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Institutional quality and the duration of agri-food trade flows

Helena Engemann | **Yaghoob Jafari** | **Thomas Heckelei**

Institute for Food and Resource Economics, University of Bonn, Bonn, Germany

Correspondence
Helena Engemann, Institute for Food and Resource Economics,University of Bonn, ILR, Nussallee 21,53115 Bonn, Germany.
Email: helena.engemann@ilr.uni-bonn.de

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Abstract

Recent trade disruptions and their consequences on supply chains show the importance of stable trade relations for exporters' economic planning and importers' supply security. Both instability in trading partners' economic and institutional environment and differences between them are likely to exacerbate these disruptions. We investigate the role of exporters' institutional quality (IQ) and its similarity with importers' IQ in the stability of trade links. We focus on the trade links of agri-food products exported from sub-Saharan African (SSA) countries to the European Union (EU-28) and consider three dimensions of IQ: 'government selection, monitoring, and replacement'; 'efficiency of policy formulation and implementation'; and 'respect of citizens and state for institutions'. Using a discrete-time duration model, we show that the duration of SSA exports to the EU-28 increases with higher exporters' IQ and similarity of trading partners' IQ. The strongest impact of exporters' IQ is associated with 'government selection, monitoring, and replacement'. In terms of the similarity of trading partners, 'respect of citizens and state for institutions' has the largest impact on trade durations. Our findings suggest that the improvement of countries' IQ may boost the stability of trade relationships. Moreover, the similarity of IQs between trading

partners supports the stability of trade links and should be carefully considered when establishing new trade relations.

KEYWORDS
Agri-food trade, discrete-time model, institutional quality, trade duration

JEL CLASSIFICATION
F14; P48; Q17; Q18

1 | INTRODUCTION

Given the substantial costs of establishing new trade relationships, the successful maintenance of existing trade relationships, that is, their long-term survival, is crucial for the success of exporters and importers. Stable trade relations contribute to the income of producers in exporting countries and the availability of product varieties in importing countries, which have welfare implications on both sides of the trade relationship. However, bilateral trade links across sectors can be short-lived, suggesting that specific factors hinder their continuity (Besedeš and Prusa, 2006a; Bojnec and Fertő, 2018; Hess and Persson, 2011; Nitsch, 2009). Recent advances in modelling the dynamics of heterogeneous firms' decisions to engage in costly export markets emphasise the role of variable trade costs (Melitz, 2003) and uncertainty in explaining the stability of bilateral trade relationships (Rauch and Watson, 2003; Bernard et al., 2009; Segura-Cayuela and Vilarrubia, 2008). The institutional environment of trading partners also has an impact on both uncertainties and variable costs (Martínez-Zarzoso and Márquez-Ramos, 2019; North, 1991), and can affect the stability of trade relations. Consequently, the role of institutional quality (IQ) factors can be important for firms' selection of trade partners to reduce uncertainties and for policy planners seeking to boost the stability of trade relations and/or to adjust their institutional environment.[1]

We investigate the impact of trading partners' IQ on the stability of trade relationships along the extensive margin of trade. We use the information on agri-food export flows from sub-Saharan African (SSA) countries to the individual European Union (EU-28) countries, as an example. More specifically, we analyse the impact of exporters' IQ and the similarity of IQ between partner countries on the duration of trade (the time from the start of a trade relation to its end). We also examine the impact of different attributes of exporters' IQ and their similarity with that of importers on the duration of trade. The attributes we identify are: 'government selection, monitoring, and replacement'; 'efficiency of policy formulation and implementation'; and 'respect of citizens and state for institutions'. Finally, we rank the importance of these attributes with regard to their impact on trade duration.

We focus on agri-food exports from SSA countries to the individual EU-28 members for several reasons. In many countries in SSA, the agri-food sector has the largest share in GDP and trade, indicating the importance of this sector. The EU-28 and even several individual EU-28 countries are major destinations for SSA agri-food exports (WITS, 2021; World Bank, 2021a; World Bank, 2021b)[2] whereas the duration of these trade relationships are low

[1]Countries worldwide have recently implemented institutional reforms as the drawbacks of institutional instabilities are evident (Boudreaux and Holcombe, 2018; Kanani and Larizza, 2021). Countries are also concerned about the stability of their trade relationships (WTO, 2018; Huang et al., 2020).

[2]The Netherlands, the UK and France are the top three destinations of food products from SSA (WITS, 2021).

with, on average, 2.5 years.[3] Moreover, the majority of countries located in SSA are least developed countries with low levels of IQ (see Appendix S1), but are trying to improve their IQ (AFDB, 2021). The EU-28 countries have, on average, higher IQs leading to substantial differences between IQs of the country-pairs involved in EU-SSA trade relationships. Consequently, the SSAs' export flows to the EU-28 countries are interesting for the analysis of the impact of IQ of exporters and its similarity with that of importers on trade duration.

Trade relations are initiated when both exporters and importers expect benefits from the exchange of goods over a sufficiently long period of time so that at least the costs of establishing a trade link are covered (Besedeš and Prusa, 2011). Upon successful entry, firms may revise their decisions at any time, depending on the changes in operating profits and the level of uncertainty they face. Reducing uncertainty is the major contribution of functioning institutions, which can help create stability for human interaction (North, 1991). In exporting countries, IQ is related to uncertainties associated with bilateral trade frictions, production and demand conditions, and the non-market factors that increase the firms' risk of exiting the export market (Nguyen, 2012; Besedeš and Prusa, 2011). Further, the similarity of IQ between trading partners is important. A greater similarity in the institutional environment leads to more confidence among economic agents due to partners' comparable formal procedures, behavioural norms and levels of trust in conducting business (Groot et al., 2004). This might reduce uncertainties regarding trading partners' mutual expectations. The IQ environment also affects fixed and variable costs relevant for trade through several channels such as contracting, investment, productivity, comparability, trust and transparency (Martínez-Zarzoso and Márquez-Ramos, 2019). (Unexpected) changes of these costs carry further implications for export participation and continuation (see Chaney, 2008; Helpman et al., 2008).

Empirical evidence on the role of IQ of trading partners and institutional similarity in trade duration is limited. A study by Bojnec and Fertő (2012) is to our knowledge the only research that examines the impact of exporters' IQ on the duration of exports. They find that IQ increases the duration of the EU agri-food exports. However, further empirical studies investigate the impact of IQ on the quantity of trade (Álvarez et al., 2018; Nunn and Trefler, 2014; Martínez-Zarzoso and Márquez-Ramos, 2019). These show that higher IQ reduces trade barriers, for example, due to greater transparency and reduced uncertainty between trading partners.

We contribute to the literature in two ways. First, we show the impact of different IQ indicators on the duration of trade. Compared to Bojnec and Fertő (2012), who analyse the impacts of the EU enlargement on its agri-food exports, we explore the relative importance of different dimensions of IQ with a focus on the exports of SSA countries to the EU-28. Second, we examine the effect of institutional dissimilarity between exporters and importers on the duration of bilateral trade for different dimensions. We use the trade flow information from 1996 to 2017 for each SSA country to the individual EU-28 countries at the HS 6-digit level to perform a duration analysis using the Kaplan–Meier survivor function that shows the probability of exports surviving a certain number of years. To analyse the impact of trading partners' IQs on trade durations, we use discrete-time analysis (Hess and Persson, 2012) as trade relationships are reported in discrete units of yearly length.

The remainder of this paper is structured as follows. Section 2 reviews relevant theoretical and empirical literature on IQ and the duration of trade relationships. Section 3 presents the methods used for analysing the impact of institutional factors on trade duration. Sections 4 and 5 present the data description and results, respectively, and Section 6 concludes.

[3]See also Rudi et al. (2012), who find low survival rates of exports from Africa.

TABLE 1 Institutional quality indicators

IQ dimension	WGI (World Bank)	Explanation
(A) Government selection, monitoring and replacement	Voice and Accountability	Citizens' ability to participate in government selection, freedom of expression, freedom of association and freedom of media
	Political Stability and Absence of Violence/ Terrorism	Likelihood of government destabilisation by politically motivated violence and terrorism
(B) Efficiency of policy formulation and implementation	Government Effectiveness	Quality of public services, quality of civil service and its degree of independence from political pressures, quality of policy formulation and implementation, and credibility of the government's commitment to such policies
	Regulatory Quality	Government's ability to formulate and implement sound policies and regulations that permit and promote private sector development
(C) Respect of citizens and state for institutions	Rule of Law	Agents' confidence in abiding by the rules of society (quality of contract enforcement, property rights, the police and courts) and likelihood of crime and violence
	Control of Corruption	The extent of exercising public power for private gain (petty and grand forms of corruption) and capture of the state by elites and private interests

Note: The annual indicators are created by Kaufmann and Kraay using an unobserved component model (UCM). They are based on 31 data sources and are available from 1996.
Source: Own illustration based on Kaufmann et al. (2010).

2 | BACKGROUND AND DERIVED HYPOTHESES

Duration of trade is defined as the number of consecutive years with uninterrupted trade flows of a specific product between two trade partners. Recent studies reveal short trade durations across sectors, with means between 2.7 and 5.7 years and medians of 1 and 2 years (e.g., Besedeš and Prusa, 2006a; Peterson et al., 2017; Hess and Persson, 2011).[4] Although no specific theory explains the duration of trade, different trade theories, including those on firms' export behaviour and buyers' behaviour in the export destination markets, suggest reasons for (non-)continued trading on an already established trade link.

An exporting firm's decision on initiating, continuing or terminating a trading activity is inherently a decision under uncertainty. Assuming risk-neutral firms, a firm exports if the associated expected profit over the planned period is at least as large as the fixed costs of establishing an export link (see e.g., Melitz, 2003). Since expected profits are not always earned, firms revise their expectations once they enter the export market or during their ongoing trade relation (Nguyen, 2012; Besedeš and Prusa, 2011). One reason for unexpected changes in profits is the uncertainty of market and non-market conditions in exporter countries, importer countries, or both (Fera et al., 2017; Bodt and van Wassenhove, 1983), which can lead to changes in production costs and domestic demand conditions (see Esteves and Rua, 2015 for a review), in the export market's competition level (see Bernard et al., 2009), or in trading costs due to changing tariff and non-tariff measures (see Chaney, 2008; Helpman et al., 2008). The revision of exporters' expectations is based on changes in uncertainty and actual market conditions.

Trade links are also established and (dis-)continued at the discretions of buyers, that is, importers, taking uncertainty into account. Buyers search for the supplier with the lowest price among all possible sellers of the desired product with a certain quality (Rauch and Watson, 2003). Once a suitable supplier, that is, exporter, is found, they bear the costs of establishing a trade relationship and revise the trade decision every time unexpected changes occur.[5] Importers establish new trade relations if these costs are lower than their expected operating profits. Their decision to continue trading with an exporter or to shift to another supplier depends on the ability of sellers to meet their expectations (Peterson et al., 2017).

IQ plays a crucial role in the entry and continuation decisions through its impact on uncertainty and costs for importers and exporters. IQ relates to how authority in a country is exercised. IQ has been more specifically defined by Kaufmann et al. (2010) as: 'the process by which governments are selected, monitored, and replaced'; 'the capacity of the government to effectively formulate and implement sound policies'; and 'the respect of citizens and the state for the institutions that govern economic and social interactions among them' (Kaufmann et al., 2010, p. 4; see Table 1). These dimensions of IQ affect trade duration through different pathways and cost elements (see Álvarez et al., 2018; Bojnec et al., 2014; Lin et al., 2019; Martínez-Zarzoso and Márquez-Ramos, 2019).[6] Better IQ (1) facilitates contracting between companies; (2) leads indirectly to investment and firms' productivity

[4]For example, Besedeš and Prusa (2006a) find an average duration of 2.7 years and a median of 1 year for the US imports from 160 countries, and an especially low survival rate of exports from Africa (48% survive after 1 year of trade). Later, Besedeš and Prusa (2011) study the export survival of 46 countries and find that more than 50% of the relations fail in the first 2 years. Hess and Persson (2011) and Nitsch (2009) find an average import duration of 3.3 years and medians of 1 and 2 years, respectively. In addition, Rudi et al. (2012) find a mean export duration of 5.7 years for fresh fruits and vegetables trade.

[5]Since agri-food products are subject to numerous product standards, buyers might face relatively high costs for finding the trading partners meeting such standards or training them to comply with those standards (Bojnec et al., 2014; Peterson et al., 2017). We note that these training and time costs vary between products depending on product differentiation, which affects the ease of switching to another trade partner and, therefore, the trade duration (Besedeš and Prusa, 2006b).

[6]See also Anderson and Marcouiller (2002); Bojnec et al. (2014); Berden et al. (2014); Besedeš and Prusa (2002); Levchenko (2007); Marquez-Ramos (2011); Nguyen (2012).

improvements; (3) facilitates custom procedures; and (4) increases transparency and comparability. The IQ dimensions further differ in their impact on uncertainty, that is, how they (5) enhance trust between trading partners[7] and (6) stabilise factors that affect firms' business environment.[8] Although IQ dimensions are interlinked, dimension (A) may relate most to channels 2 and 6, dimension (B) to channel 1, and dimension (C) to channels 3, 4 and 5. The direction of IQ dimensions on trade duration could also differ. For example, higher voice and accountability (dimension A) may be associated with bargaining power of workers and through channel 2 reduce trade duration, but better control of corruption (dimension C) increases domestic investment through channel 2 and may increase trade duration (Berden et al., 2014).[9]

Bojnec and Fertő (2012) create one IQ indicator applying Principal Component Analysis to different dimensions of IQ, that is, all six World Bank Worldwide Governance Indicators (WGI), and integrate this composite into an extended Cox proportional hazard model (Cox, 1972) to estimate the impact of IQ on the survival rate of trade links. Their findings show that an overall measure of IQ increases the duration of EU agri-food exports. Nonetheless, there is a lack of an empirical analysis of the impact of individual dimensions of the institutional environment on trade duration. Literature that focuses on other determinants affecting trade duration find that in general, factors that reduce trade costs lead to lower failure rates and, consequently, to longer bilateral trade duration (e.g., Bacchetta et al., 2012; Besedeš and Prusa 2006b; Hess and Persson 2011; Nitsch 2009). Since higher IQ can reduce trade costs, (Anderson and Marcouiller, 2002; Álvarez et al., 2018) this might lead to an increase in trade duration. Against this background, we hypothesise (H1a) that a higher IQ of SSA exporters leads to longer bilateral trade duration. Additionally, because of the different impact pathways of IQ dimensions, we hypothesise (H1b) that the various dimensions of IQ have different effects on the trade duration.

Trade relationships are affected by both countries' IQ and the similarity of importers' and exporters' IQ (Álvarez et al., 2018; Fiankor et al., 2019; Yu et al., 2010). Similarity of IQs can affect transaction costs and the uncertainty related to trade links. It may reduce the transaction cost but its impact on uncertainty may depend on the absolute level of IQs of both partners involved. With respect to the transaction costs, Álvarez et al. (2018) argue that similarity among trading partners reduces trade costs due to familiarity regarding their institutional environment. For example, Horsewood and Voicu (2012) analyse the impact of importers' and exporters' corruption levels on trade flows between Romania and Bulgaria. They show that countries with similar business ethics and mutually acceptable practices for cross-border transactions tend to trade more. With regard to the uncertainty component of IQ similarity, trading with low IQ partners may increase the risk of deviations from expectations (Martínez-Zarzoso and Márquez-Ramos, 2019). Further, Ben Ali and Mdhillat (2015) suggest that countries with high ethical standards would risk reputation when trading with a corrupt country. Consequently, countries with high IQ might prefer partner countries with same IQ standards, and, for example, increasing corruption in one partner country could lead to the termination of the trade link to avoid reputational

[7]For example, Bojnec et al. (2014) indicate the role of IQ for meeting standards, which are particularly high for food consumed in the EU (European Commission, 2021), as better IQ increases transparency and reduces uncertainty.

[8]See also Horsewood and Voicu (2012) and Ben Ali and Mdhillat (2015).

[9]We note that the mentioned studies empirically analysed IQ impacts on trade values but not on the trade duration. Anderson and Marcouiller (2002) and Jansen and Nördas (2004) identify market competition, legal security and corruption as the most important impact factors on trade values. Álvarez et al. (2018) find stronger effects of countries' regulatory quality, governmental effectiveness and rule of law compared to the voice and accountability, political stability and control for corruption. Lin et al. (2019) conclude that voice and accountability is relevant for the degree of cooperation in the production process and workers' bargaining, government effectiveness mainly affects the ability of contract enforcement, and monitoring is generally important for both the production process and trade relations.

damage. The overall impact of IQ similarity and its different dimensions on trade duration depends on the combined effect through transaction cost and uncertainty channels. Considering that EU-28 countries have generally high IQs, they would trade more with SSA countries of high IQs to reduce both the associated uncertainty and transactions costs. In this context, we hypothesise (H2a) that the greater the similarity of IQs between SSA countries and their EU-28 trading partners, the greater the probability of a longer bilateral trade duration. Finally, we hypothesise (H2b) that the various dimensions of similarity in IQ differ with respect to their effects on the trade duration.

3 | METHODOLOGY

We apply the Kaplan–Meier survivor function to perform a descriptive duration analysis of the SSA-EU agri-food trade and use different discrete-time regression models to identify the effects of IQ and its various dimensions on the duration of trade.

Survival analysis estimates the expected time until one or more events happen, which we apply in the context of trade duration. We define an event as the failure of a trade relation after one or several successive years of trade (e.g., Besedeš and Prusa, 2006a; Besedeš and Prusa, 2006b; Hess and Persson, 2011; Nitsch, 2009; Peterson et al., 2017; Rudi et al., 2012). We follow Besedeš et al. (2016) and define the term 'trade relation' as the trade of a specific product between two countries. For each trade relation, the time from the first trade flow in any given year until the year, in which the trade stops, is called a 'spell' (Hess and Persson, 2011, p. 666). When two countries re-start trading a specific product, the trade relation has 'multiple spells' (Hess and Persson, 2011, p. 671). The number of consecutive trade years of a spell is the 'length of spell' representing the trade duration of that spell (Hess and Persson, 2011, p. 666).[10]

To calculate the probability of a spell of length k, we estimate the survival function $\widehat{S}(t)$ using the non-parametric Kaplan–Meier (KM) survival estimator of the hazard function. Thus, we calculate the probability of spells' survival in period t, given that the length of spell lasted until k using (Kaplan and Meier, 1958; Nicita et al., 2013).

$$\widehat{S}(t) = \prod_{t(k)<t} \frac{n_k - d_k}{n_k} \tag{1}$$

The KM estimator is a standard measure in survival analysis and robust to censoring; however, it does not capture any functional relationship between trade survival and its covariates (Besedeš and Prusa, 2006a). We complement the analysis with a model that allows us to investigate the effects of IQ indicators and other factors on the duration of SSA–EU trade relations. Studies on trade duration widely use the Cox (1972) proportional hazard model (Besedeš and Prusa, 2006b; Rudi et al., 2012). However, Hess and Persson (2012) argue that the application of the Cox hazard model is unsuitable for analysing the determinants that affect trade duration because, first, the data are grouped into discrete units, while the Cox hazard model relies on a continuous-time specification leading to biased estimations. Second, it is difficult to properly control for unobserved heterogeneity using the Cox approach, which can create spurious negative duration dependence of the estimated survivor functions and biased parameters. Third, the Cox hazard model restricts the independent

[10]For example, Ghana exported eggplants to the UK in 1994 and 1995. Thus, the length of the first spell is 2 years. As Ghana exported eggplants again to the UK from 2003 to 2011, this trade relation reveals an example for multiple spells. In our analysis, we consider multiple spells.

variables from having a constant effect on the hazard rate across a spell, but this is not expected for many explanatory variables (see for further discussion Hess and Persson, 2012). Following Hess and Persson (2012), we use the discrete-time model for our impact analysis on trade duration.

In the discrete-time hazard model, export duration is estimated as a conditional probability that the export of one specific product will terminate in a particular time interval $[t_k,t_{k+1}]$, whereas $k = 1, 2, \ldots, k_{max}$, and $t_1 = 0$, given that the export of this specific product already lasted until this time interval. In this model, the estimated conditional probability is explained by independent variablesx_{ik}. Consequently, the discrete-time hazard rate h_{ik}, that is, the probability of termination of a specific spell i at time interval k, can be defined as (Hess and Persson, 2012).

$$h_{ik} = P\left(T_i < t_{k+1}\right)\ T_i \geq t_k, x_{ik} = F\left(x'_{ik}\beta + \gamma_k\right), \tag{2}$$

where T_i is a non-negative continuous random variable denoting the length of the spell. $x\prime_{ik}$ denotes a vector of time-varying explanatory variables, and β refers to their corresponding coefficients. An appropriate distribution function $F(.)$ ensures that the hazard rate h_{ik}lies in the range from zero to one for all i and k. γ_k refers to a function of time allowing the hazard rate $h_{ik}$to vary over time (Hess and Persson, 2012) captured in our discrete-time model by year-specific dummies.

The discrete-time hazard model can be estimated using the log-likelihood function,

$$\ln\mathcal{L} = \sum_{i=1}^{n}\sum_{k=1}^{k_i}\left[y_{ik}\ln\left(h_{ik}\right) + \left(1 - y_{ik}\right)\ln\left(1 - h_{ik}\right)\right], \tag{3}$$

where y_{ik} is a binary variable equal to one if the spell i ends in the time interval k_i, that is, if the trade relation fails, and zero if trade occurs.

We follow Hess and Persson (2012) and assume that the hazard rate has a normal distribution and estimate Equation (3) using the probit model. To test the sensitivity regarding this assumption, we re-estimate Equation (3) with a logit model, which underlies the assumption of a logistic distribution (Hess and Persson, 2011). With regards to the hazards assumption, the probit model imposes non-proportionality, whereas the logit model only slightly deviates from the proportional hazards assumption of the Cox (1972) model (Hess and Persson, 2012).

Specifically, we estimate the hazard rates of exports using

$$y_{odpk} = \delta_0 + \delta_1 IQ_{o(k-1)} + \boldsymbol{\delta_2 prod_p} + \boldsymbol{\tau_{od}\delta_3} + \boldsymbol{X_{odp(k-1)}\delta_4} + \boldsymbol{\lambda_O\delta_5} + \boldsymbol{\lambda_d\delta_6} + \boldsymbol{\lambda_k\delta_7} + \varepsilon_{odpk}, \tag{4}$$

where the dependent variable y_{odpk} equals one if the spell (of a specific product p between origin o and destination d) fails in k given that trade continuously occurred in previous year(s), and zero if the spell survives.

$IQ_{o(k-1)}$ denotes the IQ of exporters, that is, the SSA countries, which lags by 1 year, to reduce potential endogeneity/reverse causality where bilateral trade flows may influence IQ (Nunn and Trefler, 2014; Álvarez et al., 2018). Álvarez et al. (2018) also note that institutions likely affect trade with a time lag. With the estimate of $IQ_{o(k-1)}$, we test H1a, that is, higher IQ of SSA exporters leads to longer bilateral trade duration. We iterate the regression for the overall exporter IQ and each dimension of IQ (Table 1).

The binary variable $prod_p$ refers to the classification into agricultural commodities (zero; less differentiated) and processed food products (one; more differentiated), which we expect

to influence the costs of establishing trade links and hence trade duration (Besedeš and Prusa, 2006b; Rauch and Watson, 2003). Given that switching between different suppliers, from a buyers' perspective, is easier in the case of homogeneous commodities than with differentiated products, we anticipate longer trade durations for processed food products (Besedeš and Prusa, 2006b). The vector $\boldsymbol{\tau}_{od}$in Equation (4) captures several trade cost variables such as countries' landlock status as well as trading partners' colonial ties, language conformity and bilateral distance. Studies on trade duration show that being landlocked, having no colonial ties or a common official language, and a longer bilateral distance may increase trade costs and lead to a shorter trade duration (Bacchetta et al., 2012; Nitsch, 2009; Besedeš, 2011).

Vector$\boldsymbol{X}_{odp(k-1)}$includes time-variant control variables such as the GDPs of exporters and importers as measures of economic size and the exporters' exchange rate as a proxy for an economy's stability (Bojnec and Fertő, 2012). We consider these variables typically used in gravity models and commonly introduced in duration analyses to control for their effects on the duration of SSA agri-food exports to the EU-28 (e.g., Bacchetta et al., 2012; Besedeš and Prusa, 2006b; Hess and Persson, 2011). Better economic performance (higher GDPs) may implicate longer, more stable trade relations (Besedeš and Prusa, 2006b). A longer trade duration may involve a higher exchange rate of the exporting country as weaker currencies stimulate exports due to relatively cheaper prices for importing countries and, in turn, enhance the probability of trade survival (Krugman et al., 2011). $X_{odp(k-1)}$ also captures variables of exporters' experience, that is, the number of EU destination countries per product and the number of products traded to one destination. Greater diversification and, thus, more experience with the export of specific products and markets may lead to a longer trade duration (Brenton et al., 2010; Hess and Persson, 2011). All the time-variant covariates are included in the model with a one-year lag to reduce potential biases associated with reverse causality.

We introduce exporter-specific fixed effects ($\lambda_{\boldsymbol{O}}$), importer-specific fixed effects ($\lambda_{\boldsymbol{d}}$), and time dummies ($\lambda_{\boldsymbol{k}}$). Incorporating exporter and importer fixed effects captures remaining country-specific differences that are not explicitly identified by the introduced country-specific variables. They are regularly used in the empirical gravity model specification of international trade flows, capturing the outward and inward multilateral resistance terms, that is, the exporters' ease of market access to and importers' ease of market access from all countries in the trade network, respectively (Yotov et al., 2016). The use of yearly time fixed effects controls for common shocks such as global economic booms or slowdowns in a given year (Baldwin and Taglioni, 2006). ε_{odpk} is the error term.

To examine the impact of institutional dissimilarity of trading partners on trade survival, we use Equation (4) and estimate effects of the dissimilarity of IQ (overall and different dimensions) $IQ_{o(k-1)-d(k-1)}$ instead of the IQ of exporters $IQ_{o(k-1)}$, which addresses H2a, that is, greater similarity in the IQ of an SSA country and an EU-28 country, the higher is the probability of achieving longer bilateral trade duration.

We calculate marginal effects of the regression coefficients to assess the sizes of the IQ (overall and different dimensions) effects on the probability of trade failure. Additionally, we standardise the IQ indicators' marginal effects and consider confidence intervals to evaluate the differences in the effect among the three dimensions, thereby addressing H1b and H2b, that is, the various dimensions of IQ and of the similarity in IQ differ with respect to their effects on the trade duration.[11]

[11]Following Menard (2004), we partially standardise the marginal effects with the standard deviations of the explanatory variables.

4 | DATA AND DESCRIPTIVE STATISTICS

For our analysis, we use annual trade data from the UN Commodity Trade Statistics Database (Comtrade) at HS 6-digit level for 1996–2017 (United Nations, 2019). The sample includes agri-food trade flows from each SSA country to each EU-28 country. Appendix S1 show the SSA countries and product groups included in the analysis. We use the import data reported by the EU-28 as import statistics are more reliable than export statistics (Jacob, 2016).

The trade data are limited to a specific period, that is, censored (Verbeek, 2008), either flows/spells ongoing in 1996 or flows/spells ongoing in 2017 (Besedeš and Prusa, 2006b; Verbeek, 2008). The first (left-) censoring is problematic, leading to estimation bias, whereas we can neglect right-censoring in duration analyses (Hess and Persson, 2012). Following Peterson et al. (2017), we use the trade data available before the investigation period (limited by the data availability of the WGIs) starting from 1988 to control for left-censored spells.

We consider the six IQ indicators retrieved from the World Bank's WGI database (Kaufmann and Kraay, 2021). For assessing a country's IQ, (A) the government selection, monitoring and replacement; (B) the governmental efficiency of policy formulation and implementation; and (C) the respect of citizens and state for institutions are relevant characteristics (Kaufmann et al., 2010). Table 1 describes the three dimensions (A–C) and the underlying indicators of the World Bank's WGIs. The WGIs are in standard normal units ranging from approximately −2.5 to 2.5. The higher the value, the better the IQ (Kaufmann et al., 2010). These data are available from 1996 to 2017; however, from 1996 to 2002, they were only published for every second year, leading to three missing (1997, 1999 and 2001) observation years. We follow Lin et al. (2019) and use the values of each previous year for the missing observations. Looking at the WGI scores of all SSA and EU-28 countries in 2017 (Appendix S1) shows that the IQ of the EU-28 ($\mu = 1.02, sd = 0.54$) is higher than the IQ of SSA countries ($\mu = -0.69, sd = 0.72$).[12]

The six IQ indicators are highly correlated (see Appendix S1). To avoid the problem of multicollinearity, we aggregate the six indicators into a single index, which provides the overall impact of IQ. In addition, we examine the three major dimensions (A–C) of the World Bank's WGIs in separate regressions to identify the effects of the different aspects of IQ (following Bojnec and Fertő, 2012; Globerman and Shapiro, 2002; Asongu and Nwachukwu, 2016; Daude and Stein, 2007). For the aggregation, we employ Principle Component Analysis (PCA). We use the first components of the PCAs that suit the Kaiser–Guttman criterion as their eigenvalues are greater than one in each of the PCAs (Ismail, 2008) and capture high shares of the overall variance of their underlying indicators (see results of the PCAs in Appendix S1).[13]

The dissimilarity index is calculated as the absolute difference between the exporter and importer IQ index for the six indicators ($| IQ_o - IQ_d |$), and then we apply PCA to calculate an aggregated dissimilarity index and one for each dimension. Our main analysis consists of estimating eight regressions: the first four consider the impact of the overall exporters' IQ and the three dimensions of IQ on trade duration; the following four use the dissimilarity indices instead of the exporters' IQ indices.

Appendix S1, presents an overview of our main variables, the control variables, their definitions and sources. Table 2 provides descriptive statistics. The statistics of the three

[12]Finland is the country with the best IQ (WGIs range from 1.08 to 2.22) among all EU and SSA countries, whereas Somalia scores lowest (−2.31 to −1.72).

[13]For the aggregation to the three dimensions, one can alternatively calculate the mean or sum of the underlying WGIs; see Groot et al., 2004; 2005; Linders et al. (2005). We apply the sum approach as a robustness check.

TABLE 2 Descriptive statistics of the variables

Variable	Mean	Std. dev.	Min.	Max.	N
Trade relation failure (0 = survival, 1 = failure)	0.25	0.43	0	1	274,329
IQ dimension (A)	0.98	1.99	−6.05	5.37	273,094
IQ dimension (B)	−0.18	0.48	−2.37	1.98	273,094
IQ dimension (C)	−0.07	0.28	−1.45	1.06	273,094
Dissimilarity of IQ, dimension (A)	0.01	1.19	−2.13	5.11	270,997
Dissimilarity of IQ, dimension (B)	−0.02	1.27	−2.56	5.71	270,997
Dissimilarity of IQ, dimension (C)	−0.03	1.39	−3.28	4.16	270,997
Landlocked (0 = no country is landlocked,1 = at least one trade partner is landlocked)	0.19	0.39	0	1	274,329
Colonial ties (0 = no colonial ties,1 = colonial ties)	0.16	0.36	0	1	274,329
Common language (0 = no common language,1 = common language)	0.21	0.41	0	1	274,329
Distance (km)	6631	1969	2183	10,487	274,329
Exchange rate (ln of LCU/USD)	4.38	2.58	−4.60	22.63	261,746
Exporter's product diversification (number of products exported to the destination)	61.52	78.90	0	488	274,329
Exporter's market diversification (number of destinations the product is exported to)	5.50	5.72	0	28	274,329
GDP exporter (billion USD constant 2010)	102.40	149.75	0.12	464.00	264,697
GDP importer (billion USD constant 2010)	16,906	73,579	11.07	44,200	272,413
Product classification (0 = agricultural commodity,1 = food product)	0.26	0.44	0	1	274,329

Source: Own calculations based on data extracted from various databases (CEPII, 2021; United Nations, 2019; Kaufmann and Kraay, 2021; World Bank, 2021c, World Bank, 2021d).

IQ dimensions suggest heterogeneity of their underlying data, for example, the IQ (A) in terms of the government selection and monitoring in the SSA countries ($\mu = 0.98, sd = 1.99$) range from −6.05 to 5.37 across countries and time. The means of the binary variables show that for more than three-fourths of the reported trade links, countries are not landlocked, do not have any colonial ties, and do not share a common language. Additionally, there is a large gap between the GDPs of SSA ($\mu = 102, sd = 149$) and EU ($\mu = 16{,}906, sd = 73{,}579$) countries.

5 | RESULTS

Our data reveal substantial entries and exits in agri-food trade flows between SSA and EU-28 countries, with mean and median lengths of spell of 2.53 years and 1 year, respectively. The KM survivor function of these trade flows (Figure 1) shows the unconditional survival probability of trade links for every year of trade duration. The probability of trade failure increases

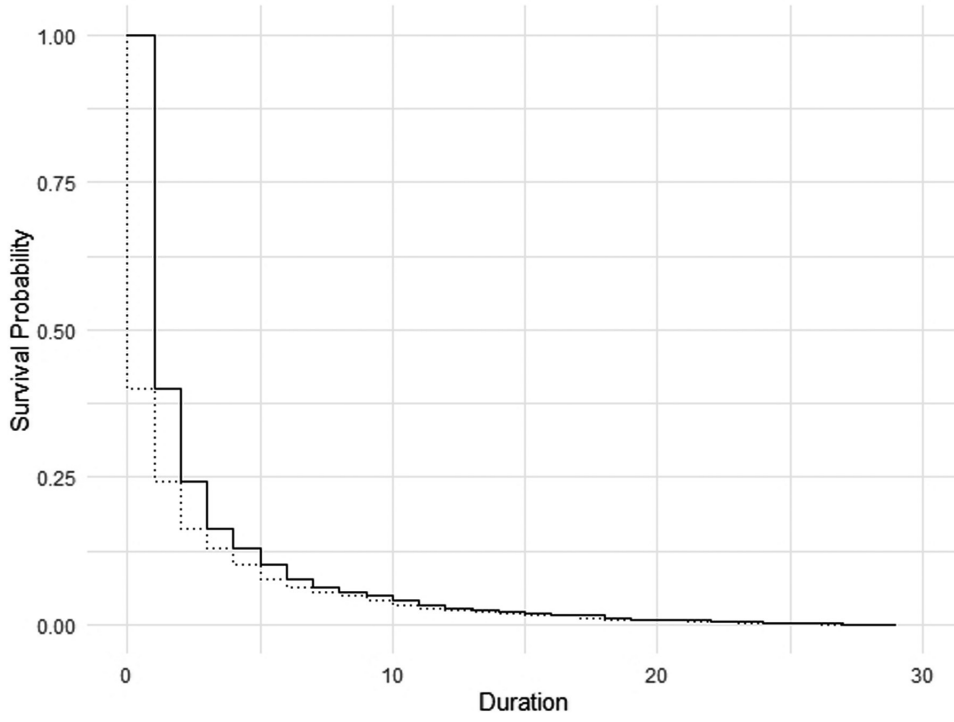

FIGURE 1 Kaplan–Meier survival function
Note: The Kaplan–Meier survival function shows the decreasing survival probability for each length of spell (i.e., the duration) of SSA's agri-food exports (see Appendix S1 for SSA countries and Appendix S1 for product groups) to the individual EU-28 countries from 1988 to 2017.
Source: Own calculation and illustration based on UN Comtrade data (United Nations, 2019).

with each additional year of spell length. After 1 year of trade, trade links fail with a probability of 60%. Until the end of the first 3 years, there is an 84% probability of failure. Only a small fraction of spells achieves durations longer than 10 years. We find higher failure rates and a lower mean of duration than other studies that show failure rates between 33% and 61% in the first year of trade and means of duration between 2.7 and 5.9 years (Besedeš and Prusa, 2006b; Nitsch, 2009; Rudi et al., 2012). This instability of trade relations is consistent with Rudi et al. (2012), who find particularly low survival rates of export flows from Africa.

Findings reveal that exporters with high IQ achieve longer trade durations than exporters with low IQ and, thus, support hypothesis H1a. In Table 3, we show the impact of the overall indicator of exporters' IQ (column 1) and its different dimensions (columns 2 to 4) on the probability of trade failure. The marginal effect of the overall quality indicator shows a 0.78% reduction in the probability of survival of agri-food exports from SSA to EU-28. When differentiating between IQ dimensions, all dimensions (A–C) negatively impact the trade failure rate, that is, an increase in IQ reduces trade failure. A one-unit increase of the exporter's IQ dimensions decreases the probability of trade failure by 1.11 to 1.79 percentage points.

Our results (Table 4) also suggest that greater dissimilarity of SSA–EU trade partners' IQ is associated with smaller bilateral trade durations, supporting hypothesis H2a. The marginal effect (column 1) indicates that a one-unit increase in the institutional dissimilarity indicators increases the probability of trade failure by 0.29 percentage points. This is consistent with the study of Álvarez et al. (2018), who state that less familiar institutional environments in partner countries lead to a reduction in trade quantities due to higher transaction costs. Similarly, we

TABLE 3 Probit marginal effects—Exporters' institutional quality

	Overall IQ index	(A) Government selection, monitoring and replacement	(B) Efficiency of policy formulation and implementation	(C) Respect of citizens and state for institutions
Inst. quality exporter	−0.01***	−0.01***	−0.01**	−0.02***
	[−0.01, −0.01]	[−0.01, −0.01]	[−0.02, −0.00]	[−0.03, −0.01]
Exchange rate	−0.00	−0.01***	−0.01***	−0.01***
	[−0.01, 0.00]	[−0.01, −0.00]	[−0.01, −0.00]	[−0.01, −0.00]
Product classification	−0.01***	−0.02***	−0.02***	−0.02***
	[−0.01, −0.008]	[−0.02, −0.01]	[−0.02, −0.01]	[−0.02, −0.01]
Exporter's product diversification	−0.00***	−0.00***	−0.00***	−0.00***
	[−0.00, −0.00]	[−0.00, −0.00]	[−0.00, −0.00]	[−0.00, −0.00]
Exporter GDP	−0.01***	0.0003	−0.02*	−0.02**
	[−0.01, −0.01]	[−0.02, 0.02]	[−0.03, −0.00]	[−0.03, −0.01]
Importer GDP	−0.02***	−0.00	−0.00	−0.00
	[−0.02, −0.02]	[−0.00, 0.00]	[−0.00, 0.00]	[−0.00, 0.00]
Exporter's market diversification	−0.02 ***	−0.04***	−0.04***	−0.04***
	[−0.02, −0.02]	[−0.04, −0.04]	[−0.04, −0.04]	[−0.04, −0.04]
Language	−0.02***	−0.02***	−0.02***	−0.02***
	[−0.03, −0.01]	[−0.03, −0.01]	[−0.03, −0.01]	[−0.03, −0.01]
Colonial ties	−0.00	−0.01	−0.01	−0.01
	[−0.01, 0.01]	[−0.01, 0.00]	[−0.01, 0.00]	[−0.01, 0.00]
Landlocked	−0.01	0.05**	0.03	0.02
	[−0.03, 0.02]	[0.02, 0.08]	[−0.01, 0.06	[−0.01, 0.05]
Distance	0.03*	0.01	0.01	0.01
	[0.01, 0.06]	[−0.02, 0.03]	[−0.02, 0.03	[−0.02, 0.03]
LogLik	−114,846	−116,448	−116,462	−116,460
AIC	229,903	233,098	233,126	233,123
N	238,886	238,886	238,886	238,886

Note: All time-variant variables are one-year lagged; Logarithms are taken of the distance, GDPs and the exchange rate; Estimations with importer, exporter and time FE; Lower and upper limits of 95% CI in parentheses; ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

Source: Own calculation based on data sources indicated in Appendix S1.

TABLE 4 Probit marginal effects—Dissimilarity of institutional quality

	Overall IQ index	(A) Government selection, monitoring and replacement	(B) Efficiency of policy formulation and implementation	(C) Respect of citizens and state for institutions
Dissim. of inst. Quality	0.00 **	0.00 *	0.01***	0.01 ***
	[0.00, 0.01]	[0.00, 0.01]	[0.00, 0.01]	[0.01, 0.02]
Exchange rate	−0.00	−0.01 ***	−0.01 ***	−0.01 ***
	[−0.01, 0.00]	[−0.01, −0.00]	[−0.01, −0.00]	[−0.01, −0.00]
Product classification	−0.01 ***	−0.02 ***	−0.02 ***	−0.02 ***
	[−0.01, −0.01]	[−0.02, −0.01]	[−0.02, −0.01]	[−0.02, −0.01]
Exporter's product diversification	−0.00 ***	−0.00 ***	−0.00***	−0.00***
	[−0.00, −0.00]	[−0.00–0.00]	[−0.00, −0.00]	[−0.00, −0.00]
Exporter GDP	−0.01 ***	−0.02 *	−0.01	−0.01
	[−0.01, −0.00]	[−0.03, −0.00]	[−0.03, 0.00]	[−0.02, 0.01]
Importer GDP	−0.02 ***	−0.00	−0.00	−0.00
	[−0.02, −0.02]	[−0.00, 0.00]	[−0.00, 0.00]	[−0.01, 0.00]
Exporter's market diversification	−0.02 ***	−0.04 ***	−0.04 ***	−0.04 ***
	[−0.02, −0.02]	[−0.04, −0.04]	[−0.04, −0.04]	[−0.04, −0.04]
Language	−0.02***	−0.02***	−0.02***	−0.02***
	[−0.03, −0.01]	[−0.03, −0.01]	[−0.03, −0.01]	[−0.03, −0.01]
Colonial ties	−0.00	−0.01	−0.01	−0.01
	[−0.01, 0.01]	[−0.01, 0.00]	[−0.01, 0.00]	[−0.02, 0.00]
Landlocked	−0.01	0.03	0.03	0.05**
	[−0.03, 0.02]	[−0.01, 0.06]	[0.00, 0.06]	[0.01, 0.08]
Distance	0.03 *	0.00	0.00	0.01
	[0.01, 0.06]	[−0.02, 0.03]	[−0.02, 0.03]	[−0.02, 0.03]
LogLik	−113,873	−115,388	−115,385	−115,376
AIC	227,957	230,976	230,969	230,953
N	237,014	237,014	237,014	237,014

Note: All time-variant variables are one-year lagged; Logarithms are taken of the distance, GDPs and the exchange rate; Estimations with importer, exporter and time FE; Lower and upper limits of 95% CI in parentheses; ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

Source: Own calculation based on data sources indicated in Appendix S1.

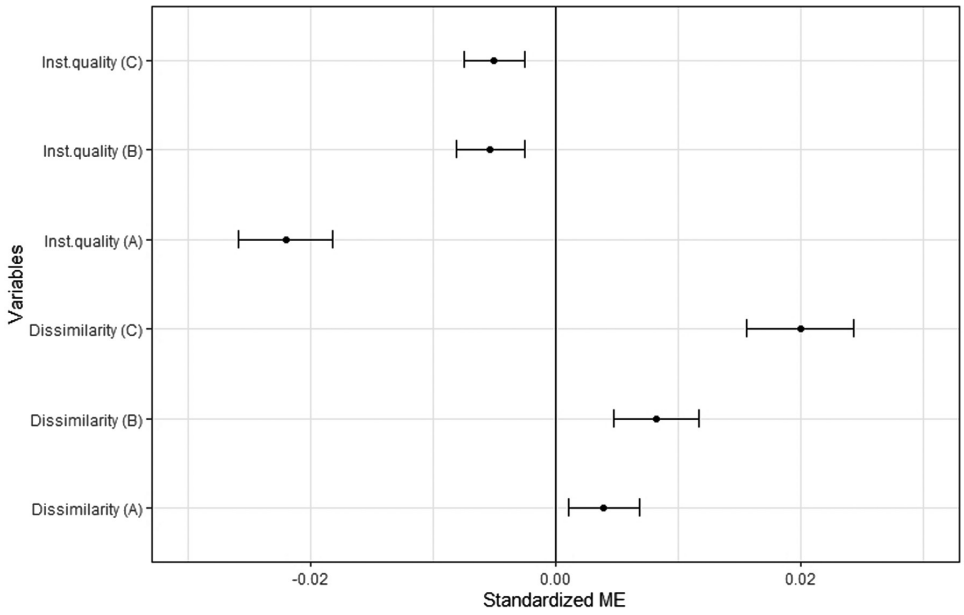

FIGURE 2 Standardised marginal effects of the different dimensions of IQ
Note: A, B, and C represent the three WGI dimensions: (A) Government selection, monitoring and replacement; (B) Efficiency of policy formulation and implementation; and (C) Respect of citizens and state for institutions; Inst. quality = IQ of exporters; Dissimilarity = institutional dissimilarity of importer and exporter; We show the standardised marginal effects with their 90% confidence intervals.
Source: Own calculations and illustration based on United Nations (2019) and Kaufmann and Kraay (2021) WGI database.

find the positive impact of institutional dissimilarity across different dimensions on the trade duration. The results indicate that a 1% increase in IQ dissimilarity of one of the three dimensions increases the probability of export failure by 0.3% to 1.4%. Businesses might resist risking a bad reputation because of on-going trade relations with a corrupt country and prefer to trade with partners having similar ethical standards in this respect.

Figure 2 shows the relative importance of the impact of each IQ dimension by standardising the marginal effects (of one SD difference). Our results partly support H1b, that is, the dimensions of IQ have different effects on the trade duration. The standardised marginal effect of dimension (A) reflecting government selection, monitoring and replacement (voice and accountability and political stability and absence of violence/terrorism) differ significantly from dimensions (B) and (C) at 90% confidence level. However, the exporters' quality in dimensions (B) and (C) show insignificantly different effects on trade duration.

The standardized marginal effects (Figure 2) of the dissimilarity of the different IQ dimensions between SSA and EU also only partly support H2b. We find that the effect of dimension (C)—the respect of citizens and state for institutions—on trade duration is statistically different from and larger than those of dimensions (A) and (B), which themselves are statistically indistinguishable. This result suggests that mutual agreements regarding the rule of law and corruption control is more important for the stability of trade links than other aspects of IQ. This is reasonable, since (C) directly represents the behaviour and legal working environment of operators involved in international trade as well as the degree of common understanding of acceptable legal practices. This might be crucial for trading partners' compliance with standards and quality requirements that play an increasingly important role in agri-food trade (European Commission, 2021; Bojnec et al., 2014). A better institutional environment in this respect might therefore increase the duration of bilateral trade relationships.

Findings underline the relevance of IQ when establishing trade relations in terms of the consideration of institutional adjustments and/or choosing the right trade partner to enhance the duration of trade relations.[14] Countries can foster durations of their existing or potential trade relationships by improving their institutions and/or by trading with partners with similar IQ. From exporters' point of view, higher trade duration can result from institutional adjustments, mainly concerning governmental selection, monitoring and replacement. From both trade partners' viewpoints, the right trade partner is the one with the most similar IQ levels, mainly, along the respect of citizens and state for institutions.

Our estimation results also show the impact of further control variables on the trade duration in the context of SSA's agri-food exports. The marginal effect of the level of product differentiation reveals a positive impact on trade duration (see Table 4). This is consistent with Besedeš and Prusa (2006b) and Rauch and Watson (2003), though our estimated coefficients are lower compared to these studies, perhaps reflecting that agricultural and food products are relatively more homogeneous than the manufacturing products considered in those studies (see e.g., Brenton et al., 2010). The same official language in the two trading countries leads to longer spells, as expected. In contrast to Hess and Persson (2011), who show that being an old colony has a positive effect on the trade duration, we find no significant effects of colonial ties. Perhaps colonial ties not only contribute to countries' greater attachment but also to tensions and conflicts leading to more vulnerable trade relations (Bulhan, 2015). Moreover, as our investigated period is later than that of Hess and Persson (2011), old colonial ties might have lost importance over time. The exporter's exchange rate shows negative effects on the hazard rate of spells. An increase in nominal exchange rate (i.e., exporter's domestic currency depreciates) is associated with a lower probability of trade failure. This is also in line with Hess and Persson (2011), who conclude that a higher relative real exchange rate of non-EU exporters increases the trade duration for EU imports. The negative signs of coefficients for product and export diversification show that greater product and export market diversity reduces the trade failure rate (Tables 3 and 4), which imply that an increased trade experience, that is, the learning-by-doing effect, enhances trade duration (Hess and Persson, 2011; Besedeš, 2011; Nitsch, 2009).

As a robustness check, we re-estimate the models using the logit model. Results across all IQ dimensions only slightly differ in magnitude (Appendix S1), hence are robust against the estimation technique. We also perform a robustness check for the method of aggregating institutional indices. We sum the underlying WGIs under the three IQ dimensions (A–C) and estimate the results using a probit model (Appendix S1). In contrast to the main results, the dissimilarity in terms of (A) governmental selection, monitoring and replacement does not show an impact on the probability of trade failure. The remaining results are similar to the estimation results based on the PCA approach. Finally, instead of considering all spells, we only use the first spells to perform probit estimations of the regression with the overall exporters' IQ and institutional similarity indicators. Estimation results (Appendix S1) are largely unaffected by the consideration of the different spell types, as also pointed out by others (e.g., Bojnec and Fertő, 2018; Hess and Persson, 2011).

6 | CONCLUSIONS

The stability of agri-food trade relationships is important for importers' product accessibility and variety as well as exporters' income generation and economic development. Institutional quality (IQ) is potentially important to these relationships, and associated

[14]We also use the likelihood ratio test to compare our models with the (nested) model in which the IQ variables are omitted (see Verbeek, 2008), and find that the inclusion of the IQ variables significantly improves the goodness of fit and therefore contributes to explaining the duration of trade.

trade flows. We explore the duration of agri-food exports at the 6-digit level from SSA to the EU countries over the period 1996–2017, and investigate the impact of IQ factors on export flows and their duration, using the World Bank World Governance Indicators (WGI) as indicators of IQ. We use survival analysis to investigate the probability of the failure of trade links, and apply a discrete-time analysis to investigate how the IQ of exporters and the similarity with the IQs from partner countries along different dimensions affect export duration.

Our results show that, on average, export flows have a duration of 2.5 years. The probability of the failure of trade links is very high in the early years of exporting, with the probability of failure of 60% in the first year and 84% by the end of the third year. We find that higher IQ of the SSA exporters contributes to a lower failure rate in their bilateral trade links. SSA's similarity to the IQ of the EU destination country also favours longer trade duration. We distinguish between the impact of three major dimensions of IQ ('government selection, monitoring and replacement'; 'efficiency of policy formulation and implementation'; and 'respect of citizens and state for institutions') by comparing their standardised marginal effects. We show that the quality of governmental selection, monitoring and replacement (i.e., voice and accountability, political stability, and absence of violence/terrorism) in SSA countries, that is, the most related IQ dimension to enhance firms' investment and productivity and the stability of their business environment, has the largest effect on their export duration. In terms of dissimilarity, the institutional dimension evaluating the respect of citizens and state for institutions (i.e., rule of law and control of corruption) is the most important. This suggests that improving trade partners' compliance with common rules and standards are important for agri-food trade.

The positive impact of IQ and its dimensions reveals that institutional adjustments in exporting countries can enhance the stability of (potential) trade relations. The differences of the impact across different attributes of institutional adjustments suggest targeting specific attributes may be important to increase the stability of trade relationships and associated flows. Considering that levels of IQ in most SSA countries are low compared to the global average, there is substantial scope for IQ improvements. The positive impact of the similarity of the institutional environment of trading partners motivates exporters and importers to select the appropriate partner as a strategy to accomplish long-term trade partnerships, especially regarding partner countries' rule of law and corruption control. Given the significantly lower IQs of many SSA countries compared to the individual EU-28 countries, institutional adjustments can further enhance trade by increasing the common understanding of trade partners' mutual business environment.

Different dimensions of IQ might substitute or complement each other in determining the overall impact of IQ on the stability of trade relations. Considering the interaction between the different IQ dimensions (e.g., complementarity effects), and then drawing from the impact of those interactions on trade duration offers potential scope for further research. Further, the interaction of IQs with some other trade-related factors may provide insights about where the IQ measures play greater roles with regard to trade risks and uncertainty.

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