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The effect of export credit agencies on the trade around the global financial crisis: evidence from G20 countries --Manuscript Draft--

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JEL Classification: F13, F34, G01, O24.

1. Introduction

The 2008 global financial crisis, widely regarded as the most severe economic downturn since the Great Depression of 1929, had profound implications for the world economy (Tooze, 2018). The crisis precipitated sharp contractions in real economic activities, e.g., declines across real GDP, industrial production, export growth, and international trade (Hall, 2010; ITC, 2019; OECD, 2020). According to the Keynesian economic theory, such significant economic disruptions require government intervention to stabilize the economy. Thus, governments and central banks worldwide implemented substantial fiscal stimulus packages in response to this unprecedented macroeconomic event (Pentecote & Rondeau, 2015). These measures aimed to support key financial institutions, enhance societal wealth, and mitigate the crisis's negative impacts (Bussiere et al., 2013). Countries more deeply integrated into global financial markets experienced more significant output losses, highlighting the crisis's impact (Laeven et al., 2010; Blanchard et al., 2010; Cetorelli & Goldberg, 2011).

Stimulus packages encompassed a range of economic measures, including tax cuts, infrastructure spending, and employment measures (Khatiwada, 2009). These measures were primarily deployed by G20 countries, which accounted for nearly 90% of global stimulus efforts during the crisis (Ahrens, 2009; Zhang et al., 2009). The fundamental premise underlying stimulus packages is economic recovery through demand stimulation via spending to increase employment rates and sustain business operations (Makin, 1989). A vital component of these responses was the support from export credit agencies (ECAs) to finance trade activities. G20 countries pledged \$250 billion via ECAs and multilateral development banks after the global financial crisis, which denotes the importance of trade finance in economic recovery (Hickie, 2009).

The crisis led to a sharper decline in exports compared to total output, with trade volumes decreasing by 20% in the 12 months from April 2008, while industrial production fell by 12% (Eichengreen & O'Rourke, 2010). This collapse of international trade was exceptional in historical terms, surpassing the decline observed in previous postwar recessions, except for 2001 (Levchenko et al., 2010). Despite the significant resources devoted to ECAs during the crisis, there is limited comprehensive research on their effectiveness in supporting exports across major economies during this period. This study aims to address this gap by

examining the impact of ECAs on countries' (G20) exports before, during, and after the 2008 global financial crisis.

We analyze trade flows using a dataset that spans 17 countries over 61 quarters, from the second quarter of 2005 to the second quarter of 2020, by employing the augmented gravity model of international trade integrating the ARDL model. The ascertained findings show that medium-term and short-term Export Credit Agencies (ECAs) significantly impact long-term trade dynamics, displaying both positive and negative effects, respectively, although these effects are not evident in the short term. During the global financial crisis, total insured ECAs showed a negative long-term impact but a positive short-term effect, a finding consistent with previous research. About 0.25% of deviations from long-term equilibrium are corrected each quarter, illustrating the gradual adjustment process in trade balances.

This research holds significant importance for several reasons. Given the crucial role of international trade in the global economy, understanding the effectiveness of policy tools such as ECAs in supporting exports during major economic downturns is vital for future policy decisions. The study provides valuable insights for policymakers preparing for future crises by examining ECA's performance during the financial crisis. Moreover, as countries continue to use ECAs as a tool for export promotion, empirical evidence of their effectiveness may inform the design and implementation of these agencies to contribute to more robust trade policies.

Our paper contributes to the existing literature by comprehensively analyzing ECA impacts across G20 countries—precisely, the findings theoretically contribute to the literature on international trade and economic recovery by explaining how different nations' export capabilities and financial systems adjust in the face of global economic fluctuations. Examining the impacts of crisis and stable periods allows for a dynamic understanding of ECA effectiveness under different economic conditions. Since ECA impacted trade during the financial crisis, the 2008 consideration shows the importance of ECA in understanding its role in crisis mitigation. Another contribution of this study is to offer a unique feature of the traditional Gravity Model's distance variable—i.e., the average trade route distance between the most populated city in the home country and the most populated city in partner countries is measured in hours.

The remainder of this study is organized as follows: Section 2 reviews the literature on export stimulus packages, export credit agencies, and international trade. Section 3 outlines the methodology employed. Section 5 reports and interprets the empirical results. Finally, Section 5 concludes with further directions.

2. Literature Review

2.1 Stimulus Packages and Global Trade

Following the 2008 global financial crisis, various countries implemented stimulus packages to mitigate the economic downturn. The rapid escalation of the crisis verified the strong ties of globalization. The scale of this crisis is beyond estimations, and Eichengreen and O'Rourke (2010) compared it to the Great Depression regarding the volume of world trade. Many countries, particularly G20 nations representing over 75% of world GDP and 62% of world trade, announced stimulus measures between November 2008 and January 2009 (ILO, 2011; Prasad & Sorkin, 2009). The estimated global stimulus spending ranged from 1.7% to 2% of the world GDP (Khatiwada, 2009), where the US, China, and Japan accounted for 62% of the total 2009 packages (World Bank, 2020; ILO, 2011).

These packages varied in content and size across countries, focusing mainly on tax cuts, infrastructure spending, or measures to boost aggregate demand. Notably, the G20 pledged \$250 billion to support trade finance through ECAs and multilateral development banks (G20 London Summit, 2009). The crisis affected international trade through supply and demand channels, with GDP growth in destination countries being a crucial determinant of export and import demands (Behrens et al., 2011). While the crisis impacted advanced economies more severely, developing countries showed some decoupling from the global economic cycle (Imbs, 2010).

2.2 Stimulus Packages and Global Trade

Participation in export markets improves the financial health of firms (Greenaway et al., 2007). However, exporters are more reliant on short-term financial liabilities due to higher variable costs, risks, working capital requirements, and sunk costs compared to non-exporters (Mansilla-Fernández & Milgram-Baleix, 2022; Maes et al., 2019; Melitz, 2003). Consequently, any liquidity constraints fundamentally alter exporters' behaviors and may limit or hinder some firms' ability to export (Manova et al., 2015; Chaney, 2016). This effect was also evident during the Global Financial Crisis. For instance, Maes et al. (2019) suggested that "The strong reliance of exporting firms on short-term (asset-backed) funds to refinance their export activities may serve as an explanation for a trade collapse during credit crunches or in periods of low profitability." Moreover, Chor and Manova (2012) demonstrated that countries with higher credit costs and tighter credit conditions exported less to the US during the financial crisis.

During the crisis, surveys by the IMF and other sources indicated that bank-intermediated trade finance declined in value, though not as sharply as merchandise trade (Asmundson et al., 2011). Despite the recognized importance of exports and the vulnerability of exporters, interest in international trade finance was very limited until the 2008-2009 crisis (Auboin & Engemann, 2012). Trade finance is often characterized as both a facilitator of trade and a shock absorber (WTO, 2016; Irwin & O'Rourke, 2013). Inekwe et al. (2018) found that financial distress in U.S. businesses resulted in a 14% decline in exports, an 11% reduction in investment, and a 9% decrease in GDP growth.

In financial difficulty for exporters, financial support for these companies, which act as catalysts of national economies, becomes crucial. Indeed, institutions that promote exports tend to adjust their support based on local and global economic conditions, offering more aid during recessions and less during strong economic growth (Pýcha, 2022). According to the Organization for Economic Cooperation and Development, government institutions or private companies acting on behalf of governments provide officially supported export credits to national exporters. This support includes direct credits to foreign buyers, refinancing, interest-rate support, and insurance or guarantee coverage for credits from private financial institutions, facilitating competition in overseas markets (OECD, 2024).

2.3 Export Credit Agencies: Empirical Studies and Regulatory Insights

No uniform structure characterizes Export Credit Agencies (ECAs) worldwide since their operational scopes and services vary considerably. Some ECAs restrict their services to providing insurance or guarantees, while others extend their offerings to include loans. In some cases, they provide both services. Depending on their primary functions, these agencies are often categorized as insurers or Eximbanks. Regarding insurance coverage, some agencies specialize exclusively in export credit insurance or investment insurance, whereas the more substantial agencies typically provide both. Furthermore, while some ECAs focus primarily on insuring against political risks, others are geared towards covering commercial risks, although it is common for larger agencies to manage both risk categories (Stephens, 1999).

Since 1978, the OECD's Arrangement on Guidelines for Officially Supported Export Credits has regulated ECAs to promote fair competition in the export credit sector, although it is not legally binding. The Competitiveness Report (Export-Import Bank of the United States, 2019) revealed that only 34% of all export credits adhere to this OECD Consensus globally. Competing ECAs from various countries strive to offer their exporters the most favorable conditions possible, suggesting that competition among ECAs could be a reason for the weak adherence to the Consensus. However, Agarwal and Wang (2018) found no evidence that financing provided by ECAs of competing countries increased competition in the global market for U.S. exporters. They also claimed that their findings were not influenced by whether the competing countries were members of the OECD Consensus or received EXIM support. Moreover, Dawar (2020) argued that the current economic slowdown in export growth and the uncontrollable rise in export

credit support programs, especially among developed country ECAs, urgently require increased cooperation.

In the case of developing countries, there is an issue of ECA efficiency, while developed countries face competition problems among ECAs. For instance, Aydemir and Gerni (2011) ascertained that the Turkish Eximbank failed to meet customer expectations regarding service quality, and this shortfall in satisfaction was consistent across various dimensions, including industry sector, number of employees, and geographical location. This finding emphasizes the essential role of export credit agencies (ECAs) in developing countries in enhancing export value (Köksal, 2018).

Numerous studies support the positive impact of ECAs on countries' and firms' exports. Badinger and Url (2013) investigated Austrian exporting firms and found that export credit guarantees significantly influenced trade among these entities. Similarly, Choi and Kim (2021) observed in South Korea that short-term export credit insurance mitigated financial constraints for firms, consequently enhancing exports; this effect was notably more pronounced in exports originating from developing countries or smaller firms. Utilizing the 2008 Financial Crisis as a dummy variable, Köksal and Genç (2019) reported that in 22 high-income countries, export credit insurance notably increased exports, with a significant impact observed for medium to long-term insurance policies. Earlier, Moser et al. (2008) conducted a pre-Global Financial Crisis study (1991-2003) in Germany and documented that public export guarantees had a statistically significant positive impact on exports. During the Global Financial Crisis, Felbermayr and Yalcin (2013) found that such a crisis mitigated the decline in German exports.

Research employing large sample sizes has significantly enriched the academic literature. Auboin and Engemann (2014) utilized data from 91 countries over the period 2005-2011 and found that insured commercial credits from ECAs had a strong positive impact on trade in both crisis and non-crisis periods. The influence of ECAs extends beyond mere export facilitation to broader macroeconomic implications. Soh Young (2014) reported that while ECAs positively impact exports in the long term, their presence in a country does not correlate with higher economic growth or improved employment rates. In contrast, Egger and Url (2006) found that export credit guarantees provided by Austria's ECA had a significant, albeit modest, short-term effect on exports. Additionally, these guarantees supported broader economic activity and generated a multiplier effect.

In a noteworthy study from a developing country context, Polat and Yeşilyaprak (2017) analyzed Türkiye's exports to 212 destinations, revealing that a 1% increase in export credit insurance led to a rise in Türkiye's exports by between 3% and 17%. These findings emphasize the pivotal role of Export Credit Agencies (ECAs) in bolstering national export volumes. Moreover, they highlight how ECAs can significantly enhance the competitive position of countries on the global stage by demonstrating their importance in international trade dynamics.

Although previous research has explored various aspects of ECA activities and their impact on international trade, there has been no comprehensive analysis focused on G20 countries across the critical periods before, during, and after the Global Financial Crisis (GFC). This study seeks to fill that gap by providing, to the best of the authors' knowledge, the first examination of ECAs' influence on exports by offering new insights into their role in global trade during these distinct periods of economic turbulence.

3. Research Methodology

3.1 Data Nature and Source

We briefly describe the dataset before moving on to the econometric analysis—to reveal the direct insurance or lending impact of Export Credit Agencies on the export of G20 countries during the global financial crisis. The sample dataset contains 17 countries (excluding Saudi Arabia and Indonesia due to missing variables) from 2005:Q2 to 2020:Q2. All variables, except GFC, are transformed into natural logarithmic form to provide reliable and consistent estimates (Tab 1:).

213
214

Table 1: Description of variables and sources

Variable	Description	Source
LNEXPM	Export of country in the related quarter of year t	Trade Map
LNDIST	The average trade route distance between the most crowded city of the country and the most crowded city of Partner countries in hours	SeaRates
LNGDPU	The Gross Domestic Product per Capita of the country in the related quarter of year t (Constant 2010 US\$)	World Bank
LNGDPP	The average Gross Domestic Product per Capita of partner countries in the related quarter of year t (Constant 2010 US\$)	World Bank
LNREEXC	Reel Effective Exchange Rate, based on the Consumer Price Index in the related quarter of year t	IMF
LNSTECA	Short-term Insured Export Credit Exposures (direct insurance or lending) of Export Credit Agency of the country in the related quarter of year t	World Bank – Berne Union
LNMLTECA	Medium-term Insured Export Credit Exposures (direct insurance or lending) of Export Credit Agency of the country in the related quarter of year t	World Bank – Berne Union
TOTECA	Total Insured Export Credit Exposures (direct insurance or lending) of Export Credit Agency of the country in the related quarter of year t	World Bank – Berne Union
GFC	Dummy Variable of Global Financial Crisis, it takes 1 for the period between 2007: Q3 – 2009: Q1*, otherwise zero.	NA

215 *Note: *Reserve Bank of Australia notes that the GFC was a period of extreme stress in global financial markets and banking systems*
216 *between mid-2007 and early 2009. LNEXPM, LNGDPU, LNGDPP, LNSTECA, LNMLTECA, TOTECA (in million USD). Source: Authors*

217 **3.2 Econometric Model**

218 Currently, one of the cornerstones of empirical trade theory is the gravity equation. The theory connects
219 the volume of trade between nations to those nations' sizes, distances, and relative trade barriers,
220 formulated by Jan Tinbergen in 1962. The theoretical foundation of the model was extended by Anderson
221 (1979) and further elaborated upon through subsequent studies by Bergstrand (1985, 1989) and Deardorff
222 (1998). The basic gravity model of Tinberegen (1962) is defined as:

223
$$\ln(Exp_{ij}) = \beta_0 + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(Dist_{ij}) + \epsilon_{ij} \quad (1)$$

224 where, GDP and distance between countries determine the export of i to j, and ϵ_{ij} refers to the stochastic
225 error term in the model. We measure the distance as a trade route between the most crowded cities of
226 countries, such as New York instead of Washington for the USA or Istanbul instead of Ankara for Turkiye.
227 Generally, the traditional gravity model considers the distance the airline measures; however, nearly 80%
228 of international trade in goods is carried by maritime (UNCTAD, 2022). For this reason, as in the paper of
229 Simdi and Unal (2022), the study uses the distance of SEARATES because it presents the total trade route
230 time between two cities in hours. The GDP and distance variables of our gravity model are calculated by
231 considering the export shares of partner countries. For example, the total export of Germany in 2020Q4 is

232 \$387 billion, and the export share of the top 20 trade partners equals 79%, equaling 100% for each to
 233 calculate the “GDP” variable. For the “Distance” variable, the same method has been applied (Tab 2:).

234

235 **Table 2:** Calculation of partner countries weight in export for germany (2020Q4)

Country	Export Share (%)	Weight in Calculation	Country	Export Share (%)	Weight in Calculation
USA	8.8	11.1	Czechia	3.3	4.1
China	8.4	10.5	Spain	3.2	4
France	7.4	9.4	Hungary	2	2.6
Netherlands	6.3	7.9	Sweden	2	2.5
Poland	5.5	7	Turkiye	1.9	2.4
UK	5.5	6.9	Russia	1.8	2.3
Italy	5.1	6.4	Denmark	1.5	1.9
Austria	4.7	6	Japan	1.4	1.8
Switzerland	4.4	5.5	Korea, Rep.	1.4	1.7
Belgium	3.6	4.6	Romania	1.3	1.7

236 *Source: Authors*

237

238 Therefore, the partner country GDP variable for Germany 2020:Q4 is as follows:

239 = 11.1%*GDP of USA in 2020Q4 + 10.5%*GDP of China in 2020Q4 + 9.4%*GDP of France in 2020Q4 +
 240

241 The study considered the same calculation method for distance variable as used for Germany 2020:Q4:

242 = 11.1%*Trade distance between Berlin and New York + 10.5%* Trade distance between Berlin and
 243 Shanghai + 9.4%* Trade distance between Berlin and Paris +

244 Complying with the objective of this study, the basic gravity model is augmented with more variables to
 245 increase the explanation power of regression and expressed as follows:

246

247
$$LnExp_m = \beta_0 + \beta_1 GFC + \beta_2 GFCTOTECA + \beta_3 LnGDPP + \beta_4 LnGDPU + \beta_5 LnMLTECA$$

248
$$+ \beta_6 ELnREEXC + \beta_7 LnSTECA + \beta_8 LnDIS + \epsilon$$

249 (2)

250 Since the sample variables are stationary at I(0) and I(1), we intend to incorporate the Autoregressive
 251 Distributed Lag (ARDL) method into the augmented gravity model. This approach was initially proposed by
 252 Charemza et al. (1997); Pesaran et al. (1999, 2001) further developed and advocated due to its multifaceted
 253 advantages—i.e., suitable for small sample sizes, flexible to accommodate variables integrated of order
 254 zero [I(0)] and one [I(1)], and capable of specifying different lag lengths for different variables (Ali et a.,
 255 2017; Rahman & Kashem, 2017).

256 Based on the ARDL framework, this study constructs an unconstrained error correction model that
 257 articulates both long-term and short-term dynamics among the sample variables. The ARDL equation is
 258 formulated as follows:

259

$$\begin{aligned}
\Delta \text{LnExp}m_t = & \beta_0 + \beta_1 \text{Exp}m_{t-1} + \beta_2 \text{GFC}_{t-1} + \beta_3 \text{GFCTOTECA}_{t-1} + \beta_4 \text{LnGDPP}_{t-1} + \beta_5 \text{LnGDPU}_{t-1} \\
& + \beta_6 \text{LnMLTECA}_{t-1} + \beta_7 \text{LnREEXC}_{t-1} + \beta_8 \text{LnSTECA}_{t-1} + \beta_9 \text{LnDIS}_{t-1} \\
& + \sum_{i=0}^p \beta_{1i} \Delta \text{LnExp}m_{t-1} + \sum_{i=0}^p \beta_{2i} \Delta \text{LnGFC}_{t-1} + \sum_{i=0}^p \beta_{3i} \Delta \text{LnGFCTOTECA}_{t-1} \\
& + \sum_{i=0}^p \beta_{4i} \Delta \text{LnGDPP}_{t-1} + \sum_{i=0}^p \beta_{5i} \Delta \text{LnGDPU}_{t-1} + \sum_{i=0}^p \beta_{6i} \Delta \text{LnMLTECA}_{t-1} \\
& + \sum_{i=0}^p \beta_{7i} \Delta \text{LnREEXC}_{t-1} + \sum_{i=0}^p \beta_{8i} \Delta \text{LnSTECA}_{t-1} + \sum_{i=0}^p \beta_{9i} \Delta \text{LnDIS}_{t-1} + \mu_{1t}
\end{aligned} \tag{3}$$

where, μ_{1t} represents white noise, Δ signifies the first-order difference, p denotes the order of lag; β_i ($i = 4, 4, 4, 4, 4, 4, 4, 4, 4$) is the long-term coefficient between variables, and β_{ji} ($j = 4, 4, 4, 4, 4, 4, 4, 4, 4$) is the short-term coefficient between variables.

3.3 Variables and Model Justification

In this study, the standard gravity model structure is not considered due to specific concerns around the endogeneity of insured trade credits as an explanatory variable (Auboin & Engemann, 2014). This potential source of endogeneity is because trade credits and trade flows may be determined simultaneously – higher trade volumes could increase demand for trade finance, and higher availability of trade finance could increase trade flows.

Our analysis differs from the standard gravity model approach because of the nature of the sample data—while traditional gravity models usually focus on bilateral trade flows, we considered aggregated short-term insured trade credit data by destination country. In order to account for these data restrictions as well as to better tackle the endogeneity issues stemming from trade finance, this study relies on a modified version of the classical import estimation equation, using trade credit insurance as an additional explanatory variable following Brandi and Schmitz (2015).

In addition, as this study only uses total ECA from the exporting country, rather than data specific to each bilateral trade flow, the econometric model considers the total exports from the home country as the dependent variable (Auboin & Engemann, 2014). This enables the research to account for the aggregate effects of ECAs providing export finance through a support of export performance without breaching data availability restrictions or presenting additional endogeneity concern related to bilateral trade inconsistencies.

4. Results and Discussion

4.1 Results

Descriptive Statistics

The descriptive statistics summary of the variables is presented in Tab. 3, which depicts the data nature of 17 countries for 61 quarters between 2005:Q2 and 2020:Q2 and contains 1,037 observations.

Tab. 3 shows differences across variables regarding dispersion and distribution shape, which are critical for subsequent econometric modeling. The mean and median values indicate that while export performance exhibits a relatively symmetric distribution, GFC and GFCTOTECA display pronounced right-skewness. Particularly, GFCTOTECA evinces not only extreme positive kurtosis and significant skewness but also a substantial difference between the mean and median, indicating a distribution heavily influenced by outliers. Variables such as LNMLTECA and LNSTECA show moderate variability and standard deviations close to unity, which denotes more stability. However, their kurtosis and skewness values, though less extreme

than GFCTOTECA or GFC, still deviate from the normal distribution—the likelihood of the presence of outliers or data asymmetry. Because of the diverse distributional behavior of the dataset, this research considers logarithmic transformations of the dataset. Besides, it employs an Autoregressive Distributed Lag (ARDL) model, which effectively handles these non-normal characteristics through its flexible lag structure to address them for more accurate econometric analysis.

Table 3: Descriptive statistics of variables

Particulars	1	2	3	4	5	6	7	8	9
MEA	25.240	0.164	6.396	23.760	23.090	4.550	27.989	5.772	26.884
MED	25.363	0.000	0.000	23.662	23.243	4.574	27.919	5.867	26.843
STD	0.937	0.370	17.516	0.917	0.958	0.147	0.508	0.443	0.966
SMV	0.877	0.137	306.803	0.840	0.918	0.022	0.258	0.196	0.933
KUR	-0.430	1.308	10.787	-0.157	0.707	1.464	-0.371	-0.817	0.258
SKW	-0.170	1.818	3.226	-0.217	-0.866	-0.793	0.370	-0.465	0.326
RAN	4.223	1.000	104.890	5.636	5.479	0.929	2.455	1.793	4.687
MIN	23.011	0.000	0.000	20.341	19.489	3.951	26.718	4.747	24.635
MAX	27.234	1.000	104.890	25.976	24.968	4.881	29.173	6.540	29.322
Count	1037	1037	1037	1037	1037	1037	1037	1037	1037

Note: Mean (MEA), Median (MED), Standard Error (STE), Standard Deviation (STD), Sample Variance (SMV), Kurtosis (KUR), Skewness (SKW), Range (RAN), Minimum (MIN), Maximum (MAX). LNEXPM= 1, GFC= 2, GFCTOTECA= 3, LNSTECA= 4, LNMLTECA= 5, LNREEXC= 6, LNGDPP= 7, LNDIS= 8, LNGDPU= 9. Source: Authors

Correlation Matrix

The correlation matrix supports decision-making by quantifying and visualizing the linear relationships between multiple variables. Tab. 4 presents the degree of relationship between the sample variables in this study.

Table 4: Correlation matrix

Particulars	1	2	3	4	5	6	7	8	9
LNEXPM	1.000								
GFC	-0.053	1.000							
GFCTOTECA	0.113	0.825	1.000						
LNSTECA	0.786	-0.061	0.145	1.000					
LNMLTECA	-0.035	-0.104	-0.033	0.042	1.000				
LNREEXC	0.409	0.106	0.143	0.264	0.005	1.000			
LNGDPP	0.029	-0.172	-0.243	-0.133	-0.072	-0.210	1.000		
LNDIS	-0.180	-0.035	-0.100	-0.325	0.287	-0.177	0.058	1.000	
LNGDPU	0.897	-0.051	0.128	0.783	0.065	0.369	-0.124	-0.056	1.000

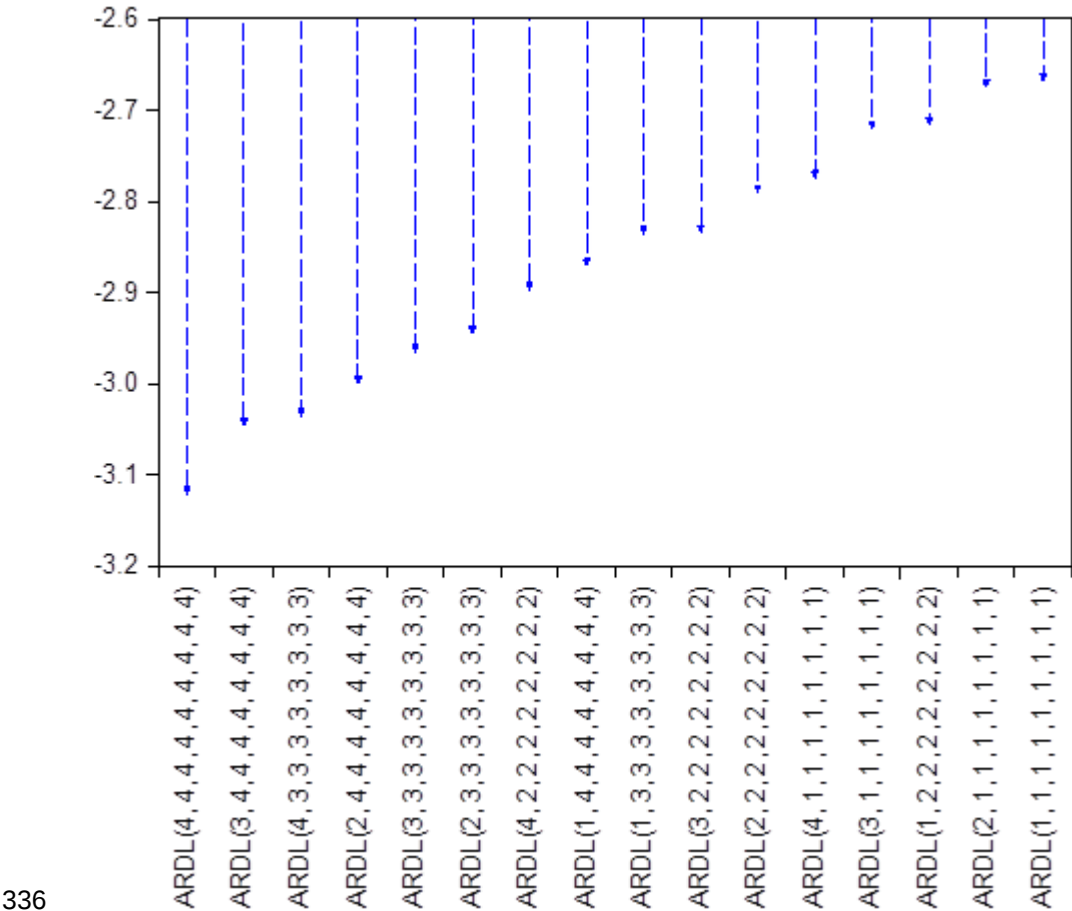
Note: LNEXPM= 1, GFC= 2, GFCTOTECA= 3, LNSTECA= 4, LNMLTECA= 5, LNREEXC= 6, LNGDPP= 7, LNDIS= 8, LNGDPU= 9. Source: Authors

Tab. 4 demonstrates relationships among economic indicators that merit a comprehensive evaluation. A strong positive correlation is observed between exports and GDP (home) (0.897)—increasing GDP seems to lead to positive export performance and vice versa. A similar pattern is also seen between export and short-term insured export credit exposures (direct insurance or lending) (0.786); however, the export performance shows an opposite linkage with medium-term insured export credit exposures (direct insurance or lending) (-0.035), as well as with distance (-0.180). Notably, the connection of short-term insured export credit exposures (direct insurance or lending) is positively correlated with GDP (home) (0.783) and negatively with distance (-0.325). The strong correlation between GFC and GFCTOTECA (0.825)

325 indicates that during periods of financial crisis, the amount of total insured export credit exposures
326 increased significantly.

327 **Model Selection Summary**

328 Fig. 1 reports the Akaike's Information Criterion (AIC) scores for various specifications of an ARDL model.
329 While the x-axis labels unique model configuration ranges from 1 to 16, the y-axis shows the AIC scores,
330 where lower scores indicate a model that effectively balances goodness of fit with simplicity to prevent
331 overfitting. The model with the lowest AIC score (Model 16; ARDL (4, 4, 4, 4, 4, 4, 4, 4, 4)) is the most
332 preferred due to its optimal trade-off between model complexity and fitting accuracy. The highest log
333 likelihood score of 2146.674432 demonstrates the best data fit among the considered models. Its superior
334 Akaike Information Criterion (AIC) of -3.115943 indicates an efficient balance between model accuracy and
335 simplicity, minimizing overfitting while effectively capturing data dynamics (Appendix I).



336
337 **Figure 1: Model Selection Criteria**

338 *Source: Authors*

339
340 Despite its comprehensive lag structure, ARDL (4, 4, 4, 4, 4, 4, 4, 4, 4), the model maintains competitive
341 Bayesian Information Criterion (BIC) and Hannan-Quinn Criterion (HQ) scores, suggesting that significant
342 improvements in model performance justify the complexity introduced by multiple lags.

343 **Long- and Short-Term Coefficient Estimation**

344 In the application of the ARDL model, the appropriate lag order for the variables is crucial for the accurate
345 estimation of both long-term and short-term coefficients. Given the sample size, the Akaike Information
346 Criterion (AIC) was employed to determine the optimal lag order. The model's coefficients were then
347 estimated with the lag order set at four (4).

Tab. 5 shows the findings of long and short-run equations for the ARDL model. In the long-term equation, all independent variables, except the distance (LNDIS), impact (p-value<0.05) export performance separately. In this model, diverse relationships are observed. For example, GFC, LNSTECA, and GDPU (home) positively affect export performance, whereas GFCOTTECA, LNMLTECA, GDP (partner), and LNREEXC show an opposite connection with exports. Considering the objective of this study, a 1% increase in short-term insured export credit exposure (LNSTECA) leads to a rise of nearly 0.12% in exports of the sample countries combined; however, the opposite is observed for the medium-term insured export credit exposures (LNMLTECA). If LNMLTECA rises by 1%, export of the sample countries falls by 0.016%, considering other variables fixed. Notably, the LNGDPU emerges as the most influential positive factor, whereas the LNREEXC shows a substantial negative impact.

Table 5: Results of long- and short-term coefficients of ARDL-ECM

Variable	Coefficient	Std. Error	t-Statistic	P-value
Long Run Equation				
GFC	0.042847	0.020550	2.085053	0.0377
LNGFCTOTECA	-0.002265	0.000409	-5.535563	0.0000
LNMLTECA	-0.015513	0.005681	-2.730569	0.0066
LNSTECA	0.119998	0.019356	6.199571	0.0000
LNGDPP	-0.251820	0.038292	-6.576291	0.0000
LNGDPU	0.811297	0.045598	17.79235	0.0000
LNDIS	-0.039997	0.038015	-1.052129	0.2934
LNREEXC	-0.507363	0.047139	-10.76304	0.0000
Short Run Equation				
COINTEQ01	-0.252786	0.096862	-2.609760	0.0094
D(GFC)	-0.265425	0.160689	-1.651798	0.0994
D(LNGFCTOTECA)	0.015174	0.007887	1.924061	0.0551
D(LNMLTECA)	-0.028627	0.033867	-0.845279	0.3985
D(LNSTECA)	-0.030952	0.037961	-0.815374	0.4153
D(LNGDPP)	0.278219	0.121665	2.286760	0.0227
D(LNGDPU)	0.807175	0.214189	3.768525	0.0002
D(LNDIS)	0.188988	0.069018	2.738259	0.0065
D(LNREEXC)	-0.824593	0.199679	-4.129594	0.0000
C	2.629825	1.007281	2.610814	0.0094

Note: Dependent Variable: D(LNEXPM), Maximum dependent lags: 3, Model selection method: Akaike info criterion (AIC), Dynamic regressors (4 lags). Source: Authors

In the short run, the adjustment mechanisms to deviations from long-term equilibrium are evident through the COINTEQ01 term, which indicates a significant correction process—how quickly the variables converge to long-run equilibrium. The coefficient value of -0.252786 means that about 25% of departure from long-run equilibrium is corrected each period (quarter). Since this coefficient is negative and statistically significant (0.0094, p-value<0.05), it can be concluded that the variables are jointly cointegrated and eight regressors (independent variables) are mutually Granger cause export performance in the long run. All the variables, except LNMTECA and LNSTECA, significantly influence export performance. Surprisingly, these two insured export credit exposure variables impact export (statistically insignificant, p-value>0.05), which is the opposite in the long-run case. GFC, which positively impacts exports in the long run, has a negative influence in the short run. Similar but inverse relationship is observed regarding distance (LNDIS). GDP (home) and GDP (partner) show significant positive adjustments, reflecting their vital role in

rapid economic recovery post-shocks. Notably, a sharp decline in the LNREEXC significantly affects exports, highlighting the acute sensitivity of export volumes to exchange rate volatility in the short term.

Cross-Section Short-Term Coefficient

The country-wise short-term coefficient is reported in Tab. 6. In analyzing the impact of predictor variables on the export performance of each country, France, Italy, and Japan show significant influences across all variables. Specifically, in France, two variables positively and six negatively affect export performance, while Italy shows an equal distribution with four variables impacting positively and four negatively. Japan displays a predominantly positive influence.

Table 6: Results of cross-section short-term coefficient

Particulars	C	1	2	3	4	5	6	7	8	T(√*)
ARG	√(-)	×	×	√(-)	√(-)	√(-)	√(+)	√(+)	√(+)	6(3/3)
AUS	×	×	√(+)	√(-)	√(+)	√(-)	√(+)	√(+)	√(+)	7(5/2)
BRZ	×	√(+)	√(-)	×	√(+)	×	×	√(+)	√(+)	6(4/2)
CAN	√(-)	√(-)	√(+)	√(-)	√(+)	×	√(+)	√(+)	√(+)	7(5/2)
CHI	×	×	√(+)	√(-)	√(-)	√(-)	√(-)	×	√(+)	6(2/4)
FRA	√(-)	√(+)	√(-)	√(-)	√(-)	√(-)	√(+)	√(-)	√(-)	8(2/6)
GER	√(-)	×	√(+)	√(+)	√(+)	√(-)	√(+)	√(-)	×	6(4/2)
IND	×	×	√(-)	√(+)	√(+)	√(-)	√(-)	√(-)	√(+)	7(3/4)
ITA	√(-)	√(-)	√(+)	√(+)	√(-)	√(-)	√(+)	√(+)	√(-)	8(4/4)
JAP	√(-)	√(-)	√(+)	√(-)	√(+)	√(-)	√(+)	√(+)	√(+)	8(5/3)
KOR	×	√(-)	√(+)	√(-)	×	√(-)	√(-)	√(+)	√(+)	7(3/4)
MEX	√(-)	√(-)	√(+)	√(-)	√(+)	√(-)	√(+)	×	√(+)	7(4/3)
RUS	√(-)	√(-)	√(+)	√(+)	√(-)	√(-)	√(+)	√(+)	√(+)	7(5/2)
SAF	×	√(-)	√(+)	√(+)	√(-)	√(+)	×	×	×	5(3/2)
TUR	√(-)	×	√(-)	√(+)	√(-)	√(-)	×	×	√(+)	5(2/3)
UKG	√(-)	×	√(-)	×	×	×	√(-)	√(+)	√(+)	4(2/2)
USA	√(-)	√(-)	√(+)	√(+)	√(-)	×	×	×	√(+)	5(3/2)
T (√*)	11	11 (2/9)	16 (11/5)	15 (7/8)	15 (7/8)	13 (1/12)	13 (9/4)	13 (9/4)	15 (13/2)	

Note: Dependent Variable: D(LNEXPM). If significant (p-value<0.05), then coefficient(positive) = “√”, otherwise, coefficient(negative) “×”. * indicates the sign of the coefficient (positive/negative). COINTEGRATION= C, GFC= 1, GFCTOTECA= 2, LNSTECA= 3, LNMLTECA= 4, LNREEXC= 5, LNGDPP= 6, LNDIS= 7, LNGDPU= 8. ARG= Argentina, AUS= Australia, BRZ= Brazil, CAN= Canada, CHI= China, FRA= France, GER= Germany, IND= India, ITA= Italy, JAP= Japan, KOR= Korea, MEX= Mexico, RUS= Russia, SAF= South Africa, TUR= Turkiye, UKG= United Kingdom, USA= United States. Source: Authors

In contrast, the United Kingdom shows the most minor influence from these variables. Regarding the impact across countries, GFCTOTECA emerges as the most influential, significantly affecting export performance in 16 countries, whereas GFC has the most negligible impact, influencing only 11 countries. While the total insured export credit exposures during the financial crisis have a positive effect on the exports of the 11 countries in the short term, the impact is negative for Brazil, France, India, Turkiye, and the UK. LNMLTECA and LNSTECA also significantly influence the export dynamics in these nations, 15 and 13 countries, respectively. France, Italy, and Japan seem to have substantial contributions to the overall model dynamics since they have critical roles in shaping export performances. The home country's GDP

(positive) and real exchange rate variables (negative) are other explanatory variables that have certain effects on exports for the short term (Simakova & Prazak, 2024).

Tab. 7 documents the variables' adjustment speed to long-term equilibrium across sample countries. We rank them based on the magnitude of their cointegration coefficients, which indicates their significant error correction processes. It is seen that France has the highest adjustment speed (1.42%), followed closely by Japan, the United Kingdom, and Russia. Conversely, the United States shows the lowest significant adjustment speed. Countries such as Brazil, South Africa, China, India, and Australia, with statistically insignificant cointegration coefficients, are excluded from detailed consideration in this analysis. This ranking highlights the varying abilities of national economies to correct deviations from long-term stability.

Table 7: Country-wise speed of adjustment of variable to long-term equilibrium

Variable	Rank	Coefficient	Std. Error	t-Statistic	P-value
FRA	1	-1.42539	0.05533	-25.76169	0.00010
JAP	2	-0.97148	0.00317	-306.10800	0.00000
UKG	3	-0.61489	0.07743	-7.94085	0.00420
RUS	4	-0.28933	0.01102	-26.25902	0.00010
CAN	5	-0.28776	0.00761	-37.79204	0.00000
GER	6	-0.23301	0.02043	-11.40788	0.00140
TUR	7	-0.20400	0.00375	-54.35442	0.00000
ITA	8	-0.11543	0.00333	-34.70984	0.00010
ARG	9	-0.05752	0.00390	-14.76957	0.00070
MEX	10	-0.05382	0.00442	-12.17650	0.00120
USA	11	-0.03842	0.00290	-13.24427	0.00090
BRZ	12	-0.02469	0.01651	-1.49547	0.23170
CHI	13	-0.00597	0.00313	-1.91019	0.15210
IND	14	-0.00583	0.00483	-1.20649	0.31410
AUS	15	-0.00262	0.00293	-0.89466	0.43690
SAF	16	0.01959	0.01804	1.08619	0.35690
KOR	17	0.01320	0.00519	2.54371	0.08440

Note: ARG= Argentina, AUS= Australia, BRZ= Brazil, CAN= Canada, CHI= China, FRA= France, GER= Germany, IND= India, ITA= Italy, JAP= Japan, KOR= Korea, MEX= Mexico, RUS= Russia, SAF= South Africa, TUR= Turkiye, UKG= United Kingdom, USA= United States.
Source: Authors

4.2 Discussion

Our findings reveal multifaceted significant insights about the impact of insured export credit exposures on trade (export). The medium-term and short-term ECA have a strong positive and negative effect on trade in the long run, respectively, but not in the short run during the sample period (supported by Soh Young (2014)). However, this effect does not vary during the global financial crisis period. Notably, the total insured ECA had a negative impact in the long run and a positive in the short run (Köksal and Genç (2019), Auboin and Engemann (2014), and Egger and Url (2006) found a similar result, but not specific to the crisis). Considering the short-run equation, about 0.25% of departure from long-run equilibrium is corrected each period (quarter). These findings emphasize the significance of trade finance in international trade. While discussions on the significant trade collapse have highlighted the critical role of trade credit during crises, it is evident that export credit is also vital during periods of stability. Therefore, policymakers should comprehend the subtle effects of export credit subsidies and develop a strategic timeline for implementing ECA policies for both the short and long run, as well as both crisis and stable periods.

During the financial crisis, 11 countries experienced a positive short-term impact on exports, while Brazil, France, India, Turkiye, and the UK faced adverse effects, with three of these being developing economies.

Saborowski et al. (2010) emphasized that developing countries should only rely on ECAs when specific preconditions, such as financial capacity, institutional capability, and governance, are adequately met. This highlights the difficulties developing nations encounter in effectively utilizing ECAs during times of crisis. Furthermore, Aydemir and Gerni (2011) suggested that ECAs in developing economies may require structural reforms to enhance their effectiveness in managing economic shocks. Therefore, we recommend restructuring ECAs in developing countries to address institutional weaknesses and strengthen their crisis management capacities.

Regarding cross-section short-term analysis, country-wise short-term error correction process reports France's rapid adjustment capabilities, followed closely by Japan, the United Kingdom, and Russia, indicating robust error correction mechanisms in response to deviations from long-term equilibrium. These results are essential, as they suggest that these countries are highly responsive to economic shocks, potentially due to well-established financial systems or effective economic policies.

Generally, while policymakers often credit ECAs' risk-bearing capacity to their guarantee schemes, the actual acceleration to exports is predominantly driven by direct credit schemes. However, it is crucial to note the drawbacks associated with these schemes, notably their potential to directly increase public debt and their functional overlap with private financial sector activities. Based on the findings of this research, since ECAs offer significant advantages in managing exporter risks, reliance on direct credit schemes requires careful consideration due to their financial implications and redundancy with existing private solutions.

From the theoretical aspect, the findings of this study contribute to the literature on international trade and economic recovery by explaining how different nations' export capabilities and financial systems adjust in the face of global economic fluctuations. The implications of the outcomes are profound for policymakers and financial institutions. For countries with slower adjustments, targeted reforms in financial regulations or more aggressive monetary and fiscal interventions may be necessary to enhance responsiveness to global economic shifts. Understanding these dynamics for international businesses and investors could guide strategic decisions about where to allocate resources most effectively during economic downturns, enhancing risk management.

5. Conclusions

The 2008 global financial crisis exposed the fragility of international trade and the critical role that policy instruments such as ECAs can play in stabilizing exports during economic turbulence. This research provides a comprehensive examination of the impact of ECAs on export performance across G20 countries, particularly during the critical periods surrounding the 2008 GFC. Using the augmented gravity model combined with the ARDL approach, we analyzed trade flows (export) from 2005 to 2020 to assess both short- and long-term effects of ECAs on export performance.

The results reveal a nuanced understanding of ECA effectiveness. In the medium term, ECAs positively influence long-term exports, emphasizing their importance in stabilizing trade flows. However, short-term ECA interventions display a negative long-term impact, which suggests the need for careful strategic planning when employing these instruments. During the GFC, ECAs provided a positive short-term boost to exports, although their long-term effectiveness was more limited. These results align with existing literature on the mixed role of ECAs, highlighting their capacity to mitigate immediate trade disruptions. A key finding is the diverse responses of countries to economic turbulence, e.g., France, Japan, the UK, and Russia demonstrated strong short-term error correction mechanisms, reflecting their well-established financial systems. This contrasts with slower adjustments seen in other countries, particularly developing economies, which points to the necessity of strengthening institutional frameworks and financial governance to improve crisis resilience.

469 From a policy perspective, our findings suggest that ECAs should be used as a dual-purpose tool—
470 providing immediate support during economic crises while being part of a broader, long-term export
471 strategy. In developing economies, ECAs may require structural reforms to enhance their capacity,
472 addressing governance, financial sustainability, and institutional capability. These reforms are critical to
473 ensuring that ECAs contribute to not only short-term recovery but also sustained trade growth.

474 Despite these critical contributions, the study has a few limitations. While relevant for major economies,
475 the exclusive focus on G20 countries limits the findings' applicability to smaller or the least developing
476 nations, where ECAs may operate under different institutional and financial conditions. Additionally, the
477 analysis period from 2005 to 2020, though capturing the effects of the GFC, may not reflect more recent
478 economic disruptions, such as the COVID-19 pandemic or evolving trade policies, which could alter the role
479 of ECAs. Furthermore, while the ARDL model effectively captures short- and long-term dynamics, it may
480 not account for more complex—i.e., nonlinear relationships, particularly in times of global crisis to observe
481 the countries separately. These limitations highlight the need for further research, incorporating a broader
482 range of countries, updated data, and alternative econometric approaches to provide a more
483 comprehensive understanding of ECA effectiveness across varying contexts.

484 In a nutshell, this study advances our understanding of the complex role ECAs play in international trade.
485 Policymakers should recognize both the short-term benefits and potential long-term drawbacks of ECAs,
486 ensuring that these agencies are deployed in a manner that supports sustainable, resilient trade growth.
487 The findings contribute to ongoing discussions on trade finance and crisis management, particularly in light
488 of the periodic economic shocks experienced by global economies.

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494 **Author contributions (mandatory)**

495 All authors have accepted responsibility for the entire content of this manuscript, consented to its
496 submission to the journal, reviewed all the results, and approved the final version of the manuscript. HS
497 and HT conceptualized the study. HS and RJ contributed to the methodology, validation, formal analysis,
498 and investigation. HS, HT, and RJ participated in writing the original draft and contributed to the review and
499 editing process. HS curated and tested the data, and created tables. HS and HT supervised the work.

500 **Conflict of interest (mandatory)**

501 Authors state no conflicts of interest.

502 **Data availability (mandatory)**

503 The data supporting the findings of this study are available upon request.

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507

509 **Appendix I: Model selection criteria table**

Model	LogL	AIC*	BIC	HQ	Specification
16	2146.674432	-3.115943	0.089610	-1.895749	ARDL (4, 4, 4, 4, 4, 4, 4, 4)
12	2093.509318	-3.041299	0.078705	-1.853669	ARDL (3, 4, 4, 4, 4, 4, 4, 4)
15	1969.276926	-3.030499	-0.509335	-2.070817	ARDL (4, 3, 3, 3, 3, 3, 3, 3)
8	2053.988303	-2.994816	0.039640	-1.839750	ARDL (2, 4, 4, 4, 4, 4, 4, 4)
11	1918.170225	-2.960104	-0.524487	-2.032986	ARDL (3, 3, 3, 3, 3, 3, 3, 3)
7	1891.674533	-2.940505	-0.590437	-2.045951	ARDL (2, 3, 3, 3, 3, 3, 3, 3)
14	1766.221759	-2.892099	-1.055322	-2.192929	ARDL (4, 2, 2, 2, 2, 2, 2, 2)
4	1974.537924	-2.865919	0.082988	-1.743417	ARDL (1, 4, 4, 4, 4, 4, 4, 4)
3	1821.481257	-2.830715	-0.566196	-1.968725	ARDL (1, 3, 3, 3, 3, 3, 3, 3)
10	1718.743789	-2.829193	-1.077964	-2.162587	ARDL (3, 2, 2, 2, 2, 2, 2, 2)
6	1680.354272	-2.785045	-1.119365	-2.151004	ARDL (2, 2, 2, 2, 2, 2, 2, 2)
13	1570.737763	-2.769325	-1.616936	-2.330668	ARDL (4, 1, 1, 1, 1, 1, 1, 1)
9	1527.424660	-2.715015	-1.648175	-2.308922	ARDL (3, 1, 1, 1, 1, 1, 1, 1)
2	1627.427773	-2.710893	-1.130762	-2.109416	ARDL (1, 2, 2, 2, 2, 2, 2, 2)
5	1488.442858	-2.669645	-1.688353	-2.296116	ARDL (2, 1, 1, 1, 1, 1, 1, 1)
1	1468.122542	-2.662792	-1.767048	-2.321827	ARDL (1, 1, 1, 1, 1, 1, 1, 1)

510 *Note: Dependent Variable: LNEXPM. Log Likelihood (LogL). Source: Authors*

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