrialization. J. Econ. Growth 21 (1), 1–33.
Schieffer, J., Wu, S., 2006. Private mechanisms, informal incentives, and policy intervention in agricultural contracts. Am. J. Agric. Econ. 88 (5), 1251–1257.
Silva, J.M.C.S., Tenreyro, S., 2006. The log of gravity. Rev. Econ. Stat. 88 (4), 641–658.
Sokoloff, K.L., Engerman, S.L., 2000. Institutions, factor endowments, and paths of development in the new world. J. Econ. Perspect. 14 (3), 217–232.
Stefanidis, C., 2010. Appropriation, property rights institutions, and international trade. Am. Econ. J. Econ. Policy 2 (4), 148–172.
Waha, K., Zipf, B., Kurukulasuriya, P., Hassan, R.M., 2016. An agricultural survey for more than 9,500 African households. Sci. Data 3 (160020).