Revista de Política Agrícola

R. pol. agríc., Brasília, v.35, e02061, 2026
DOI: 10.35977/2317-224X.rpa2026.v35.02061

Publicação da Secretaria de Política Agrícola do Ministério da Agricultura e Pecuária, editada pela Embrapa

e-ISSN 2317-224X
ISSN 1413-4969
Página da revista: www.embrapa.br/rpa

Artigo

Brazilian primary exports under uncertainty and oil shocks

Abstract – This article examines how uncertainty and crude oil price fluctuations influenced Brazilian primary product exports between 2010 and 2021. Using a gravity model estimated via Poisson Pseudo Maximum Likelihood (PPML), we test whether different uncertainty measures alter coefficient sensitivity. To address potential reverse causality, we include one-year lags of both the uncertainty index and oil price. Our results reveal a slight positive link between uncertainty and primary export volumes, reflecting Brazil's comparative advantage in trading goods with inelastic global demand. In contrast, higher global oil prices correlate with lower export levels. Robustness checks (alternative uncertainty index and lagged regressors) confirm these findings. The study underscores the role of strategic economic management in leveraging Brazil's strength in primary commodities, while highlighting the vulnerability of its trade balance to world energy market shifts. Overall, the paper provides evidence that trade policy and institutional reforms must consider external shocks to sustain export growth.

Keywords: Brazil, economic policy uncertainty, international primary commodity trade, oil price fluctuations.

Victor Henrique Lana Pinto ✉
Universidade Federal de Viçosa, Departamento de Economia, Viçosa, MG, Brasil
E-mail: victor.h.lana@ufv.br
✉ Autor correspondente

Michelle Márcia Viana Martins
Universidade Federal de Viçosa, Departamento de Economia, Viçosa, MG, Brasil
E-mail: michelle.viana@ufv.br

Recebido
6/8/2025

Aceito
8/12/2025

Como citar
PINTO, V.H.L.; MARTINS, M.M.V. Brazilian primary exports under uncertainty and oil shocks. **Revista de Política Agrícola**, v.35, e02061, 2026. DOI: https://doi.org/10.35977/2317-224X.rpa2026.v35.02061.

Exportações primárias brasileiras sob incerteza e choques do petróleo

Resumo – Este artigo examina como incerteza e flutuações do preço do petróleo bruto influenciaram as exportações brasileiras de produtos primários entre 2010 e 2021. Utilizando um modelo gravitacional estimado via pseudo-Poisson de máxima verossimilhança (PPML), testou-se se diferentes medidas de incerteza alteram a sensibilidade dos coeficientes. Para contornar a potencial causalidade reversa, foram incluídas defasagens de um ano tanto do índice de incerteza quanto do preço do petróleo. Os resultados revelam ligeira ligação positiva entre incerteza

e exportações primárias, refletindo a vantagem comparativa do Brasil no comércio de bens com demanda global inelástica. Em contraste, preços do petróleo mais altos se correlacionam com menores níveis de exportação. Checagens de robustez (índice de incerteza alternativo e regressores defasados) confirmam esses achados. O estudo destaca o papel da gestão econômica estratégica na alavancagem da força do Brasil em commodities primárias, ao mesmo tempo que destaca a vulnerabilidade de sua balança comercial às mudanças no mercado mundial de energia. De modo geral, o artigo fornece evidências de que a política comercial e reformas institucionais devem considerar choques externos para sustentar o crescimento das exportações.

Palavras-chave: Brasil, incerteza da política econômica, comércio primário internacional, flutuações do preço do petróleo.

Introduction

Many are the factors that affect the exports of primary products worldwide. Natural resource endowment, trade costs, governmental support, trade policies, and global market shocks represent some of these aspects that might determine the export performance of a country (Tadesse & Badiane, 2018). Overall, various domestic and international elements from both the demand and supply sides could exert influence on commodity exports. Economic uncertainty, for instance, may generate an unstable environment filled with unforeseen changes that could delay investments and cause a decline in profitability (Smales, 2021), potentially affecting sectors tied to natural resources. Furthermore, disruptions in global energy markets, particularly those involving petroleum-derived fuels, can affect trade flows, given their extensive use in production and transportation (Camp, 2019; Ahir et al., 2022).

Uncertainty indicates the inability to forecast possibilities associated with certain events (Franco, 2022). Unexpected occurrences, such as economic turmoil or disruptions in global logistics chains and geopolitical tensions, create an unpredictable setting, which affects international trade (Hassan et al., 2018). The uncertainty of economic policy might also influence the value of currency (Camp, 2019) and optimal production decisions in resource-based sectors (Arias et al., 2019), pushing up trade costs and, consequently, impacting the exports of primary goods. In addition, the extraction and processing of natural resources rely heavily on petroleum-derived fuels, both directly, to operate machinery and transport goods, and indirectly, through the energy required in industrial inputs (Hitaj & Suttles, 2016). Moreover, crude oil varieties account for an important part of total cost among primary commodity producers (Hitaj & Suttles, 2016), which could then determine the international trade of commodity goods.

Developing countries stand out among the nations whose primary foreign trade suffers most from changes in economic policy uncertainty and international crude oil price. It is known that these economies tend to be abundant in natural resources (Ross, 2015; Adams et al., 2019), which are essential for obtaining these goods. Thus, economic policy uncertainty as well as variations in the price of oil may imply oscillations in land returns and in the trade balance of these economies.

Particularly, among emerging countries, Brazil has a prominent role in the international trade of products based on natural resources. Soybeans, oils, iron ores, corn, sugar cane, and bovine meat represent some of the main commodities that make up the Brazilian export basket in recent years. More clearly, according to Comexstat (Brasil, 2023), Brazil consolidated its position as a global exporting force, leading with US$ 64 billion in net food exports. In addition to agribusiness, the country had a performance in the mineral sector, with US$ 19.6 billion in crude oil exports and US$ 25.5 billion in iron ore. Gold exports are also important, at US$ 4.9 billion. For this reason, it is important to try and understand the possible effects that both uncertainty and oil price shocks could have on Brazilian primary product exports.

The importance of researches evaluating how uncertainty and oil price shocks could influence primary exports in Brazil is noteworthy. Instability in the business environment may hinder employment opportunities and affect profitability (Smales, 2021). Economic uncertainties, exposed by corruption scandals and elections with competing parties from opposite ends of the political spectrum (Ferreira

R. pol. agríc., Brasília, v.35, e02061, 2026
DOI: 10.35977/2317-224X.rpa2026.v35.02061

et al., 2019), have heightened the relevance of this topic. Additionally, Camp (2019) emphasizes the existing dependence between oil and commodity prices, which could play a significant role in determining Brazilian export flows of primary goods.

Various researchers have investigated the interactions between economic variables and primary markets. Antonakakis et al. (2014), Wang et al. (2015) and Andreasson et al. (2016), for instance, evaluate how economic uncertainty affects commodity markets, while Vo et al. (2019) and Sun et al. (2021) focus on the connectedness between oil and agricultural prices. In sum, these studies observe the existence of an effect running from uncertainty to agricultural prices as well as the interactions between crude oil and the prices of primary goods. However, there is still room for investigations aiming to identify whether these effects also hold for the relationship between uncertainty and oil price changes, and the exports of commodities, especially for an emergent, more vulnerable economy such as Brazil.

In this context, this paper aims to understand the role of uncertainty and crude oil price shocks in Brazilian primary product exports from 2010 to 2021. This timeframe comprises several domestic and international episodes that affected the economic environment in Brazil such as corruption scandals, a presidential impeachment, and the Covid-19 pandemic.

The contributions of this study are threefold. First, it examines whether uncertainty and oil price adjustments are determinants of Brazilian primary exports, as opposed to commodity prices. Second, it assesses two contrasting uncertainty measures to evaluate the possible effects of economic policy uncertainty on the aggregate Brazilian exports of primary products, which enhances the quality of its empirical analyses and provides a valuable supplement to existing studies. Third, this study identifies the extent to which uncertainty and the crude oil price influence primary goods that Brazil exports and whether this effect is contemporaneous.

Finally, policymakers aiming at the international trade of primary products in Brazil could benefit from this investigation. For instance, by analyzing primary product exports, legislators can gain a better understanding of how uncertainty and crude oil price oscillations can affect the trade of Brazilian primary varieties over time. The findings of this study can assist government efforts to maintain a more stable economic environment and evaluate the country's priorities regarding the domestic fuel sector, especially in the context where promoting international trade in primary products is a priority.

Theoretical insights on the effects of economic uncertainty and oil prices on primary exports

Fluctuations in crude-oil prices reach Brazil's commodity trade through two intertwined cost channels: production and transport. Agriculture and mining are energy-hungry activities; tractors, irrigation pumps, and nitrogen fertilizers all depend on hydrocarbons. Mining relies on diesel-powered equipment for extraction and crushing. A rise in oil prices therefore pushes operating expenses higher and compresses margins, which can reduce the supply of exportable output (Hitaj & Suttles, 2016). The same price spike lifts freight tariffs for ships, trucks, and rail wagons, cutting the price competitiveness of bulky, low value-to-weight goods in foreign markets (Choi & Yoon, 2020).

This transmission is aggravated by Brazil's current export makeup. Christ et al. (2022) document that agribusiness still dominates the country's sales abroad, with modest diversification over the past decade. Gonçalves Júnior et al. (2024) show that most of this trade captures only a small domestic slice of value added; the margins available to absorb higher bunker-fuel or diesel costs are thin.

Oil prices also operate as a macroeconomic conduit. A global upswing in energy costs tends to fan inflation, erode growth, and unsettle financial markets; weaker activity abroad cools demand for commodities, even those usually bought regardless of price (Zhang & Broadstock, 2014). The slowdown heightens economic uncertainty, understood here as limited ability to assign probabilities to future states of the world (Franco, 2022), which in turn prompts firms to postpone investment and scale back production (Arias et al., 2019).

Periods of uncertainty inflate perceived trade risk. Insurance premiums rise, working-capital credit tightens, and supply chains become more fragile (Hassan et al., 2018). Exchange-rate volatility often follows: although a weaker real can boost price competitiveness, the benefit may be neutralized if importers curb orders or if domestic producers face dearer imported inputs (Asteriou et al., 2016).

Commodity specialization deepens the exposure. Basso et al. (2021) trace the rapid spread of soybean cultivation into new frontiers, reinforcing dependence on a single crop and making regional export earnings more sensitive to global price shocks. Market structure matters as well: Santos et al. (2024) find that timber-product exports are concentrated in a few firms and destinations, a setting in which higher freight or energy costs translate quickly into revenue swings.

On the revenue side, the interplay among prices, quantities, and the exchange rate can undo volume gains. Using a shift-share decomposition for pulp-and-paper sales, Silva et al. (2024) show that adverse combinations of world prices and currency moves have repeatedly offset rising shipment volumes during crises. Their evidence aligns with the channels discussed above, as when oil prices jump and uncertainty rises, the exchange rate often slides while freight and input costs climb, squeezing export earnings despite steady or even growing physical volumes.

Although demand for staples is usually price inelastic (Thompson, 1916; International Monetary Fund, 2024), importers' purchasing schedules remain sensitive to risk. Heightened uncertainty leads to leaner inventories and shorter contracts, trimming Brazil's export flows even when underlying consumption needs persist.

However, this focus on cost and risk channels overlooks a structural factor that may mitigate the negative effects of uncertainty and even provide a competitive advantage: the knowledge-intensive nature of Brazilian agribusiness. The sector's success is not merely a function of resource endowment, but a result of successful induced institutional and technological innovation (Hayami & Ruttan, 1985). This transformation was driven by the creation of institutions like the Brazilian Agricultural Research Corporation (Embrapa), which provided the scientific foundation for tropical agriculture (Alves, 2010), a process that Fishlow & Vieira Filho (2020) argue has made the sector a globally competitive, knowledge-intensive industry. Furthermore, the agricultural sector has historically demonstrated a strong market-rationality and responsiveness to price signals (Pastore, 1973, 2021), suggesting a capacity to quickly adapt and capitalize on market opportunities that arise during periods of global instability.

In sum, Brazil's primary-centered export basket, i.e., low processed content, rising specialization, and pockets of market concentration, amplifies the pass-through of oil-price shocks and macro uncertainty to trade outcomes. The empirical section that follows quantifies the magnitude of these intertwined channels for the 2010-2021 period.

Research design

This section is divided in two parts. The first of them briefly presents the gravity model of trade, demonstrates our empirical strategy to identify the potential association running from uncertainty and oil prices to the exports of basic products in Brazil. The second part elaborates further on our data source.

Empirical strategy

For the empirical analysis of the potential effect of the economic policy uncertainty and the international crude oil price on Brazilian primary commodity exports, we rely on the gravity model of trade. In sum, this model suggests using the Newtonian gravity concept to explain bilateral trade (attraction) by the national incomes of the trading economies (mass) and the (repulsion) geographical distance between them (Pöyhönen, 1963; Tinbergen, 1962). However, some studies, such as Castro & Kornher (2022), Heid et al. (2021), and Pinto & Silva (2020) have later expanded the model including many other predictors, such as population, trade blocs, contiguity, country-specific cultural features[1], among others.

In this section, we concentrate on the effect of both uncertainty and oil price fluctuations onto Brazil's primary commodity exports to its main trading partners[2] from 2010 to 2021. We begin by defining a gravity model for panel data. To estimate the model, we adhere to the recommended procedures in Matzner et al. (2023) and Yotov et al. (2016), and compute the following equations[3]:

[1] There is a theoretical construction for the insertion of these variables, as discussed in Yotov et al. (2016).

[2] This sample comprises the countries to which Brazil has consecutively exported primary products from 2010 to 2021.

[3] Equations (1) and (2) are run separately due to high collinearity between the uncertainty and oil price variables.

R. pol. agríc., Brasília, v.35, e02061, 2026
DOI: 10.35977/2317-224X.rpa2026.v35.02061

$$X_{ijt} = \alpha + \beta_1 uncertainty_{it} + \mu_j + \rho_t + \varepsilon_{ijt} \quad (1)$$

$$X_{ijt} = \alpha + \delta_1 ln\_oilprice_t + \mu_j + \rho_t + \vartheta_{ijt} \quad (2)$$

where X_{ijt} denotes the aggregate raw product exports of country i (Brazil) to country j (Brazil's main trading partners) in year t (2010-2021). α represents the gravitational constant. Our variables of interest, $uncertainty_{it}$ and $oilprice_t$, refer to the economic policy uncertainty index of Brazil and the international Brent crude oil spot price, respectively, in year t. Hence, we incorporate in equations (1) and (2) importer fixed effects, μ_j, which account for inward multilateral resistance terms. Moreover, to account for time-varying bilateral costs, we incorporate in equations (1) and (2) year fixed effects, ρ_t. Lastly, ε_{ijt} and ϑ_{ijt} denote the error terms. For our descriptive analysis, we also consider the gross domestic product (GDP)[4] of Brazil in t. The panel data structure allows us to include different types of fixed effects to control for heterogeneity and reduce the scope for potential omitted variable bias.

Similarly to Castro & Kornher (2022), our econometric framework does not explicitly consider non-tariff measures (NTMs) because they tend to vary by product and pose challenges in terms of aggregation. However, we believe that we partially control for NTMs indirectly. That is, by including our set of year fixed effects, ρ_t, we account for the trade relations and costs that are specific to the pair of trading partners that year.

In a nutshell, although the gravity model is suitable for our analysis, we are aware that it is subject to endogeneity bias. Nonetheless, we address this issue in different ways. First, we follow Yotov et al. (2016) and use panel data to allow explanatory variables to adjust in time. Second, the two-way fixed effects allow us to control for unobserved importer-specific and time-variant relevant covariates that could be correlated with the error term and, thus, affect X_{ijt}.

For the estimations of equations (1) and (2), we rely on the Poisson Pseudo Maximum Likelihood (PPML) estimator. This estimator is appropriate because it does not make any assumptions about the distributional form of the covariates, only that the conditional mean of the outcome variable is correctly specified, as indicated in Santos Silva & Tenreyro (2010) and in Yotov et al. (2016). In addition, Santos Silva & Tenreyro (2011) and Yotov et al. (2016) point out six advantages of this approach: i) it is consistent, unbiased, and efficient in the presence of heteroscedasticity; ii) it remains consistent even in the presence of over or under dispersion as it does not make any assumptions on the distribution of the outcome variable; iii) it applies equal weighting to all observations; iv) it properly deals with zero flows, frequent in trade data; v) it generates estimates that equate actual and estimated trade flows across trading economies; and vi) it avoids sample selection bias.

Finally, this study provides robustness checks for the estimation results. First, as in Matzner et al. (2023), we examine whether our selection of the uncertainty measure affects the sensitivity of our estimates. Second, we follow Jia et al. (2020) and Matzner et al. (2023) and check for the dynamic effect of the uncertainty index and oil price by employing their yearly lagged value, ruling out potential reverse causality econometric issues.

Data

Our data comes from multiple sources. Information on the Brazilian exports of raw goods (in US dollars) is from the World Integrated Trade Solution (WITS, 2023). These data refer to the aggregate exports of primary products comprising all goods coded 01 to 27 in the Harmonized System, namely animals, food products, vegetables, minerals, and fuels. Our main uncertainty measure, i.e., the economic policy uncertainty (EPU) index for Brazil comes from Baker et al. (2016). The construct of this index uses text archives for the newspaper "Folha de São Paulo". It basically counts the number of news reports comprising the terms "incerto" or "incerteza", "econômico" or "economia", and the following policy-related terms, namely, "regulação, déficit, orçamento, imposto, banco central, alvorada, planalto, congresso, senado, câmara dos deputados, legislação, lei, tarifa." Since the EPU index is provided on a monthly basis, we calculate yearly uncertainty measures through their means within each year. Our remaining variable of interest, the international crude oil price, comes from the US

[4] GDP is not included in the main regressions because, since the focus of the analysis is on external trade shocks and not on internal capacity or output, the inclusion of GDP could obscure the direct effect of uncertainty and oil price on export flows.

Energy Information Administration (EIA, 2013), and consists of yearly data on the Europe Brent Spot Price FOB (in US dollars). Yearly data on the Brazilian gross domestic product (in constant 2015 US dollars) come from the World Bank (2023).

Lastly, our alternative uncertainty measure for the robustness check, the Brazilian Economic Policy Uncertainty (BEPU) index, is produced by Ferreira et al. (2019). It is comprised of two components: i) the media uncertainty indicator, weighing 80%, which also relies on the frequency of news reports using economic uncertainty terms in leading newspapers in Brazil; and ii) the forecast disagreement uncertainty indicator, weighing 20%, which is based on the dispersion of market exports' predictions. The first component evaluates the six most read newspapers in Brazil, namely "Valor Econômico, Folha de São Paulo, Correio Brasiliense, Estadão, O Globo, Zero Hora", using words reduced to their roots such as econ, instab, uncert, and crisis. The second component uses information taken from the Focus Report, published by the Brazilian Central Bank. In sum, it considers the dispersion forecasts for the short-term interest rate (Selic), the official national consumer price index [IPCA], and the Brazilian Real/Dollar exchange rate (PTAX). Like the EPU, we compute yearly uncertainty measures for the BEPU through their means within each year.

Results

Recent studies suggest that macroeconomic uncertainty as well as oil price adjustments could be relevant predictors of exports of basic products. For this reason, this study investigates whether the economic policy uncertainty and crude oil price shocks affect the exports of primary goods in Brazil. Our hypothesis is that the economic policy uncertainty exerts an important yet negative influence on primary commodity exports in the country. Such an effect may occur because uncertainty tends to depress investments, output, and employment leading to a possible decrease in food and raw supply. Furthermore, we believe that oil price movements have a negative effect on the Brazilian exports of basic goods. This might happen because many inputs are oil-dependent, which could increase production costs, and reduce the country's exporting capacity.

In this context, this section presents our estimation results. First, we provide an overview of our data and show some descriptive statistics. Then, we report on the role of uncertainty and oil price changes in the Brazilian trade of primary goods.

Summary statistics

This section looks at some raw data to try and shed light on the relationship between uncertainty and exports of raw products together with the responsiveness of the international trade of primary varieties to oil price shocks. Table 1 shows descriptive statistics on these associations. Specifically, we adopt an approach to identify those moments when both uncertainty and oil price achieved higher levels. For that, we first calculate the mean and standard deviation of each of these variables (uncertainty: 191.94 and 76.6; oil price: 75.71 and 25.08, respectively). Then, we consider a 'high uncertainty' moment when uncertainty is equal to or greater than the average value of this variable plus one standard deviation; i.e. 268.54. The same procedure follows with the oil price covariate, that is, a 'high oil price' episode denotes when this variable is equal to or greater than its average value plus one standard deviation or 100.79.

After establishing this criterion, we obtain the mean values of primary commodity exports and the GDP of Brazil in both states (high and low uncertainty/oil price), aiming to characterize our sample and discuss their differences (if any). In addition, we perform a mean-comparison test to verify whether the exports of primary products as well as Brazil's GDP are statistically similar in those two different states (Table 1).

Table 1. Mean values of variables for high (low) levels of uncertainty and oil prices.

	High uncertainty?		High oil price?	
	Yes	No	Yes	No
Primary product exports (in billions USD)	505^{NS}	606	646^{NS}	570
GDP (in billions USD)	1,750***	1,800	1,810***	1,790
Obs.	362	1,810	543	1,629

Notes: *** means are statistically different from the 'control' group at 1%; NS means are statistically nonsignificant, i.e., equal to the 'control' group; figures rounded to two decimal places.

Table 1 reports the mean values of primary product exports and GDP when uncertainty and oil prices are relatively high/low. These findings show that when uncertainty is higher the exports of raw

R. pol. agríc., Brasília, v.35, e02061, 2026
DOI: 10.35977/2317-224X.rpa2026.v35.02061

goods in Brazil reached 505 billion dollars while during lower uncertainty regimes the country shipped 606 billion dollars' worth of basic goods worldwide. The result of the mean-comparison test indicates that there exists no statistical difference between these values. This means that the country's exports remain unaffected during different states of uncertainty, which is somewhat surprising. However, this analysis still denotes prima facie evidence and, therefore, does not allow us to draw firm conclusions of the effect of uncertainty on primary product exports in Brazil.

The results in Table 1 demonstrate that when uncertainty is relatively higher, the GDP of Brazil was 1.75 trillion dollars while during moments when uncertainty was reduced, the GDP of the country was 1.80 trillion dollars. Based on the results of the mean-comparison test, we observe that these findings are statistically different, meaning that uncertainty might play an important negative role in the product level of the country.

With regard to the associations between oil price changes and the primary product exports of Brazil, we also observe no statistical difference in the mean values for this variable. In other words, the findings in Table 1 insinuate that there exists no difference in the volume of basic goods Brazil exports when oil prices are relatively higher. Contrarily, the findings for the GDP of Brazil show that its mean values under both states, high or low oil prices, are statistically different. This implies that oil price changes affect the Brazilian economy as a whole, impacting the country's product level.

Table 2 complements the analysis carried out so far. It provides the mean values of the uncertainty indexes used in this study, EPU and BEPU, as well as the oil price variable over time. In addition, Table 2 shows the mean values of the Brazilian exports of primary goods sent to the country's top- and bottom-3 trading partners between 2010 and 2021.

The findings in Table 2 evidence that uncertainty exhibits, for both EPU and BEPU, figures that increase over time. It is possible to observe that in 2020, for instance, their mean values reached 255.49 and 155.93, respectively. Given the nature of these variables, this means that the incidence of news reports including economic-related terms was high. This result probably reflects the Covid-19 pandemic when the entire globe suffered from the most adverse health conditions causing economic frictions worldwide. The mean values of the oil price, however, present a contrasting result. In 2020, it reached 41.96 USD, lower than in 2010 and 2015, for example. The rationale behind this finding might also be related to the economic depression as a result of the Covid-19 pandemic. During that time, global production came to halt and oil producers were possibly led to an oversupply, negatively affecting the international oil price.

Table 2 also reports the mean values of the Brazilian raw goods sent to the country's top-3 (China, Netherlands, and the United States) and bottom-3 (Malawi, Papua New Guinea, and Micronesia) trading partners between 2010 and 2021. The results in Table 2 do not allow us to detect any specific patterns across top- and bottom-3 importers. Nevertheless, we verify that China and Malawi increased their imports of Brazilian raw goods markedly in 2020. This finding could be associated with higher domestic demand in those respective

Table 2. Mean values of uncertainty, oil price, and primary-product exports for selected years.

		2010	2015	2020	Avg. (2010-2021)
Variables of interest	EPU index	92.78	249.82	255.49	191.95
	BPEU index	99.43	112.73	155.93	111.32
	Oil price (USD)	79.61	52.32	41.96	75.72
Top and bottom destinations for Brazilian primary exports	China	14.9 T	18.4 T	48.8 T	34.2 T
	Netherlands	5.5 T	5.3 T	5.08 T	5.68 T
	United States	3.3 T	4.05 T	3.95 T	4.37 T
	Malawi	118.0 M	79.5 M	432.0 M	158.0 M
	Papua New Guinea	33.8 M	168.0 M	24.5 M	140.0 M
	Micronesia	102.0 M	162.0 M	67.1 M	84.2 M

Notes: figures rounded to one/two decimal places; M, B, and T refer to million, billion, and trillion.

economies during that year or with specific supply shortages as a result of the restrictions imposed during the Covid-19 pandemic. Contrarily, we observe that countries such as the Netherlands and the United States seem to present a somewhat similar trading volume of imports from Brazil in 2010, 2015, and 2020.

In short, the results in Tables 1 and 2 allow us to gain some analytical support regarding the relationships between uncertainty and exports of natural-resource-based products in Brazil and how oil price could affect the exports of Brazilian basic goods. However, these associations require further econometric modeling, whose results we present in the following section.

The effect of uncertainty on Brazilian primary-product exports

This section focuses on the results of equation (1), aiming to disclose how primary-product exports respond to moments of uncertainty in Brazil. For that, we run four different models. The first of them verifies the effect of EPU on the dependent variable. Model 2 checks for a possible dynamic effect running from past uncertainty to the contemporaneous volume of primary-product exports. Model 3 regresses the exports of primary products on our alternative measure of uncertainty; i.e. BEPU. Finally, model 4 shows our estimated coefficients for the dynamic association between past Brazilian economic policy uncertainty and the country's current exports of primary products. In all models, we include importer and time fixed effects to control for heterogeneity across trading partners and years (Table 3).

In all models in Table 3, the estimated coefficients make explicit the positive and statistically significant effect of uncertainty on the exports of primary products in Brazil. This is rather unexpected since higher levels of economic and political uncertainty might increase imported input prices, depressing the trading volume of a country (Hassan et al., 2018). However, the magnitude of these coefficients reveals that the absolute marginal variations are extremely small. Since the dependent variable is measured in thousands of USD, the coefficient of 0.0061 (Model 1, EPU) implies that a one-unit increase in the EPU index is associated with an increase of only 6.10 USD in primary-product exports. Similarly, the largest coefficient found, 0.0219 (Model 3, BEPU), represents an absolute marginal variation of only

Table 3. PPML estimation results for the role of uncertainty in Brazilian primary-product exports.

Variable	Brazilian primary-product exports (in thousands of USD)			
	Model 1	Model 2	Model 3	Model 4
EPU	0.0061**			
	(0.0021)			
Lagged EPU		0.0014*		
		(0.0008)		
BEPU			0.0219**	
			(0.0073)	
Lagged BEPU				0.0039*
				(0.0023)
Intercept	15.4915***	16.3107***	13.8804***	16.0474***
	(0.4097)	(0.2939)	(0.8918)	(0.3803)
Importer FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	2,172	1,991	2,172	1,991
Wald chi^2	92,074.63	90,279.20	92,074.63	90,279.20
Prob > chi^2	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.9648	0.9684	0.9648	0.9684

Notes: standard errors in parentheses; *** p < 0.01, ** < 0.05 and * < 0.10; figures rounded to two decimal places.

R. pol. agríc., Brasília, v.35, e02061, 2026
DOI: 10.35977/2317-224X.rpa2026.v35.02061

21.90 USD per unit increase in uncertainty. These variations, although statistically different from zero, are economically insignificant, reinforcing the argument that the impact of uncertainty on the volume of primary-product exports is virtually null during the analyzed period.

Thus, it is more reasonable to say that from 2010 to 2021, the average effect of uncertainty on the Brazilian primary-product exports was virtually zero. We then provide some rationale for these findings. In this study, we solely consider the exports of primary products, whose demand is relatively inelastic. Agriculture, for example, denotes an industry which relates to the production of the most absolute needs of life; therefore, it is believed that the demand for this type of products is less sensitive to shocks (Thompson, 1916; Ni Mhurchu et al., 2013), such as the economic policy uncertainty.

This demand inelasticity extends to other primary commodities like oil, which is fundamental for energy and industry; iron ore, essential for steel production in sectors such as construction and manufacturing; and gold, which acts as a "safe haven" asset during periods of instability. The demand for these goods tends to be less volatile, regardless of economic fluctuations, ensuring remarkable resilience in their exports during uncertain times (International Monetary Fund, 2024).

Thus, we believe that although uncertainty influences optimal decisions (Arias et al., 2019), possibly affecting prices, and consequently, the domestic market, such a finding might not hold for the association between uncertainty and primary-product exports. The demand for primary-product exports can vary depending on various factors, and it may exhibit both elastic and inelastic characteristics. However, in general, the demand for primary-product exports tends to be relatively inelastic as early observed in Thompson (1916) and Ni Mhurchu et al. (2013). There are a few reasons that contribute to this inelasticity in the case of Brazil. First, we highpoint that the country is resource-rich and often serves as an essential raw material world supplier, which generally has limited substitutes. Second, uncertainty may affect domestic prices; however, the demand for primary goods may not change significantly in response to price fluctuations because these goods are necessary for food production and have restricted alternatives.

Finally, we highlight that the estimated coefficients in models 2 and 4 reveal that the effect of uncertainty reduces even more over time. That is, when we regress the dependent variable on both lagged uncertainty measures, we unveil that uncertainty events from a past year affect the current volume of primary-product exports less than it does when we regard a contemporaneous relationship (models 1 and 3). In short, the rationale behind these findings is similar to that noted for the estimated coefficients in models 1 and 3, that being the intrinsic features of commodity goods that do not seem to affect the capacity of Brazil to export these goods.

Albeit minimal, we also explore the potential positive influence of uncertainty on primary-product exports in Brazil. While this effect seems to be insignificant, one possible explanation relates to the exchange rate. In periods of high uncertainty, it is common for the currency's value to depreciate (Isah & Ekeocha, 2023), which can be advantageous for stimulating exports. Nevertheless, such a positive effect of uncertainty on Brazilian primary-product exports can be understood not merely as a consequence of exchange rate depreciation, but as a manifestation of the sector's structural competitiveness and market responsiveness. The success of Brazilian agribusiness is fundamentally rooted in a deliberate, decades-long process of induced institutional and technological innovation (Hayami & Ruttan, 1985; Alves, 2010). This process, exemplified by the creation and sustained investment in Embrapa, transformed tropical agriculture into a knowledge-intensive industry (Fishlow & Vieira Filho, 2020). In this sense, we observe that the resulting technological capacity may allow the primary sector to maintain high productivity and quality standards, even when facing external shocks and global market volatility.

This technological and institutional resilience provides Brazilian exporters with a critical competitive advantage, enabling them to quickly capitalize on global supply gaps and price signals that arise during periods of uncertainty. As Pastore (1973, 2021) demonstrated, the agricultural sector in Brazil is highly responsive to price changes, a necessary condition for the induced innovation model to function. Therefore, while currency depreciation may provide an immediate price advantage, the ability of the sector to rapidly scale up production and efficiently meet increased international demand is the underlying factor that translates uncertainty into a sustained, albeit small, positive effect on export

flows. This finding underscores the importance of public institution building and scientific investment in securing a stable position in the global commodity market (Fishlow & Vieira Filho, 2020).

In short, the results we discuss in this section imply that there exists a positive, yet almost negligible, average effect of uncertainty on primary-product exports in Brazil between 2010 and 2021. This outcome is robust to different checks, namely the inclusion of an alternative uncertainty index, the BEPU, which delivers very similar results, and the insertion of lagged regressors aiming to identify the dynamics of our relationship of interest.

The role of oil price shocks in the exports of primary products in Brazil

This section shows the estimated coefficient results of equation (2) seeking to reveal the impact of oil price changes on the Brazilian exports of primary goods. To achieve this, we run two distinct models. Model 1 regresses the dependent variable on oil prices while model 2 verifies whether there exists a dynamic effect of oil price shocks on the exports of primary products in Brazil. To account for variations among trading partners and years, our regressions incorporate fixed effects for importers and time. The outcomes of these models are presented in Table 4.

Table 4. PPML estimation results for the impact of oil price changes in primary-product exports in Brazil.

Variable	Brazilian primary-product exports (in thousands of USD)	
	Model 1	Model 2
Oil price	-5.0531**	
	(1.6876)	
Lagged Oil price		-0.3457*
		(0.1997)
Intercept	38.1791***	17.9503***
	(7.2680)	(0.8741)
Importer FE	Yes	Yes
Year FE	Yes	Yes
Obs.	2,172	1,991
Wald chi^2	92,074.63	90,279.20
Prob > chi^2	0.0000	0.0000
Pseudo R^2	0.9648	0.9684

Notes: standard errors in parentheses; *** p < 0.01, ** < 0.05, and * < 0.10; figures rounded to two decimal places.

The estimated coefficients in models 1 and 2 demonstrate a negative relationship with statistical significance, indicating that shocks in oil prices do lead to a reduction in primary-product exports from Brazil. We propose that this linkage between oil price fluctuations and the trade volume of Brazilian primary goods is associated with the dependence of extractive and resource-based sectors on petroleum-derived inputs. These sectors require energy for machinery operation, processing, and transportation of raw materials, making them sensitive to variations in fuel costs. Consequently, increases in oil prices can raise production and logistics expenses, affecting the competitiveness of Brazilian primary exports in international markets. (Hitaj & Suttles, 2016).

We acknowledge that oil prices may affect primary-product exports in a complex and multifaceted way, as they depend on various elements and the specific context of the sector in question. Thus, we elaborate further on some of these aspects to try and gain more detailed knowledge into the negative associations between oil prices and primary-product exports. To begin with, we believe that fluctuations in oil prices can potentially impact the production costs of these goods, either increasing or decreasing them. Higher oil prices may incentivize the substitution of certain commodity products with biofuels or other energy alternatives. However, if access to these substitutes is limited or expensive, it does not mitigate the impact of oil price shocks on commodity goods, as appears to be the case in Brazil.

Additionally, unlike the Brazilian uncertainty index, which reflects economic and political frictions in a domestic setting, oil price shocks can have much broader macroeconomic effects on global economies, which influence the world demand for primary products. More clearly, fluctuations in oil prices not only impact the Brazilian capacity to produce primary goods, but the global consumer purchasing power as a whole. Higher oil prices can lead to increased transportation costs and inflationary pressures, affecting the overall demand for foods and primary raw products, and potentially influencing export levels.

We also observe that the influence of oil prices on primary-product exports can vary depending on the nature of the goods. For instance, primary goods that rely heavily on energy inputs, such as grains or perishable fruits that require re-

R. pol. agríc., Brasília, v.35, e02061, 2026
DOI: 10.35977/2317-224X.rpa2026.v35.02061

frigeration during transportation, are likely to be more susceptible to the impact of higher oil prices. On the other hand, certain products may be less affected if their energy requirements are relatively low or if their demand is primarily driven by factors other than transportation costs. In the case of Brazil, the results reported in Table 4 evidence a negative effect suggesting that the country's commodity export basket might consist of products that depend on oil intensively. This observation is supported by the fact that in 2021, for instance, oil seeds and oleaginous fruits ranked as the second most exported commodity product from Brazil (Brasil, 2023).

Another important aspect we ought to mention is the dynamic effect reported in Table 4. The estimated coefficient results of model 2 make clear the much reduced, yet still negative, connection between the fluctuations in oil prices and the Brazilian exports of primary products. This means that oil price changes from a past year affect the trade volume of primary products in Brazil contemporaneously less than it does when we do not consider such a dynamic effect (model 1).

In summary, this section presents and discusses the role of oil price fluctuations in Brazilian primary-product exports. The results in Table 4 disclose that increases in oil prices produce, on average, a negative effect on the exports of these products in Brazil from 2010 to 2021. Additionally, we provide an alternative estimation and regress the dependent variable on the lagged oil price and observe a similar, yet less pronounced, sensitivity of the exports of primary goods to past oil price shocks. Our findings suggest that the results reported in Table 4 in response to changes in international oil prices can be attributed to the global-scale nature of this phenomenon. These fluctuations not only affect Brazil's primary sector but also have negative implications for the purchasing power of important trade partners, reducing their demand for these Brazilian goods.

Final remarks

In this study, we aimed to assess the impact of uncertainty and crude oil price shifts on Brazilian primary-product exports from 2010 to 2021. Our key findings highlight a consistent positive yet minor effect of uncertainty on these exports, attributed to the inelastic nature of traded goods, which grants Brazil a competitive edge in primary goods trade. On the other hand, the analysis uncovers a significant negative effect of oil price fluctuations on primary-product exports, impacting not only Brazil's food and raw sector but also trade partners' purchasing power.

These findings underscore the necessity of managing economic unpredictability, taking into account Brazil's potential strength in trading inelastic primary goods. Simultaneously, the negative link between rising oil prices and primary-product exports stresses the vulnerability of trade relationships to global energy market shifts, urging comprehensive risk-management strategies. These results advocate for informed policy decisions that can navigate economic fluctuations and maximize Brazil's trade strengths in primary goods within the broader scope of primary economics.

To deepen our understanding, future research could delve into categorizing primary products, unveiling intricate variations in the relationships among uncertainty, oil prices, and exports across different primary products. By examining sectors individually, researchers can discern how specific characteristics, demand patterns, and supply chains interact with economic uncertainty and oil-price dynamics, contributing to more tailored trade policies and enhanced insights within the field.

References

ADAMS, D.; ADAMS, K.; ULLAH, S.; ULLAH, F. Globalisation, governance, accountability and the natural resource 'curse': implications for socio-economic growth of oil-rich developing countries. **Resources Policy**, v.61, p.128-140, 2019. DOI: https://doi.org/10.1016/j.resourpol.2019.02.009.

AHIR, H.; BLOOM, N.; FURCERI, D. **The world uncertainty index**. Cambridge: National Bureau of Economic Research, 2022. 114p. (NBER Working Paper, 29763). DOI: https://doi.org/10.3386/w29763.

ALVES, E. Embrapa: um caso bem-sucedido de inovação institucional. **Revista de Política Agrícola**, v.19, p.65-73, 2010. Edição especial de aniversário do MAPA.

ANDREASSON, P.; BEKIROS, S.; NGUYEN, D.K.; UDDIN, G.S. Impact of speculation and economic uncertainty on commodity markets. **International Review of Financial Analysis**, v.43, p.115-127, 2016. DOI: https://doi.org/10.1016/j.irfa.2015.11.005.

ANTONAKAKIS, N.; CHATZIANTONIOU, I.; FILIS, G. Dynamic spillovers of oil price shocks and economic policy uncertainty. **Energy Economics**, v.44, p.433-447, 2014. DOI: https://doi.org/10.1016/j.eneco.2014.05.007.

ARIAS, M.A.; IBÁÑEZ, A.M.; ZAMBRANO, A. Agricultural production amid conflict: separating the effects of conflict into shocks and uncertainty. **World Development**, v.119, p.165-184, 2019. DOI: https://doi.org/10.1016/j.worlddev.2017.11.011.

ASTERIOU, D.; MASATCI, K.; PILBEAM, K. Exchange rate volatility and international trade: international evidence from the MINT countries. **Economic Modelling**, v.58, p.133-140, 2016. DOI: https://doi.org/10.1016/j.econmod.2016.05.006.

BAKER, S.R.; BLOOM, N.; DAVIS, S.J. Measuring economic policy uncertainty. **The Quarterly Journal of Economics**, v.131, p.1593-1636, 2016. DOI: https://doi.org/10.1093/qje/qjw024.

BASSO, D.; TRENNEPOHL, D.; VIEIRA, E.L.; MUENCHEN, J.V. A dinâmica de ocupação do espaço natural pelo processo de expansão da sojicultura no Brasil. **Informe GEPEC**, v.25, p.164-184, 2021. DOI: https://doi.org/10.48075/igepec.v25i1.25405.

BRASIL. Ministério do Desenvolvimento, Indústria, Comércio e Serviços. **Comex Stat**. Estatísticas de comércio exterior do Brasil. 2023. Available at: <https://comexstat.mdic.gov.br>. Accessed on: May 15 2025.

CAMP, K.M. The relationship between crude oil prices and export prices of major agricultural commodities. **Beyond the Numbers: Global Economy**, v.8, p.1-11, 2019.

CASTRO, A.B.R. de; KORNHER, L. The effect of trade and customs digitalization on agrifood trade: a gravity approach. **Q Open**, v.3, p.1-33, 2022. DOI: https://doi.org/10.1093/qopen/qoac037.

CHOI, K.-H.; YOON, S.-M. Asymmetric dependence between oil prices and maritime freight rates: a time-varying copula approach. **Sustainability**, v.12, art.10687, 2020. DOI: https://doi.org/10.3390/su122410687.

CHRIST, G.D.; OLIVEIRA, A. de; GALAFASSI, L.B.; CORONEL, D.A. O agronegócio brasileiro no comércio internacional: vulnerabilidade, retrocesso, oportunidade perdida ou situação ótima? Uma análise dos triênios (2007-2009 e 2017-2019). **Informe GEPEC**, v.26, p.190-209, 2022. DOI: https://doi.org/10.48075/igepec.v26i2.28426.

EIA. U.S. Energy Information Administration. **Europe Brent spot price FOB (annual average, US$/bbl)**. 2013. Available at: <https://www.eia.gov>. Accessed on: May 15 2025.

FERREIRA, P.C.; VIEIRA, R.M.B.; SILVA, F.B. da; OLIVEIRA, I.C.L. de. Measuring Brazilian economic uncertainty. **Journal of Business Cycle Research,** v.15, p.25-40, 2019. https://doi.org/10.1007/s41549-018-00034-3.

FISHLOW, A.; VIEIRA FILHO, J.E.R. **Agriculture and industry in Brazil**: innovation and competitiveness. New York: Columbia University Press, 2020. DOI: https://doi.org/10.7312/fish19170.

FRANCO, D. de M. Expectations, economic uncertainty, and sentiment. **Revista de Administração Contemporânea**, v.26, e210029, 2022. DOI: https://doi.org/10.1590/1982-7849rac2022210029.en.

GONÇALVES JÚNIOR, C.A.; GIROTTO, C.; LOPES, R.L.; SESSO FILHO, U.A. O comércio de valor adicionado e a participação do Brasil nas cadeias globais de valor. **Informe GEPEC**, v.28, p.164-189, 2024. DOI: https://doi.org/10.48075/igepec.v28i1.31928.

HASSAN, S.S.; SHABI, S.; CHOUDHRY, T. **Asymmetry, uncertainty and international trade**. Swansea: Swansea University School of Management, 2018. 30p. (Working Papers 2018-24).

HAYAMI, Y.; RUTTAN, V.W. **Agricultural development**: an international perspective. Baltimore: John Hopkins University Press, 1985. 506p.

HEID, B.; LARCH, M.; YOTOV, Y.V. Estimating the effects of non-discriminatory trade policies within structural gravity models. **Canadian Journal of Economics**, v.54, p.376-409, 2021. DOI: https://doi.org/10.1111/caje.12493.

HITAJ, C.; SUTTLES, S. **Trends in U.S. agriculture's consumption and production of energy**: renewable power, shale energy, and cellulosic biomass. Washington: USDA, Economic Research Service, 2016. 47p. (Economic Information Bulletin, 159).

INTERNATIONAL MONETARY FUND. Commodity Special Feature: market developments and the power of prices. In: INTERNATIONAL MONETARY FUND. **World Economic Outlook**: steady but slow: resilience amid divergence. Washington: IMF, 2024. p.29-37.

ISAH, K.O.; EKEOCHA, P. Modelling exchange rate volatility in turbulent periods: the role of oil prices in Nigeria. **Scientific African**, v.19, e01520, 2023. DOI: https://doi.org/10.1016/j.sciaf.2022.e01520.

JIA, F.; HUANG, X.; XU, X.; SUN, H. The effects of economic policy uncertainty on export: a gravity model approach. **Prague Economic Papers**, v.29, p.600-622, 2020. DOI: https://doi.org/10.18267/j.pep.754.

MATZNER, A.; MEYER, B.; OBERHOFER, H. Trade in times of uncertainty. **The World Economy**, v.46, p.2564-2597, 2023. DOI: https://doi.org/10.1111/twec.13463.

NI MHURCHU, C.; EYLES, H.; SCHILLING, C.; YANG, Q.; KAYE-BLAKE, W.; GENÇ, M.; BLAKELY, T. Food prices and consumer demand: differences across income levels and ethnic groups. **PLoS ONE**, v.8, e75934, 2013. DOI: https://doi.org/10.1371/journal.pone.0075934.

PASTORE, A.C. **A resposta da produção agrícola aos preços no Brasil**. São Paulo: APEC, 1973. 173p.

PASTORE, A.C. **Erros do passado, soluções para o futuro**: a herança das políticas econômicas brasileiras do século XX. São Paulo: Portfolio-Penguin, 2021. 336p.

PINTO, V.H.L.; SILVA, F.A. South-South migration: with whom you trade matters. **The International Trade Journal**, v.34, p.470-494, 2020. DOI: https://doi.org/10.1080/08853908.2020.1733145.

PÖYHÖNEN, P. A tentative model for the volume of trade between countries. **Weltwirtschaftliches Archiv**, v.90, p.93-100, 1963.

ROSS, M.L. What have we learned about the resource curse? **Annual Review of Political Science**, v.18, p.239-259, 2015. DOI: https://doi.org/10.1146/annurev-polisci-052213-040359.

SANTOS SILVA, J.M.C.; TENREYRO, S. Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator. **Economics Letters**, v.112, p.220-222, 2011. DOI: https://doi.org/10.1016/j.econlet.2011.05.008.

SANTOS SILVA, J.M.C.; TENREYRO, S. On the existence of the maximum likelihood estimates in Poisson regression. **Economics Letters**, v.107, p.310-312, 2010. DOI: https://doi.org/10.1016/j.econlet.2010.02.020.

SANTOS, H.F.; SILVA, M.L. da; SOARES, N.S.; COELHO JUNIOR, L.M. Concentração mundial de exportações de produtos florestais madeireiros. **Informe GEPEC**, v.28, p.190-207, 2024. DOI: https://doi.org/10.48075/igepec.v28i1.31941.

SILVA, M.L. da; SOARES, N.S.; SOUZA, J.R.M. de; SILVA, J.A.C. da. Efeito preço, quantidade e taxa de câmbio nas exportações brasileiras de celulose e de papel e papelão: um olhar para os períodos de crise econômica. **Informe GEPEC**, v.28, p.10-24, 2024. DOI: https://doi.org/10.48075/igepec.v27i2.30871.

R. pol. agríc., Brasília, v.35, e02061, 2026
DOI: 10.35977/2317-224X.rpa2026.v35.02061

SMALES, L.A. Geopolitical risk and volatility spillovers in oil and stock markets. **The Quarterly Review of Economics and Finance**, v.80, p.358-366, 2021. DOI: https://doi.org/10.1016/j.qref.2021.03.008.

SUN, Y.; MIRZA, N.; QADEER, A.; HSUEH, H.-P. Connectedness between oil and agricultural commodity prices during tranquil and volatile period. Is crude oil a victim indeed? **Resources Policy**, v.72, art.102131, 2021. DOI: https://doi.org/10.1016/j.resourpol.2021.102131.

TADESSE, G.; BADIANE, O. Determinants of African agricultural exports. In: BADIANE, O.; ODJO, S.P.; COLLINS, J. (Ed.). **Africa agriculture trade monitor 2018**. Washington: International Food Policy Research Institute, 2018. p.85-109. DOI: https://doi.org/10.2499/9780896293496.

THOMPSON, J.G. The nature of demand for agricultural products and some important consequences. **Journal of Political Economy**, v.24, p.158-182, 1916. DOI: https://doi.org/10.1086/252783.

TINBERGEN, J. **Shaping the world economy**: suggestions for an international economic policy. New York: Twentieth Century Fund, 1962. 330p.

VO, D.H.; VU, T.N.; VO, A.T.; MCALEER, M. Modeling the relationship between crude oil and agricultural commodity prices. **Energies**, v.12, art.1344, 2019. DOI: https://doi.org/10.3390/en12071344.

WANG, Y.; ZHANG, B.; DIAO, X.; WU, C. Commodity price changes and the predictability of economic policy uncertainty. **Economics Letters**, v.127, p.39-42, 2015. DOI: https://doi.org/10.1016/j.econlet.2014.12.030.

WITS. **World Integrated Trade Solution**. Washington, 2023. Available at: <https://wits.worldbank.org>. Accessed on: May 15 2025.

WORLD BANK. **World development indicators**. Washington, 2023. Available at: <https://databank.worldbank.org/source/world-development-indicators>. Accessed on: May 15 2025.

YOTOV, Y.V.; PIERMARTINI, R.; MONTEIRO, J.-A.; LARCH M. **An advanced guide to trade policy analysis**: the structural gravity model. Geneva: World Trade Organization: United Nations, 2016. 137p. DOI: https://doi.org/10.30875/abc0167e-en.

ZHANG, D.; BROADSTOCK, D.C. **Impact of international oil price shocks on consumption expenditures in ASEAN and East Asia**. Jakarta: Economic Research Institute for ASEAN and East Asia, 2014. (ERIA-DP-2014-24). DOI: https://www.eria.org/ERIA-DP-2014-24.pdf.