

ON THE IMPACT OF OIL PRICES ON SECTORAL INFLATION: EVIDENCE FROM THE WORLD'S TOP OIL EXPORTERS AND IMPORTERS

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1. Introduction

Crude oil is an extremely strategically important commodity for all countries in the world. In recent years, the oil market has gone through an intense period of change in a volatile international economic environment. High variations in the

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The Journal of Energy and Development, Vol. 49, Nos. 1-2

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price of oil can have negative consequences for economic activity and inflation. Indeed, an increase in the crude oil price is followed by an increase in the prices of petroleum products, such as the gasoline and heating oil used by consumers. This increase affects all sectors that use it as a source of energy (e.g., transport) or as raw materials (e.g., chemicals or plastics). Therefore, the result will be an increase in all prices, which will lead to high inflation rates (Dogrul and Soytaş, 2010; Cunado and Gracia, 2003). The most recent crisis of the Russian-led war in Ukraine has roiled global markets, causing stock market turmoil, sending oil prices higher, and injecting even more uncertainty into an already off-balance worldwide economy. According to an UBS analyst interviewed by the *New York Times*, if oil prices are expected to rise to \$120 dollars per barrel, the effect of this increase could cause inflation to reach 9% in the coming months, which could heighten the concerns about the potential harm to economies that are heavily dependent on oil as well as the effects on their monetary policies (Stewart, 2022). The increase in oil prices has made it more difficult to control inflation and has made the backdrop of the world inflation rate worrying. Thus, the inflationary effects of oil prices are of crucial importance as it may help governments to make decisions to ease inflationary pressures.

Since the first oil crisis erupted in 1973, the relationship between oil price and inflation has been widely discussed (see Hamilton, 1983; Ghalayini, 2011; Sek, 2017; Zivkov et al., 2019; Adekoya and Adebiyi, 2020). However, the results obtained are mixed and inconclusive. While some studies support the view that oil price has a very important impact on inflation (see Alsaedi, 2015; Long and Liang, 2018), others report evidence of a very low effect (see Zivkov et al., 2019; Conflitti and Luciani, 2019), and some of them found no impact (see Anjanaraju and Marathe, 2017; Rafiq and Salim, 2014).

One of the potential reasons for the inconclusiveness of the above-mentioned studies might be that, firstly, the effect of oil prices on inflation depends on whether the country is an oil importer or exporter. Indeed, the increases in the price of oil have differentiated impacts on an importing or exporting country. Rising oil prices might be viewed as beneficial in nations that export oil and harmful in nations that import oil. When these prices decrease, the opposite is to be expected (see Filis and Chatziantoniou, 2014; Ghalayini, 2011). In fact, the rise in oil prices, in the case of oil-exporting countries, leads to an increase in government revenue and expenditure, which tends to push up domestic demand, leading to inflation. Oil revenues boost inflationary pressures due to higher credit and higher aggregate spending. In the case of oil-importing countries, when oil prices rise, inflation also increases: a higher oil price will lead to higher production costs. Unlike in oil-exporting countries, rising oil prices lead to lower revenues due to lower production. Rising production costs will affect consumer prices. However, lower oil prices may also cause inflation because of higher demand. Thus, the main mechanism explaining the oil price effect on prices is through a shift in aggregate supply,

which should work in both cases of higher and lower oil prices. In this paper, we distinguish the effect of oil prices on inflation for oil importing and exporting countries.

Secondly, most studies have assumed that the effects of oil price on inflation are linear (see Lu et al., 2010; Sek et al., 2015; Gao et al., 2014; Mukhtarov et al., 2020; Cavalcanti and Jalles, 2013; Basnet and Upadhyaya, 2015; Valcarcel and Wohar, 2013). However, assuming a linear relationship when the true one is nonlinear could impact the results. Therefore, one should be cautious about the appropriate econometric technique to use. Nonlinearity can arise from the presence of rigidity toward nominal wage decreases. When the cost of production increases in response to the rise of oil prices, industries have the option of either reducing production or increasing the consumer prices for goods. Indeed, when the cost of production decreases in response to falling oil prices, this should result in a drop in the price of goods. Yet, if nominal wages are rigid, a drop in the price of oil may not result in a drop in the cost of goods (Ibrahim, 2015). Public regulations, such as subsidies and fixed price policies, are another cause of nonlinearity. To guarantee low and constant prices for fundamental food products and petroleum items several governments, especially in countries highly dependent on oil, have provided subsidies. Due to their restrictions on how far prices may shift, these policies have the potential to lead to nonlinearity in oil prices behavior (Lachheb and Siraj, 2019).

Recently, new empirical evidence suggests that the effects of oil price on inflation are likely to be asymmetric (Salisu et al., 2017; Long and Liang, 2018; Adekoya and Adebisi, 2020). Their argument was based on changes in inflation expectation when the oil price increases versus when it decreases. Thus, the response of inflation to oil price changes could be asymmetric. The impacts of oil shocks can vary over time due to changes in the macroeconomic structure. Due to the failure of linear models to adequately explain the transmission of oil price shocks into inflation rates, this paper accounts for asymmetric issues and the Non-linear Autoregressive Distributed Lag (NARDL) approach is implemented to examine the potential asymmetries between oil price and inflation.

Another possible reliable explanation for divergent findings in literature could be that previous studies so far neglect the possibility of threshold effects in the relationship between oil prices and inflation. In this paper, we consider a more relevant and realistic framework allowing such a relationship to be nonlinear, and subject to threshold effects. To this end, we employ the threshold regression approach proposed by Hansen (2000). To our knowledge, the threshold model has not been applied yet when modeling the relationship between oil price and inflation.

Thirdly, the effect of oil prices on inflation may differ from one sector to another since certain sectors are more sensitive and influenced by changes in oil prices. Indeed, as oil is a major input in the economy and used in critical activities, some sectors that fully depend on this energy source are more sensitive to oil price changes (Dillon and Barrett, 2013).

Therefore, our main goal in this paper is to examine sectoral inflation and assess the asymmetry and the presence of a threshold effect in the relationship between oil prices and the inflation of six sectors: transport, health, fuel, food, equipment, and clothing, for five oil-exporting countries (Russia, Canada, Norway, Brazil, and Mexico) and five oil-importing countries (China, the United States, South Korea, Germany, and the Netherlands).

Specifically, this study makes three main contributions. First, we determine the effect of oil prices on the inflation of each sector. Second, a distinction is made between the effect of oil prices on the inflation of importing and exporting countries. Third, we contribute to the existing literature by assuming that the effects of oil prices on inflation might be nonlinear. We start our analysis by exploring the short- and long-run asymmetric effects of oil prices on inflation by implementing the asymmetric (nonlinear) ARDL approach of Shin et al. (2014). The major feature of the NARDL model is its capacity to deal with asymmetries and various cointegration patterns amongst series simultaneously (see Kiswani, 2021; Lacheheb and Sirag, 2019). Then, we investigate the possible threshold impact of oil prices on inflation using the Hansen's threshold model (2000), which to our knowledge, represents the first attempt to model the relationship between oil prices and sectoral inflation using this approach. We believe that such an exercise with recent data is important as it permits us to better understand how a rise in oil prices affects global as well as sectoral inflation of a country. It also provides crucial policy implications to lessen the inflationary effect of high oil prices.

The remainder of the paper is organized as follows: Section 2 is devoted to econometric issues, while Section 3 discusses the estimation results. The last section summarizes the main findings and offers some concluding remarks.

2. Methodology

The literature includes a number of diverse inflation models, with one of the most popular being the Phillips curve, which suggests a stable and inverse relationship between inflation and unemployment. Central banks and monetary authorities often use this model to formulate and evaluate their monetary policies. The investigation of the structure of the Phillips curve and its repercussions for monetary policy has become one of the most prominent fields of economics research. Philips (1958) was the first to introduce this model by investigating the inflation in the United Kingdom according to past shocks and by establishing a relationship between the rise of money wages and unemployment.

However, the persistent shortfall in inflation from the target has led some to question the traditional relationship between inflation and the unemployment rate. One major limitation and drawback of the Phillips curve is that it assumes inflation is solely an internal problem of a country related to the domestic labor market and

ignores the fact that inflation in the present modern times is not only associated with the country but is an international phenomenon. Thus, other international variables must be integrated as determinants of inflation, such as the exchange rate. Exchange rate fluctuations can significantly affect the general level of prices (Dornbusch, 1976). According to Dornbusch, when the exchange rate decreases, meaning the domestic currency appreciates, prices at the general level are expected to decline. Dornbusch's research has been the basis for other works on the subject (Brooks, 2002; Usman and Musa, 2018; Ha et al., 2020; Pham et al., 2020; Husaini et al., 2019b; Husaini and Lean, 2021; Zhu and Chen, 2019). In fact, globalization has expanded international trade to include raw goods, as well as input products. When an economy is heavily dependent on imported products, the exchange rate is essential and plays a critical role regarding the costs of imported products. A sharp rise in the cost of import inputs followed by a decrease in the exchange rate will lead prices to rise (the import price becomes more expensive), and then cause inflation to rise too. Since most international trade is conducted in U.S. dollars, exchange rate variations have an important impact on inflation. Pham et al. (2020) examined the main determinants of inflation in the ASEAN-5 countries and confirmed the presence of considerable variations in inflation and asymmetric effects caused by exchange rate movements. Furthermore, Husaini and Lean (2021), Nasir et al. (2020a), Nasir et al. (2020b), and Nasir and Vo (2020) found that inflation is strongly influenced by the exchange rate in the short and long term, and that exchange rate strengthens the pressure on inflation. According to their results, they argued that the exchange rate is a crucial determinant of inflation. Correa and Minella (2010) confirmed the existence of a nonlinear relationship that ensures the exchange rate affects inflation in Brazil under the Philips curve model.

It should be noted that the relationship between inflation and the exchange rate could be in both directions. Indeed, inflation can be thought of as a decline in the value of money. When inflation is high, the value of a country's currency weakens.¹

Many other explanatory variables have been put forward as potential determinants of inflation. Interest rates are another factor that can affect inflation rates (see, e.g., Tillmann, 2008; Adu and Marbuah, 2011). Interest rates significantly influence the purchasing and consumption decisions of consumers, industries, and governments. This is because people's consumption choices are largely dependent on the prevailing interest rates. According to Tillmann (2008) rising interest rates lead to an increase of marginal costs of production and ultimately to higher inflation, demonstrating then that the interest rate is an important factor that affects inflation by the cost channel. Jaradat and Al-Hhosban (2014) show that rising oil prices accompanied by monetary policy such as interest rates lead to higher inflation rates. As interest rates are the major instrument used by central banks to regulate inflation, an increase in interest rates is a way to fight against excessive inflation. Recently, Nasir (2021) identified empirical evidence about the presence

of a strong relationship between inflation and interest rates and found that an increase in real interest rates leads to an increase in inflation in the United Kingdom. Bernanke et al. (1997) showed that monetary policy reacts to oil price shocks by increasing interest rates to reduce inflation, which, in turn, affects GDP and employment negatively and unemployment positively.

Sek et al. (2015) used the producer price index (PPI) as a proxy for cost production to investigate the factors affecting consumer prices.² Clark (1995) also found that the PPI impacts the consumer price index (CPI) via the production chain. When the cost of inputs increases, the cost of final products should also increase (see Salisu et al., 2017; Aroui and Nguyen, 2010; L'Oeillet and Licheron, 2008). Indeed, a rise in the price of products leads to an increase in production costs, which increases the price of final goods, decreases the buying power of wages, and pushes producer inflation (PPI) higher. Accordingly, this will intensify consumer inflation (Clark, 1995).

Following the literature, we assume that oil price, exchange rate, interest rate, producer price index as a proxy for cost production, and unemployment rate are the main determinants of inflation in our empirical research. There are additional determinants of inflation, such as fiscal policy measures like real government spending and GDP. However, due to data unavailability, we were unable to include them in the estimated model. Therefore, we consider the following model in Equation (1):

$$LCPI_{it} = \alpha_0 + \alpha_1 LEXCH_t + \alpha_2 LINT_t + \alpha_3 LPPI_t + \alpha_4 LUMP_t + \alpha_5 LOP_t + \varepsilon_t \quad (1)$$

Where $LCPI_{it}$ is the log of the consumer price index for sector i . It represents the measure of inflation and reflects the variations in percentage of the cost for the consumer to purchase a set of services and goods. LOP_t is the log of oil price. We consider the spot price of West Texas Intermediate crude oil (WTI). $LEXCH_t$, $LINT_t$, $LPPI$, and $LUMP$ are, respectively, the log of the real exchange rate, the log of the interest rate, the log of the producer price index, and the log of the unemployment rate for each country, and ε_t is a white noise error term.

Throughout the analysis, we start first with the global CPI inflation rate “Global”³ before moving on to the CPI for each sector (transport, health, fuel, food, equipment, and clothing). Indeed, “Global” CPI is the average inflation of all sectors in an economy.

As discussed in the introduction, oil price could have a positive effect on inflation in both oil-exporting and oil-importing countries, depending on the mechanism of the inflationary effect in the two groups of countries. For importing countries, the expected sign of these variables is positive: this relationship is positively correlated between crude oil prices and the inflation rate. When the price of this resource increases, inflation follows in the same direction (Anandan et al., 2013;

Sharma et al., 2012). For oil-exporting countries, since these nations significantly rely on oil revenues for their projects and GDP, oil is seen as the principal engine of economic activity in these nations. Changes in oil prices will have a large impact on government revenues, government spending, and economic expansion, which will eventually have an impact on the total demand for goods and services and consumer pricing in these nations. The increase in oil prices results in higher government revenue and expenditure, which, in turn, boosts domestic demand and ultimately contributes to rising inflation (Morsy and Kandil, 2009).

As discussed in the introduction, the effects of oil prices on inflation can be asymmetric and the short-term effects of oil prices might be different from their long-term effects. For this reason, we follow Shin et al. (2014) in decomposing the variables into positive changes and negative changes. Following that, new time-series are created utilizing the partial sum approach as illustrated in Equation (2):

$$\begin{aligned} LOP_t^+ &= \sum_{i=1}^t \Delta LOP_t^+ = \sum_{i=1}^t \max(\Delta LOP_i, 0); LOP_t^- \\ &= \sum_{i=1}^t \Delta LOP_t^- = \sum_{i=1}^t \min(\Delta LOP_i, 0) \end{aligned} \quad (2)$$

where LOP^+ (LOP^-) is the partial sum of positive (negative) changes in oil price.

Each explanatory variable in Equation (2) is then substituted with its two partial sums to get:

$$\begin{aligned} \Delta LCPI_t &= c + \sum_{i=1}^n \varphi_{1i} \Delta LCPI_{t-i} + \sum_{i=0}^n \varphi'_{2i} \Delta LOP_{t-i}^+ + \sum_{i=0}^n \varphi''_{2i} \Delta LOP_{t-i}^- \\ &+ \sum_{i=0}^n \varphi_{3i} \Delta LEXCH_{t-i} + \sum_{i=0}^n \varphi_{4i} \Delta LINT_{t-i} + \sum_{i=0}^n \varphi_{5i} \Delta LPPI_{t-i} \\ &+ \sum_{i=0}^n \varphi_{6i} \Delta LUMP_{t-i} + \lambda_1 LCPI_{t-1} + \lambda'_2 LOP_{t-1}^+ + \lambda''_2 LOP_{t-1}^- \\ &+ \lambda_3 LEXCH_{t-1} + \lambda_4 LINT_{t-1} + \lambda_5 LPPI_{t-1} + \lambda_6 LUMP_{t-1} + u_t \end{aligned} \quad (3)$$

After estimating the nonlinear ARDL model in Equation (3), several asymmetric hypotheses may be put to a rigorous test. First, the short-term effects of the explanatory variables on the CPI will be asymmetric if for a particular lag order i the estimate of φ'_{2i} is different from φ''_{2i} in Equation (3). Nevertheless, if the null hypothesis of $\sum_{i=0}^n \varphi'_{2i} = \sum_{i=0}^n \varphi''_{2i}$ is rejected by the Wald test, then there will

be established short-term or cumulative effect asymmetries. Second, if the Wald test rejects the zero values of:

$$\lambda'_2 /_{-\lambda_1} = \lambda''_2 /_{-\lambda_1},$$

these explanatory factors will have long-term asymmetric impacts on inflation.

Shin et al. (2014), and Pesaran et al. (2001), suggest two tests. An F-test to establish joint significance of the lagged level variables, and the t-test to establish significance of λ_1 which must also be negative. According to Bahmani and Nourira (2021), by meaningful estimate, we mean cointegration is supported either by the F-test or by the t-test.

To establish a more thorough and rigorous methodology and, in addition to the nonlinear ARDL model, we adopt another suitable framework that allows for the presence of potentially nonlinear threshold effects using Hansen's threshold model (2000). This modeling approach has at least two interesting features. First, in contrast to quadratic specifications frequently used in the related literature, it can capture the potentially non-monotonic impacts of oil price on inflation without imposing a priori any specific non-linear functional form. Second, both the number and position of turning points are not predetermined and they are endogenously extracted from the data.

To assess the possibility of threshold effects of oil price on inflation, following Hansen (2000), Equation (1) can be specified as follows:

$$LCP_{it} = \theta_{0L} + \theta_{1L}LEXCH_t + \theta_{2L}LINT_t + \theta_{3L}LPPI_t + \theta_{4L}LUMP_t + \theta_{5L}LOP_t$$

if $LOP_t \leq \tau$ (4)

$$LCP_{it} = \theta_{0U} + \theta_{1U}LEXCH_t + \theta_{2U}LINT_t + \theta_{3U}LPPI_t + \theta_{4U}LUMP_t + \theta_{5U}LOP_t$$

if $LOP_t > \tau$ (4)'

In Equations (4) and (4)', oil price (LOP) is the threshold variable used to split the data into different regimes or groups and δ denotes the threshold parameters. This type of modeling framework allows the impact of oil prices to differ depending on whether it is below or above a specific threshold value. According to Hansen (2000), Equations (4) and (4)' can be separately estimated using the ordinary least squares method (OLS). Roughly, the Hansen procedure involves three essential steps. First, the estimated threshold values of $\hat{\tau}$ is chosen by minimizing the sum of squared errors of Equation (4). In a second step, Hansen (2000) suggests applying a F-statistic to determine whether the threshold effect is statistically significant. The null and alternative hypotheses in (4) are as follows: i) $H_0 : \theta_{jL} = \theta_{jU}$ versus $H_1 : \theta_{jL} \neq \theta_{jU}$.

However, under H_0 , the asymptotic distributions of the F-statistics associated with each of the above hypotheses are non-standard due to the presence of the nuisance parameter δ . That is why Hansen (2000) recommends the use of the bootstrapping approach to compute the p-value and the related confidence interval for this statistic. In a third step, given the estimate $\hat{\delta}$ of the threshold variable, the slope coefficients of each of the models under consideration can be estimated by OLS.

3. Empirical Results and Discussion

One of the main objectives of this paper is to assess whether oil prices have a nonlinear asymmetric effect on sectoral inflation. The nonlinear models (3) are estimated using monthly data that covers the period July 2009 to February 2021 for each of the ten countries: five oil-importing countries (China, United States, South Korea, Germany, and the Netherlands) and five oil-exporting ones (Russia, Canada, Norway, Brazil, and Mexico). The five importing countries selected are among the top seven importing countries in the world.⁴ Based on total cost, these five countries purchased 49.7% of all crude oil imported in 2021. Although the United States is classified as an oil importing and exporting country, in our paper we preferred to put it in the group of oil importing ones given that this country is ranked as the second-largest oil importer. It should be noted that we attempted to include countries from the Gulf Cooperation Council (GCC) in our sample, as they are among the major oil-exporting nations. For instance, Saudi Arabia, the world's largest oil exporter, and Iraq and the United Arab Emirates, respectively, the fourth and fifth largest oil exporters in the world. However, variables such as the CPI or unemployment rate are not available at the sectoral level for Saudi Arabia, Iraq, the United Arab Emirates, Qatar, and Kuwait. Additionally, Oman's PPI and unemployment rate data are missing. Therefore, these countries were not included in our sample. Nevertheless, the five exporting countries selected for our study (Russia, Canada, Norway, Brazil, and Mexico) are among the top 14 exporting countries in the world.⁵ Together, these five countries accounted for 25.1% of globally exported crude oil in 2021. All data sources and definitions are detailed in Appendix A.⁶

Results of the NARDL Model: We proceed to determine the long-term and short-term dynamics of the relationship between the oil price and inflation. Therefore, first, we estimate the nonlinear autoregressive model with distributed lags (NARDL) in Equation (3). A maximum of eight lags are imposed on each first-differenced variable and the Akaike's Information Criterion (AIC) is applied to determine the optimum number of lags. Furthermore, since our sample period includes the COVID-19 pandemic, we add a dummy variable in all models to account for this disturbance.

We start our analysis with the presentation of the short-term results. As they are voluminous, short-term estimates are not reported here⁷ but are summarized in Table 1.

Table 1 provides by country and by sector a synthesis of the short-term results. This summary table reports for each country the total number of sectors having at least one significant lagged coefficient of ΔLOP^+ or ΔLOP^- . It can be observed that in the aggregate bilateral model (first column), at least one of the two variables carry at least one significant lagged coefficient in nine countries (four oil-exporting countries and five importing ones), supporting short-run effects of oil price changes on global inflation.

From Table 1 we notice that the transport, fuel, and equipment sectors are the most affected by variations in the oil price in the short term in both oil-exporting and importing countries, confirming the results of Dogrul and Soytaş (2010) and Dillon and Barrett (2013). As oil is used as a raw material in a variety of products, including equipment, gasoline, and diesel, the cost of producing these commodities increases along with the rise in oil price. In other words, as transport is the primary user of oil (International Energy Outlook, 2016) all goods that are transported are subject to higher transportation costs because of rising oil prices.

The countries with the highest number of sectors having at least one significant lagged coefficient of ΔLOP^+ or ΔLOP^- are Russia, China, and the Netherlands (7/7). These last two countries are mainly the top oil-importing nations. This inflationary impact can be explained by higher costs. An increase in oil prices leads to greater production costs, which, in turn, cause higher consumer prices and lower wage purchasing power, driving up inflation (and conversely for an oil price decrease) (see Finn, 2000; Clark, 1995). Additionally, the sector most affected by oil price variations in the short term in importing countries is the global sector. In addition, we notice that the different sectors of the importing countries are more affected by the positive variations in oil price than the negative variations. In other words, a variation in oil prices is followed by an increase in inflation for most nations, confirming the result of Lacheheb and Sirag (2019), who found a significant positive link between rising oil prices and high inflation.

For oil-exporting countries, Canada has the highest number of sectors whose short-term oil price effects ΔLOP^+ have a positive effect on inflation. Moving to negative variations of ΔLOP^- , Canada has the smallest number of sectors in the exporting countries with negative variations of the oil price in the short term, negatively impacting inflation (1 sectors), and Russia has the highest number of sectors in the exporting countries whose short-term variations of oil prices negatively impact inflation (7 sectors). Thus, we notice that the different sectors of the exporting countries are more affected by the negative variations than the positive variations. Similarly, Ito (2010) found that short-term variations in oil prices have a negative impact on inflation in Russia due to the structure of the Russian economy, which is very sensitive to oil price fluctuations.

Moving on to the top oil-importing countries, those with the highest number of sectors having at least one significant lagged coefficient of ΔLOP^+ or ΔLOP^- are China and the Netherlands (7 of 7). In addition, these two countries also have the

largest number of sectors where positive short-term variations of oil prices ΔLOP^+ have a positive impact on inflation (5 sectors). The negative inflationary effect of oil prices in the short term for importing countries is found especially in Germany (4 sectors). The importing countries are more affected by the positive variations in oil prices than the negative variations confirming then the nonlinear (asymmetric) relationship of the inflationary effect of oil price changes.

According to Chang and Wong (2003) a decrease in oil prices is not harmful for importing countries. In fact, when oil prices decline, transportation costs in importing countries also decrease. The reduction in transportation and energy costs is beneficial for consumers as it increases their disposable income. Falling oil prices, along with the decrease in product costs contribute to lower inflation, allowing central banks to maintain lower interest rates without worrying about overall inflation.

The short-term effects of oil price for the food sector exist for all five exporting countries and four of the five importing ones, confirming the result of Baffes (2007), who found a causal relationship between food prices and crude oil prices, and explained that food costs have increased for most oil-exporting nations because of rising oil prices. This result also confirms the findings of Obadi (2014) who revealed that oil price increases are associated with the rise of food prices due to the importance of oil as an input in the food sector. Oil products are used in agriculture for farming equipment and machinery (tractors), transport of other resources to farms, and delivery of farm output to the final customer. Therefore, oil price variations lead to variations in food prices (Bloomberg, 2011).

The next step is to study the inflationary effect of the long-term oil price using the nonlinear ARDL model proposed by Shin et al. (2014). The results of the long-term estimates and diagnostic statistics are reported, by country, in Appendix (B1 to B10). The impact of changes in oil prices varies from one sector to another and depending on the country (oil-exporting or oil-importing). Table 2 summarizes our results. We analyze these effects by country and by sector.

We start by analyzing the results by country. The second column of Table 2 indicates for each country the sectors for which the long-term estimates are valid (i.e., the F-test for cointegration or the ECM_{t-1} test is significant). The United States and Germany have the highest number of sectors where the F-test or the ECM_{t-1} test are statistically significant (3 out of 7) for oil-importing countries. Among all sectors, transport is the one where cointegration holds most often (5 out of 10), followed by global (3 out of 10). Due to the importance of oil as a vital source in social and economic life (transport vehicles, machinery) in both exporting and importing countries, a variation in oil prices indirectly impacts global inflation and especially in the transport sector. Oil prices and the inflation index are often linked. Any change in the price of oil affects the inflation rate, and the inflationary effects of changes in oil prices are likely to affect the prices of the sectors most dependent on oil, such as transport.

Table 2
SUMMARY TABLE^a

	Cointegration holds	LOP ⁺		LOP ⁻		Long-run asymmetric effects supported	Short-run asymmetric effects supported
		Positive effects	Negative effects	Positive effects	Negative effects		
Exporting Countries							
Russia	fuels	fuels					
Canada							
Norway#	transport, food, clothing	transport, food				transport, food	
Brazil#	food	food				food	
Mexico#	fuels, clothing	fuels				fuels	clothing
Importing Countries							
China#	transport	transport		transport		transport	
US#	global, transport, health	global, transport				global, transport	
South Korea	health, clothing				health	health	
Germany	global, transport, equipment	transport				global, transport, equipment	
Netherlands #	global, transport	global, transport				global, transport	global, transport

^a# indicates significance of the COVID-19 dummy variable.

The asymmetric short-term effects of oil price are supported, for at least one sector, only in Mexico and the Netherlands. However, the asymmetric long-term effects of the oil price are supported, for at least one sector, in eight countries. The impact of the long-term asymmetry of the oil price is important in all five oil-importing nations. Like the findings in Table 1, we notice from Table 2 that the inflationary effect of long-term oil prices for the transport sector is important for most countries. The economy relies heavily on oil, which plays a crucial role in key processes such as transportation (Salisu et al., 2017). As a result, the prices of outputs and final goods tend to rise accordingly. For example, an increase in oil prices raises the cost of energy products, like gasoline, which, in turn, drives up the inflation rate in the transport sector.

According to the summary table, the increase in oil prices leads to an increase in most sectoral inflation. In the case of oil-importing countries, when oil prices rise, inflation also rises: a higher oil price leads to higher production costs, which, in turn, cause higher consumer prices and lower wage purchasing power, then driving up inflation (see Finn, 2000). Thus, if an oil-importing nation strongly depends on importing inputs, a rise in imported products puts more pressure on the domestic currency and causes it to depreciate. As a result, exchange rate depreciation causes an increase in the inflation rate (Terra, 1998; Husaini et al., 2019a; and Husaini et al., 2019b).

For nations that export oil, higher government revenue from selling oil will result in higher consumption, which will raise demand for products and services. All other things being equal, prices for the products and services will rise as a result of the rise in demand, leading then to higher inflation (Morsy and Kandil, 2009).

On the other hand, and according to the summary table, in the case where oil prices decline (for both oil-exporting and oil-importing countries), the effect on consumer inflation is weak for almost all countries and sectors confirming that the inflationary effect of oil price is nonlinear. The impacts of rising oil prices differ from those of falling prices, and the effects of falling oil prices are either not statistically significant or have a small impact, confirming the results of Nusair (2019), which justify the choice of using a nonlinear framework.

From the results in Appendix B1-B10, and in Table 2, it can be noted that the dummy COVID-19 variable “d” is significant for three importing countries (China, the U.S., and the Netherlands) and three exporting ones (Norway, Brazil, and Mexico). This shows that the global COVID pandemic has amplified the inflationary effects of oil prices for both oil-importing and oil-exporting countries, due to the dependence of these countries on this source of energy, and that the damage caused by this pandemic (economic slowdown linked to the closing of markets) amplified the inflationary effects in these countries, confirming the findings of Arezki and Nguyen (2020). The dummy variable is significant, especially for the transport sector. The pandemic has led to the closure of factories and caused a

drop in intermediate inputs due to disruptions in the transport network (Algamdi et al., 2021; Albulescu, 2020). In other words, due to the restrictions imposed in the different countries of the world, the transport sector is the most affected by this pandemic.

For the transport sector, the asymmetric effects (short-term or long-term) are supported for 4 of the 5 oil-importing countries, whereas the global sector is supported for 3 nations. The sector most affected by the increase in the oil price (LOP+) is transport. However, this sector also benefits the most from the decrease in the oil price (LOP-), confirming the results of Choi et al. (2018). Working on a panel of 72 countries, they found that the transport sector is dependent on oil prices and demonstrated that the CPI's transportation component is the most reliable determinant of how inflation will behave globally.

According to the NARDL short- and long-term estimates and in addition to interpreting the asymmetries, it is obvious that transport is the sector most dependent on oil price variations. Due to the use of oil in a variety of products including plastics, petrochemicals, cosmetics, equipment, and clothing, the cost of producing these commodities increases along with the rise of oil prices. Then, as transport is an oil-dependent sector, all the produced goods that are transported will be subject to higher transportation costs, which will be reflected in consumer prices because of rising oil prices. The increase in oil prices mostly affects air travel and road transportation but the cost of oil has a direct impact on every type and mode of transportation. An increase in oil prices raises the cost of flights, boats, cars, taxis, and tractors; in other words, as the transport sector is the most vital sector, it will in turn have repercussions on all other sectors related to transportation (Solaymani and Kari, 2013; Choi et al., 2018).

To summarize the long-term estimate results of all tables discussed in this section, we notice that overall, for most sectors, a higher oil price leads to higher consumer prices, confirming the results of Salisu et al. (2017). Regardless of whether a country is an exporter or an importer, the oil price and inflation index are frequently linked. Any change in the price of oil affects the price of production, and the inflationary effects of crude oil price fluctuations are likely to be reflected in consumer prices (Kalthum and Masih, 2017; Li et al., 2019). In fact, an increase in PPI inflation drives up CPI inflation across oil exporting and importing countries. Theoretically, this can be explained by the "cost-push inflation" (see Clark, 1995; Sek et al., 2015): producer pricing reflects any changes in the cost of raw materials. As such, a rise in the cost of production due to an increase in the price of raw materials (for example, oil), may impact the pricing of a range of goods and services, and therefore transfer along the product's cost to consumers. Hence, a rise in producer good prices would result in an increase in the producer price index, which would then lead to an increase in the consumer price index.

According to the results presented in the Appendix tables, the exchange and interest rates act as leading indicators for CPI. When an economy is heavily

dependent on imported products, the exchange rate is essential and plays a critical role in the costs of those products. A sharp rise in the cost of inputs followed by a depreciation in the exchange rate causes prices to rise (import prices become more expensive) and then leads to a higher inflation rate. On the other hand, Lachebeh and Sirag (2019), Husaini et al. (2019b), Zhu and Chen (2019), and Mpofu (2011) also found that rising oil prices accompanied with a monetary policy such as a decrease in the interest rate led to higher inflation rates. As interest rates are the major instrument used by central banks to regulate inflation, an increase in interest rates is a way to fight against excessive inflation.

The results could be best summarized as follows: First we found that oil prices affect the rate of inflation in both net oil-importing and exporting nations. Our results confirm those of Filis and Chatziantoniou (2014) but are in contrast with those of Blanchard and Gali (2007). Second, we found that the relationship between oil prices and the CPI tends to change depending on the country and the sector. In fact, an increase in oil prices leads to a rise in most of the sectoral inflation. However, the decrease in oil prices has had little impact on the majority of exporting and importing countries. Third, the impact of oil price seems to matter more when it comes to importing countries, confirming the findings of Salisu et al. (2017). Our results confirm, in part, the results of Arouri and Nguyen (2010) and Abel and Bernanke (2001), who found that in the case of an oil price shock, an oil-importing nation immediately faces inflation and the costs of production are expected to increase, given that oil is one of the most fundamental inputs of production. As a result of the higher cost, consumer prices will rise accordingly. Fourth, our results revealed that the inflationary effects of changes in oil prices in the long and short term are likely to affect prices in the sectors most dependent on oil like the energy sector (transport), confirming the results of Beyer et al. (2009), who found that energy prices are the primary cause of rising inflation rates. Indeed, the producer price index has a stronger connection with production costs and input costs (like oil prices). All goods and products that are transported will be subject to high transportation costs as a result of rising oil prices.

Consumer prices are the prices of the final goods that are sold to consumers. Every change in the price of oil affects the price of production, and the inflationary effects of crude oil price fluctuations are likely to be reflected in consumer prices. The reason why oil price changes have an important effect on the sectors that use this energy source is that oil is a major input in the economy: it is used in critical activities such as refueling, transport and heating of houses and also in everything related to food products (food packaging and the transportation costs of these products) and if the cost of the inputs increases, the cost of the final products should increase too (see Salisu et al., 2017; L'Oeillet and Licheron, 2008; Clark, 1995).

Results of the Panel Threshold Model: As mentioned in section 2, in addition to the nonlinear ARDL model, we consider the Hansen's model (2000), which is a suitable framework allowing for the presence of potentially nonlinear threshold

effects. Based on the data of 10 importing and exporting countries for the period of July 2009 to February 2021, a preliminary investigation was conducted to examine the possibility of threshold effects in the relationship between oil price and inflation. Indeed, in the Appendix C, we plotted, for each country, the successive OLS coefficients of the OLS regression between inflation and oil price over different sub-samples sorted according to the oil price (from the lowest to the highest).⁸ This provides some preliminary visual evidence supporting our argument,⁹ namely, the presence of potentially nonlinear threshold effects on the relation between oil price and inflation. As can be seen, the curve switches from negative to positive beyond a certain level of the oil price.

Tables in Appendix (D1-D10) report empirical results of the effect of oil price on sectoral inflation for the 10 countries of our sample. In these tables, we provide the estimated coefficients with their standard deviation in parentheses. In addition, each table includes the result of F-statistics, threshold estimate τ and its confidence interval. In these tables, lower regime, i.e., below the threshold level, represents the effect on inflation when oil price is lower than the threshold level τ , while, upper regime, i.e., higher than the threshold level τ , represents the effect on inflation when oil price is higher than the threshold level τ .

As a preliminary step, we estimate the nonlinear model (4) using aggregate inflation (first column: Global). For all countries, from the F-test results, it can easily be seen that the null hypothesis of absence of a threshold effect is rejected by data at the 1% level, suggesting the presence of oil price effects on inflation. For oil-exporting countries, the oil price threshold level varies between 51.05 and 70.97. The average for the five countries is 62.70. Concerning oil-importing countries, the oil price threshold level varies between 59.81 and 84.28. The average for the five oil-importing countries is 70. Once it is established that the relationship between oil price and inflation is subject to threshold effects, the next relevant question is whether the magnitude of oil price affects inflation differently in the two detected regimes of high and low oil price level. From the oil price coefficient (OP), where oil price is greater than the threshold level, the estimated coefficient of OP is positive and significant at the 1% level. This result implies that when oil prices are above the threshold it will lead to a rise of inflation.

The sectors' inflation may respond differently to oil price. Indeed, there might be sectors that are more sensitive to oil prices than others. We use the test of Hansen (2000) to investigate the existence of a nonlinear effect between oil price and inflation at a sectoral level. The results of the threshold effect test are also shown in Appendix (D1-D10). The results of the F-test reveal that the nonlinear relationship between oil price and inflation holds for most cases except for the clothing sector in Germany and Norway. The lowest threshold level for oil price is in China for the clothing sector. However, the highest threshold level is in the Netherlands for the clothing sector. According to these results, China, with the smallest average threshold level (59.74), is the country most sensitive to oil price levels. However,

the sector most sensitive to oil prices is equipment with an average threshold level of 67.21.

Next, we turn to estimate the effect of oil price on the sectors' inflation. We first start with the lower regime, in which oil price is below the estimated threshold values. The coefficients are generally negative. For aggregate inflation (first column: Global), the coefficients are negative and significant for five out of ten countries. At the sectoral level, the coefficient of oil prices is negative and significant in five out of ten cases for the transport sector, four out of ten for the health sector, six out of ten for the fuel sector, six out of ten for the food sector, seven out of ten for the equipment sector, and four out of ten for the clothing sector.

Passing to the upper regime, in which oil price is higher than the estimated threshold values, the coefficients are generally positive. Indeed, for aggregate inflation (first column: Global), the coefficients are negative and significant for seven out of ten countries. At the sectoral level, the coefficient of oil prices is negative and significant in five out of ten cases for the transport sector, three out of ten for the health sector, four out of ten for the fuel sector, six out of ten for the food sector, six out of ten for the equipment sector, and four out of ten for the clothing sector.

On first glance, we thought that this result is contradictory with the NARDL result where we showed that the effect of oil prices on inflation is generally positive. However, the results are not contradictory since the effect of oil price is negative only when the oil price level is below the threshold. Nevertheless, in reality, the level of oil prices in recent years is well above the threshold level as determined by the Hansen's model. Thus, these estimates are almost the same as those of the NARDL model. They confirm, in part, the findings of Salisu et al. (2017) and Kalthum and Masih (2017) and show that the relationship between oil price and inflation tends to change according to sectors and countries. Our results also have highlighted the role of energy intensity, which leads to different impacts of oil prices on inflation, depending on the sector. Sectors that are more dependent on oil in their production activities tend to be significantly affected by changes in oil prices.

Our research is a comprehensive and in-depth study that fills gaps of previous studies on different points: First, we evaluated the impact of oil price shocks on determining inflation, considering the impact of previous shocks using a varied number of explanatory variables. This takes into account monetary policy, the exchange market, unemployment rate, PPI, and the role of different channels in the transmission of the inflationary effect of oil prices. Second, we conducted a comparative study depending on the country, sectors, and the most performant non-linear models able to examine the potential short- and long-run asymmetries (NARDL model) and were able to investigate the possible threshold impact of oil prices (Panel threshold model). Third, unlike most studies which use quarterly or annual data to investigate the relationship between the price of oil and inflation,

our data includes a large number of monthly observations. In addition, this data covers the COVID-19 current pandemic period, which has affected all economic activities, as well as the markets of raw materials such as the price of oil and vital sectors in an economy.

4. Conclusions and Policy Implications

In this paper, we have questioned the linear response of sectoral inflation to oil price variations, which has been a common assumption in the empirical literature. To do so, the asymmetric (nonlinear) ARDL approach of Shin et al. (2014) and the nonlinear Hansen's threshold model (2000) have been applied to monthly time-series data of six sectors: transport, health, fuel, food, equipment, and clothing, for five oil-exporting and five oil-importing countries over the period from July 2009 to February 2021. With the use of this modeling strategy, we explored the asymmetric and the nonlinear effects of oil price variations on sectoral inflation.

Our findings can be summarized as follows: for the NARDL model, the inflationary effects of changes in oil prices are likely to affect prices in the sectors most dependent on oil such as the energy sector (transport). Specifically, we found that the effect of oil prices on inflation is generally positive: an increase in oil price leads to an increase in most of the sectoral inflation. However, the decrease in oil price has a weak effect on inflation.

The results of the implementation of the Hansen's threshold model (2000), which aims at investigating whether the relationship between oil prices and inflation exhibits a threshold effect, clearly confirmed this characteristic for all countries. This result still holds at a sectoral level (with a few exceptions). Furthermore, we found that the country most sensitive to the oil price level is China, and that the sector most sensitive to the oil price is equipment.

The assumption that the inflationary effect of oil price is the same for all countries is certainly false. Therefore, nations would be affected differently by oil price variations due to their major economic activities, and their status (oil-exporting versus oil-importing nations). Thus, country-level heterogeneity should be considered. Our findings support this statement and demonstrate the originality of our study by highlighting the suitability and the flexibility of two powerful nonlinear models (NARDL and Hansen's threshold) in exploring the inflationary effects of oil prices across sectors and countries.

This study has important policy implications: to lessen the inflationary effect of high oil prices and to reduce the dependence on imported oil, governments should switch to other renewable energy sources and adopt energy-efficient and fuel-efficient technologies, namely, substituting oil with other sources of energy such as biofuels, hydrocarbons, and nuclear power, which constitute real alternatives in the long term. Central banks too should also set inflation targets and act quickly to

ease inflationary pressures. A robust monetary policy is necessary to moderate inflation. Moreover, policymakers have to diversify their economies and raise the proportion of non-oil sectors in their economic activities in order to reduce the shocks caused by changes in oil prices. Consequently, those oil-dependent countries will maintain stability and remain resilient to unanticipated shocks.

On the other hand, to assist in making appropriate decisions, all the sources of an oil price shock, whether it originates on the supply side or demand side, should be carefully considered and examined. As interest rates and inflation are linked, the government may utilize them to efficiently manage the amount of money in circulation. Central banks may reduce inflation by raising interest rates and decreasing the amount of lending and credit.

Moreover, it is essential to establish an efficient monetary policy that is often associated with a fiscal policy: a monetary policy based on pricing control to achieve low inflation, combined with a fiscal policy based on subsidies, may be able to lessen shocks brought on by high oil prices and by the excessive influence of macroeconomic variables on domestic prices.

Additional research should be directed to incorporating several other determinants in the analysis such as the money supply and the wage rate, which also might have a significant impact on the relationship between oil price and inflation.

NOTES

¹Prior to the estimation, we conducted a causality test, which revealed strong evidence of unidirectional causality running from the exchange rate to inflation for the majority of countries.

²Indeed, the producer price index (PPI) measures variations in the price that producers are paid to sell their goods. It includes manufactured, mining, and agricultural products. In fact, the cost production constitutes an important element in the PPI.

³The “global” CPI inflation also denoted “total” refers to the average of the CPI of all sectors in a country.

⁴Crude Oil Imports by Country 2021 Plus Average Unit Prices (worldstopexports.com).

⁵Crude Oil Exports by Country 2021 (worldstopexports.com).

⁶The data of this study are available from the corresponding author, Dr. Christophe Rault.

⁷The short-run coefficient estimates are available from the corresponding author, Dr. Christophe Rault.

⁸The same method is applied by Méon and Sekkat (2005) to assess whether the impact of corruption on growth depends on the quality of governance.

⁹Further econometric analyses are needed to confirm the initial visual observations.

APPENDIX A: DATA PRESENTATION

Variables	Description	Definition	Source
OP	Crude oil price (spot)	West Texas Intermediate oil per barrel in Dollars (\$)	EIA (Energy Information Administration)
CPI	Consumer price index	A measure of the change in the average consumer prices of goods and services over a given period.	IMF (International Monetary Fund)
EXCH	The real exchange rate	The exchange rate refers to the ratio of currencies to each other.	IMF (International Monetary Fund)
INT	The interest rate	Percentage that allows for the measurement of the bank's compensation for extending credit	IMF (International Monetary Fund)
PPI	Producer price index	A measure of the change in the average producer prices of goods and services by domestic producers over a given period.	IMF (International Monetary Fund)
UMP	The unemployment rate	Represents the percentage of unemployed people among the active population	IMF (International Monetary Fund)
Countries			
Oil-Exporting Countries		Russia, Canada, Norway, Brazil, Mexico.	
Oil-Importing Countries		China, United States, South Korea, Germany, The Netherlands.	

APPENDIX B1: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND
DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR RUSSIA

Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
<i>Global</i>					
−0.35 (0.57)	0.11 (2.21)	−1.02 (0.69)	−0.1 (0.15)	0.32 (0.99)	−0.005 (0.001)
<i>Transport #</i>					
0.02 (0.85)	0.05 (5.6)***	0.11 (0.54)	0.02 (0.86)	0.08 (3.61)*	−0.04 (2.85)*
<i>Health</i>					
0.70 (0.81)	0.08 (0.56)	0.63 (0.48)	0.63 (0.98)	−0.27 (0.46)	−0.37 (1.41)
<i>Fuel</i>					
0.05 (.13)	0.15 (13.1)***	0.03 (0.14)	0.15 (1.23)	0.17 (3.43)*	0.009 (0.24)
<i>Food</i>					
−0.43 (0.46)	0.07 (0.66)	−1.15 (0.57)	−0.23 (0.2)	0.32 (0.70)	−0.02 (0.31)
<i>Equipment #</i>					
−0.18 (1.9)	0.07 (11.2)***	−0.29 (0.79)	−0.04 (0.2)	0.05 (0.62)	−0.1 (17.9)***
<i>Clothing</i>					
−0.22 (0.83)	0.07 (3.79)**	−0.34 (0.54)	−0.24 (1.4)	0.001 (0)	−0.1 (7.96)***
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>	<i>Wald-S</i>	<i>Wald-L</i>	
<i>Global</i>					
1.56	−0.037 (−1.17)	0.15	0.17	2.40	
<i>Transport #</i>					
0.91	−0.18 (−2.01)	1.61	1.12	18***	
<i>Health</i>					
1.31	0.02 (1.00)	45.46***	0.01	0.40	
<i>Fuel</i>					
2.26	−0.26 (−3.5)*	21.5***	0.04	8.34***	
<i>Food</i>					
1.58	−0.05 (−1.20)	0.28	0.12	1.90	
<i>Equipment #</i>					
3.03	−0.98 (−2.18)	26.5***	1.89	9.16***	
<i>Clothing</i>					
1.96	−0.02 (−1.83)	1.85	0.056	3.64***	

APPENDIX B2: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND
DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR CANADA

Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
Global					
0.41 (1.14)	−0.01 (0.05)	−0.71 (0.02)	0.49 (0.56)	0.19 (0.401)	0.04 (0.20)
Transport					
−0.35 (0.30)	0.05 (0.53)	−0.48 (0.22)	0.24 (0.27)	0.08 (0.12)	0.02 (0.50)
Health					
0.42 (0.15)	0.07 (0.54)	−4.89 (0.73)	1.84 (0.25)	0.43 (0.14)	−0.02 (−0.1)
Fuel #					
0.45 (7.08)***	−0.02 (0.67)	0.50 (0.18)	0.19 (1.08)	0.05 (0.60)	0.003 (0.005)
Food					
1.40 (0.98)	−0.01 (0.13)	0.32 (0.002)	0.44 (0.26)	0.07 (0.05)	−0.10 (0.26)
Equipment					
0.20 (0.80)	−0.07 (3.56)*	3.51 (6.01)***	0.36 (0.72)	0.13 (0.76)	0.12 (2.78)
Clothing #					
0.45 (7.08)**	−0.02 (0.67)	0.50 (0.18)	0.19 (1.08)	0.05 (0.60)	0.003 (0.05)
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>	<i>Wald-S</i>	<i>Wald-L</i>	
Global					
11.99	−0.50 (−0.83)	0.74	2.86*	0.41	
Transport					
0.79	−0.13 (−0.92)	4.26***	0.54	0.09	
Health					
2.18	−0.03 (−0.56)	20.76***	0.06	0.17	
Fuel #					
2.81	−0.13 (−2.66)	0.93	0.05	0.69	
Food					
1.24	−0.05 (−0.81)	2.88***	1.74	0.20	
Equipment					
1.75	−0.19 (−2.01)	6.9***	0.38	0.008	
Clothing #					
2.81	−0.13 (−2.66)	0.93	0.05	0.69	

APPENDIX B3: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND
DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR NORWAY

Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
<i>Global</i>					
−0.16 (0.49)	−0.009 (0.11)	−0.02 (0.09)	−0.02 (0.11)	0.05 (0.85)	−0.006 (0.16)
<i>Transport #</i>					
−0.04 (0.22)	0.001 (0.17)	0.02 (0.59)	−0.01 (0.24)	0.06 (8.7)***	0.004 (0.82)
<i>Health</i>					
−0.40 (2.25)	0.04 (1.03)	−0.33 (2.26)	0.03 (0.18)	0.24 (5.5)***	0.15 (3.47)**
<i>Fuel #</i>					
−0.12 (0.55)	−0.008 (0.17)	−0.36 (1.83)	−0.05 (0.73)	0.16 (1.81)	0.08 (0.55)
<i>Food #</i>					
0.08 (0.48)	−0.01 (1.37)	−0.03 (0.40)	0.05 (1.99)	0.05 (2.96)*	0 (6.94)
<i>Equipment</i>					
−0.29 (4.3)***	0.01 (1.27)	−0.04 (0.36)	0.06 (2.79)	0.02 (0.63)	−0.01 (0.48)
<i>Clothing</i>					
−0.43 (0.55)	0.11 (3.01)*	−0.16 (1.29)	0.11 (0.64)	0.006 (0.05)	−0.01 (0.18)
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>	<i>Wald-S</i>	<i>Wald-L</i>	
<i>Global</i>					
1.03	−0.17 (−1.48)	.079	0.42	11.8***	
<i>Transport #</i>					
1.54	−0.84 (−4.1) **	8.78***	0.88	12.1**	
<i>Health</i>					
1.97	−0.18 (−1.53)	5.33***	3.01*	12.98***	
<i>Fuel #</i>					
1.33	−0.16 (−2.11)	.08	0.008	7.69***	
<i>Food #</i>					
4.27*	−0.93 (−4.55)**	1.11	9.18***	51.91***	
<i>Equipment</i>					
3.25	−0.79 (−3.09)	6.76***	5.04***	14.59***	
<i>Clothing</i>					
4.01*	−0.48 (−1.91)	4.15***	0.84	0.55	

APPENDIX B4: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND
DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR BRAZIL

Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
Global					
0.05 (0.40)	0.02 (0.13)	0.25 (0.45)	−0.05 (0.48)	0.2 (8.10)***	−0.10 (3.18)*
Transport					
−0.03 (0.13)	0.07 (0.84)	0.84 (2.04)	−0.08 (0.62)	0.14 (2.55)	−0.12 (2.85)*
Health					
0.12 (0.23)	0.009 (0.004)	0.32 (0.18)	−0.07 (0.01)	0.15 (1.30)	−0.08 (0.47)
Fuel					
0.03 (1.85)	0.02 (2.64)	0.12 (2.16)	0.01 (1.43)	0.03 (6.1)***	−0.005 (0.20)
Food #					
0.02 (0.71)	−0.06 (1.18)	−0.29 (0.97)	−0.01 (0.37)	0.3 (32.0)***	−0.04 (1.02)
Equipment					
−0.03 (0.01)	0.02 (0.14)	0.43 (0.98)	−0.07 (0.68)	0.12 (0.23)	−0.11 (0.27)
Clothing					
−0.13 (0.32)	0.10 (0.25)	0.53 (0.20)	−0.09 (0.17)	0.16 (0.75)	−0.09 (0.39)
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>	<i>Wald-S</i>	<i>Wald-L</i>	
Global					
3.02	−0.13 (−2.90)	13.28***	1.17	340.8***	
Transport					
2.40	−0.22 (−2.41)	0.08	0.57	117.1***	
Health					
0.83	−0.10 (−1.07)	0.68***	0.33	61.51***	
Fuel					
1.91	−0.23 (−2.82)	36.83***	0.76	106.3***	
Food #					
3.69*	−.18 (−4.24)**	2.82*	1.42	684.3***	
Equipment					
0.35	−0.09 (−0.92)	30.7***	0.02	13.28***	
Clothing					
0.74	−0.10 (−1.38)	16.4***	0.31	19.36***	

APPENDIX B5: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND
DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR MEXICO

Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
<i>Global</i>					
−0.87 (0.11)	−0.14 (0.12)	−1.79 (0.80)	−0.05 (0.46)	0.32 (0.17)	0.007 (0.02)
<i>Transport</i>					
−2.07 (0.1)	−1.43 (0.01)	−12.23 (0.01)	−0.62 (0.01)	3.19 (0.21)	1.11 (0.01)
<i>Health</i>					
−0.95 (0.39)	0.14 (0.03)	3.41 (0.03)	0.05 (0.02)	−0.41 (0.25)	−0.06 (0.48)
<i>Fuel #</i>					
−0.06 (2.16)	−0.02 (4.31)***	0.20 (4.30)***	−0.01 (1.23)	0.5 (11.8)***	0 (0.004)
<i>Food</i>					
−1.01 (0.77)	−0.01 (0.13)	−2.85 (0.47)	0.28 (1.05)	0.48 (0.79)	0.03 (0.87)
<i>Equipment</i>					
−1.12 (0.31)	0.08 (0.21)	−0.16 (0.14)	0.14 (0.54)	0.13 (0.41)	0.07 (0.20)
<i>Clothing</i>					
11.49 (0.008)	−3.81 (0.008)	−78.44 (0.008)	3.62 (0.008)	8.75 (0)	−1.00 (0)
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>	<i>Wald-S</i>		<i>Wald-L</i>
<i>Global</i>					
1.62	−0.02 (−0.35)	032	13.28***		.18
<i>Transport</i>					
1.13	−0.10 (−0.14)	44.24***	0.28		0.02
<i>Health</i>					
0.44	−0.009 (−0.2)	2.03	0.001		0.02
<i>Fuel #</i>					
6.91**	−0.87 (−6.6)**	1.44	2.04		14.88***
<i>Food</i>					
1.24	−0.07 (−0.93)	.02	1.38		0.95
<i>Equipment</i>					
1.50	−0.04 (−0.05)	6.17***	0.07		0.17
<i>Clothing</i>					
5.40**	−0.003 (−0.03)	0.16	5.51**		.0008

APPENDIX B6: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND
DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR CHINA

Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
Global #					
0.21 (2.13)	−0.05 (4.14)**	0.08 (0.61)	0.03 (0.16)	0.09 (3.79)*	−0.01 (0.74)
Transport #					
0.01 (0.59)	−0.02 (7.82)***	0.08 (1.25)	−0.05 (2.7)	0.1 (22.1)***	0.03 (6.75)***
Health #					
0.10 (0.78)	−0.02 (0.47)	−0.04 (0.90)	0.14 (2.03)	0.15 (6.3)***	0.01 (0.36)
Fuel #					
0.37 (3.28)*	−0.05 (2.48)	0.27 (1.22)	0.15 (1.87)	0.11 (2.74)	−0.01 (0.93)
Food					
0.67 (0.65)	−0.22 (1.17)	−0.13 (0.35)	0.15 (0.12)	0.59 (1.23)	0.35 (0.68)
Equipment #					
0.26 (7.19)***	−0.02 (1.73)	−0.19 (2.27)	0.06 (1.34)	0.1 (15.3)***	0.05 (5.26)***
Clothing					
0.26 (6.03)**	−0.04 (6.83)	−0.20 (2.63)	−0.15 (6.5)*	0.09 (7.12)**	0.06 (6.84)**
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>	<i>Wald-S</i>	<i>Wald-L</i>	
Global #					
0.99	−0.33 (−2.13)	4.76***	4.84***	12.02***	
Transport #					
3.74	−0.40 (−3.78)**	0.02	0.44	19.71***	
Health #					
1.54	0.21 (1.40)	20.27***	2.05	9.37***	
Fuel #					
1.52	−0.57 (−2.70)	7.61***	1.90	8.16***	
Food					
2.63	0.10 (0.77)	9.09***	5.64***	2.30	
Equipment #					
1.42	−0.22 (−2.30)	21.52***	0.34	17.89***	
Clothing					
1.49	−0.93 (−3.11)	0.15	0.54	2.13	

APPENDIX B7: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR UNITED STATES

<i>LEXCHⁱ</i>	Panel A: Estimates of long-term coefficients				
	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
<i>Global #</i>					
−0.13 (3.95)*	0.005 (0.80)	0.04 (0.30)	0.03 (0.27)	0.05 (9.3)***	−0.007 (0.04)
<i>Transport #</i>					
−1.20 (5.67)***	0.01 (0.16)	−1.73 (0.90)	0.71 (10.6)	0.32 (6.1)***	−0.02 (0.81)
<i>Health #</i>					
1.53 (0.68)	0.08 (0.53)	6.64 (0.83)	−0.03 (0.01)	−0.53 (0.85)	−0.18 (0.88)
<i>Fuel #</i>					
0.47 (0.26)	0.02 (0.41)	0.94 (0.16)	0.02 (0.10)	0.06 (0.37)	0.02 (0.55)
<i>Food</i>					
−0.08 (0.42)	−0.007 (0.33)	−0.71 (0.15)	−0.23 (1.72)	0.10 (0.35)	0.10 (0.57)
<i>Equipment #</i>					
−2.58 (0.10)	0.51 (0.01)	11.88 (0.13)	0.73 (0.16)	0.03 (0.01)	−0.13 (0.06)
<i>Clothing</i>					
1.22 (0.24)	−0.10 (0.73)	1.09 (0.77)	−0.94 (0.48)	−0.05 (0.04)	0.28 (0.34)
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>	<i>Wald-S</i>	<i>Wald-L</i>	
<i>Global #</i>					
4.21*	−0.36 (−2.95)	0.004	0.50	12.92***	
<i>Transport #</i>					
2.90	−0.33 (−3.66)*	2.24	.04	7.80***	
<i>Health #</i>					
4.09*	−.03 (−0.96)	1.25	.12	.74	
<i>Fuel #</i>					
1.03	−.02 (−0.56)	0.07	0.03	.26	
<i>Food</i>					
1.03	−0.08 (−1.51)	9.21***	0.01	9.70	
<i>Equipment #</i>					
1.25	−0.005 (−0.11)	0.05	0.34	0.10	
<i>Clothing</i>					
1.08	0.06 (0.62)	2.36	0.11	0.43	

APPENDIX B8: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND DIAGNOSTICS
OF THE NONLINEAR ARDL MODEL FOR SOUTH KOREA

Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
<i>Global #</i>					
0.02 (0.15)	−0.09 (5.32)***	0.84 (6.34)***	0.08 (0.25)	0.01 (0.25)	0.01 (0.16)
<i>Transport #</i>					
0.07 (1.48)	−0.04 (1.31)	0.75 (6.12)***	−0.03 (0.4)	0.06 (1.63)	0.06 (2.25)
<i>Health #</i>					
0.01 (0.56)	−0.02 (7.17)***	0.27 (13.42)***	−0.02 (2.3)	−0.01 (2.47)	−0.02 (7.75)***
<i>Fuel #</i>					
−0.04 (0.22)	−0.13 (6.17)**	0.74 (3.15)*	−0.07 (5.9)	0.07 (1.46)	0.05 (1.05)
<i>Food</i>					
0.09 (0.66)	−0.15 (3.83)*	1.74 (6.76)**	0.26 (1.85)	0.02 (0.11)	0.01 (0.04)
<i>Equipment #</i>					
−0.06 (1.09)	−0.01 (0.35)	0.83 (6.70)**	0.08 (0.26)	−0.02 (0.25)	−0.05 (2.00)
<i>Clothing</i>					
−0.14 (0.35)	−0.16 (0.20)	1.79 (0.73)	−1.35 (0.10)	−0.11 (0.23)	−0.06 (0.01)
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>		<i>Wald-S</i>	<i>Wald-L</i>
<i>Global #</i>					
1.80	−0.11 (−1.54)	0.005		0.36	0.09
<i>Transport #</i>					
2.13	−0.27 (−3.18)	3*		.06	0.40
<i>Health #</i>					
5.21**	−0.53 (−4.8)**	0.11		0.69	26.71***
<i>Fuel #</i>					
0.93	−0.16 (−1.82)	6.97***		0.008	1.08
<i>Food</i>					
1.71	−0.30 (−1.71)	9.64***		0.25	0.11
<i>Equipment #</i>					
1.91	−0.29 (−2.05)	1.85		1.04	14.31***
<i>Clothing</i>					
3.83*	−0.02 (−0.33)	11.55***		2.80	0.03

APPENDIX B9: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR GERMANY

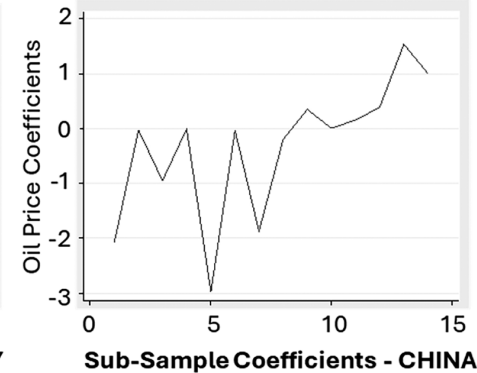
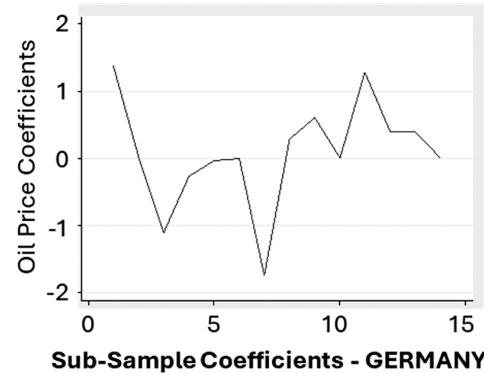
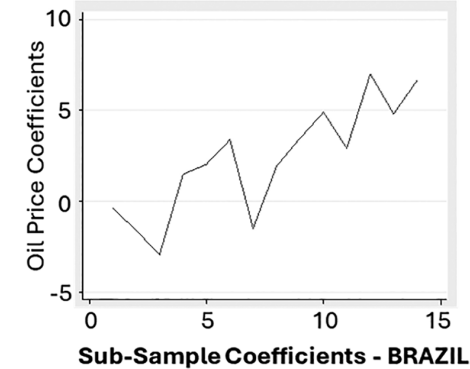
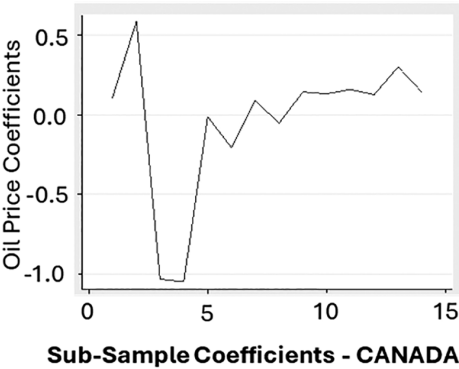
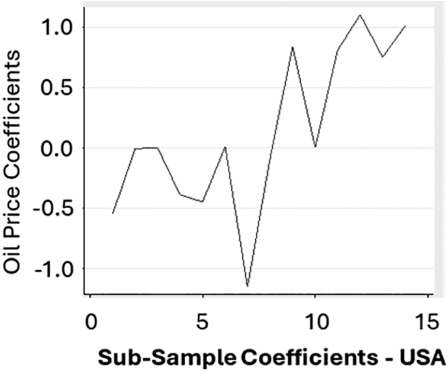
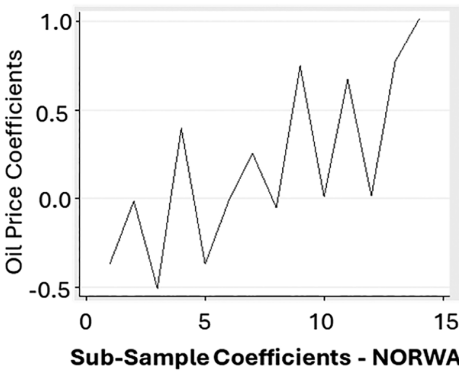
Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
<i>Global #</i>					
−0.11 (0.15)	−0.02 (12.2)***	0.42 (3.36)*	0.06 (2.9)*	0.03 (1.71)	0.01 (0.54)
<i>Transport #</i>					
0.01 (0.31)	0.01 (3.86)*	0.94 (12.26)***	−0.04 (0.09)	0.04 (2.80)*	0.02 (1.32)
<i>Health #</i>					
0.24 (0.82)	0.03 (1.80)	−0.55 (0.51)	−0.19 (2.69)	−0.01 (0.01)	−0.02 (0.18)
<i>Fuel #</i>					
0.61 (0.48)	−0.008 (0.36)	3.46 (1.34)	0.19 (0.95)	−0.15 (0.49)	−0.15 (0.68)
<i>Food</i>					
1.21 (0.50)	−0.05 (0.50)	4.65 (0.36)	−0.59 (0.72)	−0.60 (0.68)	−0.35 (0.61)
<i>Equipment #</i>					
−0.06 (2.58)	−0.006 (2.18)	0.02 (0.23)	0.01 (0.87)	0.01 (1.47)	−0.001 (0.18)
<i>Clothing</i>					
−0.08 (0.06)	0.04 (1.07)	0.49 (0.21)	−0.16 (0.95)	−0.08 (0.4)	−0.07 (0.69)
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>		Wald-S	Wald-L
<i>Global #</i>					
3.30	−0.5 (−4.4)**	0.80		0.53	3.08*
<i>Transport #</i>					
3.14	−0.88 (−3.9)**	0.68		0.30	4.01**
<i>Health #</i>					
2.09	−0.28 (−2.67)	50.1***		0.57	0.68
<i>Fuel #</i>					
2.06	−0.05 (−1.09)	27.25***		6.78***	0.03
<i>Food</i>					
2.20	−0.10 (−0.99)	0.87		3.43	0.74
<i>Equipment #</i>					
6.25**	−0.82 (−3.48)*	5.89***		2.85*	6.81***
<i>Clothing</i>					
3.23	−0.36 (−1.68)	0.85		0.93	0.01

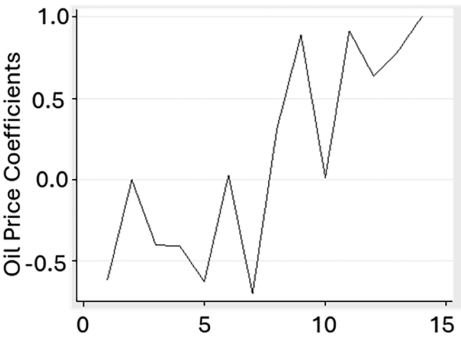
APPENDIX B10: ESTIMATES OF THE LONG-TERM COEFFICIENTS AND DIAGNOSTICS OF THE NONLINEAR ARDL MODEL FOR THE NETHERLANDS

Panel A: Estimates of long-term coefficients					
<i>LEXCHⁱ</i>	<i>LINTⁱ</i>	<i>LPPIⁱ</i>	<i>LUMPⁱ</i>	<i>POSⁱ</i>	<i>NEGⁱ</i>
Global #					
0.32 (6.38)***	0.04 (5.08)	0.24 (4.34)***	0.06 (3.5)	0.05 (5.0)***	-0.009 (0.16)
Transport #					
0.10 (0.32)	0.07 (6.87)***	0.34 (4.16)***	0.6 (1.5)**	0.1 (12.1)***	0.04 (2.06)
Health #					
-2.14 (0.31)	0.19 (0.48)	-1.96 (0.37)	-0.11 (0.27)	0.64 (0.48)	0.46 (0.44)
Fuel #					
0.36 (0.90)	0.06 (1.39)	0.13 (0.15)	0.03 (0.97)	0.16 (3.06)*	0.06 (0.70)
Food					
0.26 (1.85)	0.02 (1.25)	0.33 (3.66)*	0.03 (0.36)	0.01 (0.17)	-0.03 (1.04)
Equipment #					
0.01 (0.01)	0.06 (11.06)**	0.17 (2.76)	0.01 (3.7)*	-0.003 (0.01)	-0.03 (2.94)*
Clothing					
0.57 (2.00)	0.14 (6.93)**	0.76 (4.36)**	0.06 (4.)***	-0.08 (1.07)	-0.11 (2.60)
Panel B: Diagnostics					
<i>F</i>	<i>ECM_{t-1}</i>	<i>LM</i>	<i>Wald-S</i>	<i>Wald-L</i>	
Global #					
3.19	-0.41 (-3.54)*	0.005	2.96*	70.77***	
Transport #					
3.92*	-0.66 (-3.9)**	0.77	6.20***	54.78***	
Health #					
1.61	-0.05 (-0.71)	0.14	1.02	0.57	
Fuel #					
3.38	-0.16 (-1.94)	44.76***	4.84***	16.63***	
Food					
2.26	-0.29 (-2.96)	0.007	1.43	20.78***	
Equipment #					
2.29	-0.39 (-2.58)	0.42	3.30*	15.28***	
Clothing					
2.72	-0.98 (-3.30)	7.11***	1.17	2.00	

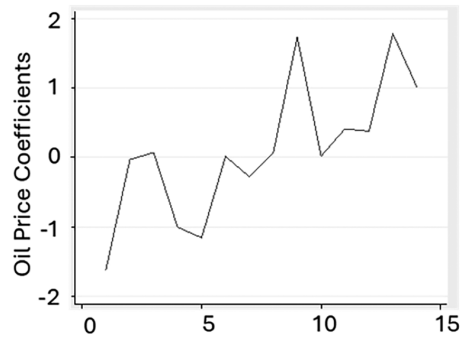
Notes for all Appendix B Tables: Numbers in brackets are absolute values of the t-ratios. *, and ** indicate significance level at 10% and 5%, respectively. Number in brackets next to ECM_{t-1} is the absolute value of the t-ratio. The upper bound critical value is -3.46 (-3.78) at the 10% (5%) significance level. It is derived from Pesaran et al. (2001, Table CII-Case III, page 303). LM refers to the Lagrange Multiplier test of residual serial correlation. It has a χ^2 distribution with one degree of freedom. The critical value is 2.70 (3.84) at the 10% (5%) significance level. Wald tests have also the χ^2 distribution with one degree of freedom. The critical values are 2.70 and 3.84 at the 10% and 5% significance levels, respectively. # Indicates significance of the COVID-19 dummy variable.

APPENDIX C: COEFFICIENTS OF THE OLS REGRESSION BETWEEN INFLATION AND OIL PRICE FOR DIFFERENT LEVELS OF THE OIL PRICE

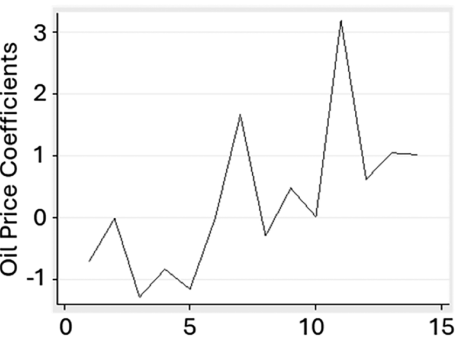




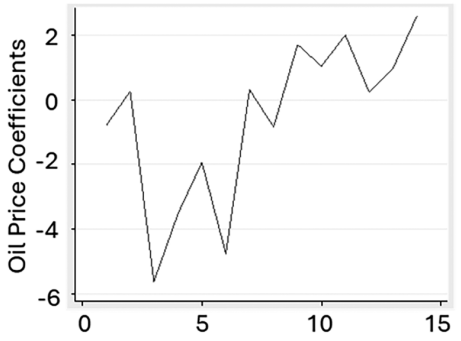
Sub-Sample Coefficients - NETHERLANDS



Sub-Sample Coefficients - MEXICO



Sub-Sample Coefficients - RUSSIA



Sub-Sample Coefficients - SOUTH KOREA

APPENDIX D1: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR RUSSIA

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	30.7#	39.12#	36.59#	30.14#	29.55#	28.45#	30.92#
<i>P-value</i>	0	0	0	0	0	0.0003	0
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>							
	63.81	59.87	63.85	63.69	63.85	59.03	63.69
<i>95%Confidence</i>							
<i>Interval</i>	[63.68, 63.82]	[59.87, 60.82]	[59.87, 63.85]	[62.72, 63.85]	[63.69, 63.85]	[57.51, 63.85]	[56.95, 63.69]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	-0.05 (0.01)#	-0.03 (0.008)#	-0.06 (0.01)#	-0.04 (0.01)#	-0.051 (0.01)#	-0.03 (0.009)#	-0.05 (0.01)#
<i>LEXCH</i>	0.089 (0.02)#	0.05 (0.03)*	0.10 (0.03)	0.03 (0.02)	0.07 (0.04)*	0.09 (0.02)#	0.20 (0.03)#
<i>LINT</i>	-0.12 (0.01)#	-0.15 (0.01)#	-0.15 (0.01)#	-0.17 (0.01)#	-0.08 (0.02)#	-0.12 (0.01)#	-0.12 (0.01)#
<i>LPPI</i>	0.33 (0.06)#	0.33 (0.05)#	0.32 (0.07)#	0.24 (0.05)#	0.42 (0.08)	0.21 (0.05)#	0.26 (0.06)#
<i>LUMP</i>	-0.008 (0.027)	-0.06 (0.02)#	0.04 (0.03)	-0.13 (0.03)#	0.10 (0.03)#	-0.003 (0.03)	-0.06 (0.04)
Upper Regime ($\geq \tau$)							
<i>LOP</i>	-0.02 (0.03)	0.10 (0.02)#	-0.06 (0.04)	0.03 (0.04)	0.01 (0.04)	.15 (0.01)#	0.04 (0.02)\$
<i>LEXCH</i>	-0.18 (0.07)#	-0.02 (0.04)	-0.23 (0.08)#	-0.13 (0.09)	-0.23 (0.08)#	0.02 (0.04)	-0.11 (0.05)\$
<i>LINT</i>	0.03 (0.008)#	0.03 (0.006)#	0.07 (0.01)#	0.02 (0.01)\$	0.01 (0.009)	0.01 (0.006)#	0.02 (.007)#
<i>LPPI</i>	0.69 (0.03)#	0.66 (0.02)#	0.68 (0.03)#	0.74 (0.04)#	0.76 (0.04)#	0.680 (0.02)#	0.63 (0.02)#
<i>LUMP</i>	-0.04 (0.02)\$	-0.02 (0.02)	-0.03 (0.03)	-0.09 (0.04)\$	-0.02 (0.03)	0.05 (0.02)#	-0.03 (0.02)

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D2: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR CANADA

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	61.98#	43.86#	70.42#	69.28#	60.50#	44.74#	69.28#
<i>P-value</i>	0	0	0	0	0	0	0
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>							
	63.85	70.97	63.85	63.85	70.97	70.97	63.85
<i>95%Confidence</i>							
<i>Interval</i>	[63.85, 63.85]	[70.97, 71.04]	[63.69, 63.85]	[59.28, 73.73]	[70.97, 71.04]	[70.97, 74.46]	[59.28, 73.73]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	0.006 (0.005)	-0.08 (0.02)#	0.003 (0.008)	-0.01 (0.003)#	-0.07 (0.01)#	-0.05 (0.01)\$	0.01 (0.003)#
<i>LEXCH</i>	-0.08 (0.03)#	-0.62 (0.10)#	-0.06 (0.05)	-0.100 (0.01)#	0.22 (0.06)#	0.10 (0.05)\$	-.100 (0.01)#
<i>LINT</i>	0.004 (.001)#	0.01 (0.007)	-0.01 (0.002)#	0.002 (0.001)\$	0.002 (0.005)	0.01 (0.003)#	.002 (0.001)\$
<i>LPPI</i>	0.27 (0.03)#	0.45 (0.11)#	-0.24 (0.04)#	-0.46 (0.02)#	0.55 (0.10)#	1.24 (0.05)#	-0.46 (0.02)
<i>LUMP</i>	-0.007 (0.005)	-0.009 (0.02)	-0.03 (0.009)#	0.002 (0.004)	-0.04 (0.02)\$	-0.0 1(0.01)	.002 (0.004)
Upper Regime ($\geq \tau$)							
<i>LOP</i>	0.026 (0.01)\$	0.055 (0.01)#	0.08 (0.01)#	0.06 (0.01)#	0.01 (0.02)#	0.06 (0.01)#	0.06 (0.01)#
<i>LEXCH</i>	0.15 (0.03)#	0.28 (0.03)#	-0.10 (0.04)#	0.10 (0.05)#	-0.07 (0.05)	-0.10 (0.05)\$	0.10 (0.05)\$
<i>LINT</i>	-0.001 (0.003)	-0.01 (0.003)#	-0.01 (0.004)#	-0.01 (0.006)	0.01 (0.005)\$	-0.02 (0.004)#	-0.01 (0.006)*
<i>LPPI</i>	1.15 (0.07)#	1.29 (0.07)#	0.90 (0.09)#	0.59 (0.12)#	1.14 (0.11)#	2.24 (0.09)#	0.59 (0.12)#
<i>LUMP</i>	-0.04 (0.01)#	0.005 (0.01)	-0.03 (0.02)	-0.03 (0.02)	-0.06 (0.02)#	-0.01 (0.01)	-0.03 (0.02)

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D3: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR NORWAY

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	41.48#	28.47#	34.11	50.91#	25.93#	35.18#	11.70
<i>P-value</i>	0	0	0	0	0	0	0.37
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>							
	51.05	51.05	49.77	75.71	49.77	71.04	87.85
<i>95%Confidence</i>							
<i>Interval</i>	[50.89, 51.05]	[50.89, 51.05]	[47.21, 66.24]	[70.97, 75.71]	[47.81, 81.88]	[71.04, 71.04]	[57.87, 87.85]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	0.007 (0.003)\$	0.02 (0.03)	-0.04 (0.02)\$	0.01 (0.03)	-0.01 (0.02)	-0.04 (0.02)\$	0.02 (0.02)
<i>LEXCH</i>	-0.22 (0.19)	-0.41 (0.20)\$	-0.01 (0.22)	-0.41 (0.15)#	-0.06 (0.22)	-0.70 (0.13)#	0.02 (0.13)
<i>LINT</i>	-0.07 (0.008)#	-0.08 (0.009)#	-0.07 (0.009)#	-0.03 (0.01)#	-0.06 (0.01)#	-0.05 (0.008)#	-0.0008 (0.01)
<i>LPPI</i>	0.06 (0.09)	0.06 (0.08)	0.22 (0.07)#	0.45 (0.04)#	-0.03 (0.09)	0.09 (0.03)#	-0.21 (0.05)#
<i>LUMP</i>	-0.15 (051)	-0.16 (0.04)#	-0.05 (0.04)	-0.03 (0.03)	-.012 (0.05)\$	-0.01 (0.03)	-0.07 (0.03)\$
Upper Regime ($\geq \tau$)							
<i>LOP</i>	0.07 (0.01)\$	-0.05 (.001)#	-0.01 (0.01)	0.04 (0.03)	0.02 (0.01)\$	0.02 (0.02)	0.07 (0.09)
<i>LEXCH</i>	-0.51 (0.06)\$	-0.58 (0.06)#	-0.62 (0.07)#	-0.33 (0.08)#	-0.52 (0.05)#	-0.34 (0.08)#	0.18 (0.26)
<i>LINT</i>	-0.01 (0.008)	-0.01 (0.009)	-0.02 (0.008)#	-0.03 (0.01)#	-0.01 (0.006)*	-0.01 (0.01)	0.07 (0.04)*
<i>LPPI</i>	0.23 (0.02)\$	0.28 (0.02)#	0.26 (0.02)#	0.06 (0.05)	0.11 (0.02)#	-0.05 (0.02)#	0.04 (0.30)
<i>LUMP</i>	0.01 (0.02)	-0.0003 (0.02)	-0.004 (0.02)	0.11 (0.03)#	-0.01 (0.01)	0.004 (0.01)	0.03 (0.05)

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D4: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR BRAZIL

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	49.08#	47.72#	50.60#	49.85#	48.91#	49.65#	49.12#
<i>P-value</i>	0	0	0	0	0	0	0
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>							
	63.85	63.85	63.85	63.85	63.85	63.85	63.85
<i>95%Confidence</i>							
<i>Interval</i>	[63.85, 63.85]	[63.69, 63.85]	[63.85, 63.85]	[63.69, 63.85]	[63.69, 63.85]	[63.85, 63.85]	[63.69, 63.85]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	0.005 (0.50)	0.008 (0.04)	0.01 (0.03)	0.001 (0.003)	0.007 (0.05)	0.002 (0.03)	-0.002 (0.04)
<i>LEXCH</i>	0.21 (0.10)\$	0.19 (0.09)\$	0.06 (0.07)	0.03 (0.009)#	0.18 (0.10)*	0.13 (0.07)#	0.22 (0.09)\$
<i>LINT</i>	-0.28 (0.02)#	-0.24 (0.02)#	-0.21 (0.02)#	-0.009 (0.002)#	-0.32 (0.30)	-0.21 (0.02)#	-0.25 (0.02)#
<i>LPPI</i>	-0.99 (0.38)#	-1.12 (0.35)#	-0.58 (0.27)\$	-0.06 (0.03)\$	-0.77 (0.41)*	-0.55 (0.29)*	-0.89 (0.37)\$
<i>LUMP</i>	-0.36 (0.03)#	-0.33 (0.03)#	-0.26 (0.02)#	-0.02 (0.002)#	-0.39 (0.03)#	-0.30 (0.02)#	-0.35 (0.03)#
Upper Regime ($\geq \tau$)							
<i>LOP</i>	0.03 (0.13)	0.03 (0.12)	0.02 (0.10)	0.01 (0.01)	0.03 (0.14)	0.01 (0.11)	0.01 (0.12)
<i>LEXCH</i>	-1.63 (0.10)#	-1.52 (0.09)#	-1.30 (0.08)#	-0.18 (0.01)#	-1.76 (0.11)#	-1.40 (0.08)#	-1.58 (0.09)#
<i>LINT</i>	0.67 (0.12)#	0.61 (0.11)#	0.55 (0.09)#	0.10 (0.01)#	0.74 (0.13)#	0.58 (0.10)#	0.61 (0.11)#
<i>LPPI</i>	2.64 (0.34)#	2.66 (0.32)#	2.15 (0.25)#	0.49 (0.04)#	2.63 (0.37)#	2.24 (0.28)#	2.51 (0.32)#
<i>LUMP</i>	-0.44 (0.05)#	-0.40 (0.05)#	-0.34 (0.04)#	-0.03 (0.007)#	-0.48 (0.06)#	-0.36 (0.04)#	-0.41 (0.05)#

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D5: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR MEXICO

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	47.97#	48.63#	46.25#	34.56#	32.81#	25.84#	39.49#
<i>P-value</i>	0	0	0	0	0	0	0
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>							
	70.97	63.85	66.24	75.78	53.46	49.81	63.85
<i>95%Confidence</i>							
<i>Interval</i>	[51.37, 81.88]	[62.72, 63.85]	[63.69, 66.24]	[75.78, 76.38]	[49.81, 71.04]	[49.51, 53.46]	[63.69, 63.85]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	0.001 (0.009)	0.07 (0.01)#	-0.005 (0.03)	0.006 (0.01)	-0.0001 (0.01)	0.03 (0.008)	0.10 (.006)\$
<i>LEXCH</i>	0.02 (0.02)	0.05 (0.04)	-0.14 (0.05)\$	0.02 (0.03)	0.07 (0.03)\$	0.01 (0.02)	-0.03 (0.02)
<i>LINT</i>	0.38 (0.006)#	0.07 (0.01)#	0.005 (0.03)	0.02 (0.01)\$	0.05 (0.009)\$	0.03 (0.007)	0.03 (0.005)\$
<i>LPPI</i>	0.92 (0.01)#	1.05 (0.07)#	0.84 (0.99)	0.71 (0.02)#	1.13 (0.04)\$	0.85 (0.04)	0.41 (0.03)\$
<i>LUMP</i>	0.05 (0.008)#	0.01 (0.03)	0.002 (0.06)	0.07 (0.01)#	0.04 (0.01)\$	0.02 (0.02)	-0.009 (0.01)
Upper Regime ($\geq \tau$)							
<i>LOP</i>	0.02 (0.01)\$	0.01 (0.01)	0.01 (0.01)	0.05 (0.02)\$	0.51 (0.01)#	-0.01 (.007)	0.01 (0.01)
<i>LEXCH</i>	-0.08 (0.02)#	-0.01 (0.04)	-0.01 (0.02)	-0.18 (0.03)#	-0.14 (0.05)#	-0.09 (0.02)#	-0.05 (0.01)#
<i>LINT</i>	-0.10 (0.01)#	-0.03 (0.01)#	-0.01 (0.008)	-0.16 (.002)#	-0.009 (0.01)	0.005 (0.008)	0.008 (0.007)
<i>LPPI</i>	0.50 (0.04)#	1.43 (0.01)#	0.97 (0.01)#	-0.20 (0.08)#	1.19 (0.01)#	0.80 (0.10)#	0.61 (0.1)#
<i>LUMP</i>	0.09 (0.01)#	-0.07 (0.01)#	-0.04 (0.006)#	0.22 (0.01)#	0.05 (0.01)#	0.01 (0.007)	-0.006 (0.006)

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D6: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR CHINA

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	43.49#	46.87#	44.69#	15.90\$	51.39#	48.21#	14.35*
<i>P-value</i>	0	0	0	0.02	0	0	0.09
<i>Critical value</i> <i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>	63.85	63.85	59.81	63.69	62.22	63.85	40.93
<i>95%Confidence</i> <i>Interval</i>	[59.87, 63.85]	[59.87, 71.04]	[59.03, 63.85]	[59.28, 74.46]	[62.22, 62.22]	[63.85, 63.85]	[38.30, 81.88]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	0.02 (0.007)#	-0.003 (0.005)	-0.005 (0.01)	-0.03 (0.01)#	-0.04 (0.02)\$	-0.02 (0.006)#	-0.05 (0.02)#
<i>LEXCH</i>	0.11 (0.07)	-0.01 (0.03)	0.07 (0.06)	-0.01 (0.12)	0.67 (0.15)\$	0.09 (0.06)	2.18 (0.41)#
<i>LINT</i>	0.06 (0.003)#	0.03 (0.003)#	0.08 (0.007)#	0.01 (0.006)*	0.03 (0.02)	0.05 (0.003)#	0.06 (0.01)#
<i>LPPI</i>	0.1 (0.2)	0.20 (0.03)#	0.32 (0.08)#	0.52 (0.06)#	1.29 (0.19)\$	0.1 (0.09)	-0.71 (0.41)*
<i>LUMP</i>	0.14 (0.007)#	0.01 (0.01)	0.15 (0.02)#	-0.04 (0.02)\$	-0.003 (0.07)	0.13 (0.06)\$	0.28 (0.12)\$
Upper Regime ($\geq \tau$)							
<i>LOP</i>	0.05 (0.03)*	0.05 (0.01)#	0.02 (0.01)	0.04 (0.06)	0.09 (0.02)#	0.005 (0.01)	0.05 (0.01)#
<i>LEXCH</i>	0.77 (0.05)#	0.43 (0.04)#	0.50 (0.03)#	0.71 (0.13)\$	0.87 (0.08)#	0.61 (0.03)#	0.24 (0.09)#
<i>LINT</i>	0.05 (0.01)#	0.02 (0.004)	0.08 (0.004)#	0.06 (0.02)#	0.06 (0.01)#	0.03 (0.006)#	-0.03 (0.008)#
<i>LPPI</i>	0.14 (0.1)	0.12 (0.03)#	0.19 (0.03)#	0.39 (0.14)#	0.10 (0.07)	0.13 (0.08)	0.03 (0.05)
<i>LUMP</i>	-0.06 (0.02)#	-0.02 (0.01)\$	-0.01 (0.01)	-0.02 (0.04)	-0.13 (0.02)#	-0.005 (0.17)	-0.18 (0.02)#

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D7: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR UNITED STATES

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	30.79#	18.78#	41.09#	50.92#	51.61#	44.30#	30.50#
<i>P-value</i>	0	0.005	0	0	0	0	0
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>							
	70.97	84.28	59.03	59.81	59.87	60.82	59.87
<i>95%Confidence</i>							
<i>Interval</i>	[59.03, 74.46]	[84.28, 85.51]	[51.99, 75.23]	[59.03, 62.22]	[59.81, 62.22]	[59.87, 63.85]	[57.51, 68.05]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	0.02 (0.008)	0.01 (0.02)	0.02 (0.01)	0.02 (0.009)\$	0.01 (0.008)	0.006 (0.008)	0.001 (0.01)
<i>LEXCH</i>	0.09 (0.06)	-0.69 (0.14)#	0.31 (0.08)#	0.37 (0.07)\$	-0.14 (0.04)\$	-0.18 (0.04)\$	-0.06 (0.08)
<i>LINT</i>	-0.01 (0.005)\$	0.009 (0.01)	-0.03 (0.006)#	-0.03 (0.006)\$	-0.02 (0.006)\$	-0.02 (0.004)\$	0.01 (0.01)
<i>LPPI</i>	0.89 (0.06)#	0.92 (0.01)#	0.77 (0.05)#	1.28 (0.05)\$	0.48 (0.06)\$	0.45 (0.04)\$	-0.47 (0.10)\$
<i>LUMP</i>	0.006 (0.007)	0.04 (0.01)#	-0.02 (0.01)	-0.01 (0.01)	0.007 (0.008)	0.01 (0.006)*	-0.005 (0.01)
Upper Regime ($\geq \tau$)							
<i>LOP</i>	0.04 (0.01)#	0.10 (0.07)	-0.02 (0.01)	0.03 (0.01)#	0.03 (0.009)#	0.02 (0.01)\$	0.07 (0.02)#
<i>LEXCH</i>	-0.06 (0.04)	0.37 (0.26)	0.02 (0.05)	0.16 (0.05)#	-0.28 (0.03)#	0.06 (0.04)	-0.24 (0.10)\$
<i>LINT</i>	-0.007 (0.005)	-0.06 (0.02)#	0.01 (0.004)#	0.02 (0.004)#	-0.001 (0.005)	-0.02 (0.003)#	-0.05 (0.01)#
<i>LPPI</i>	0.36 (0.06)#	-1.32 (0.46)#	0.88 (0.06)#	0.67 (0.07)#	0.50 (0.07)#	-0.29 (0.05)#	-0.37 (0.15)#
<i>LUMP</i>	-0.06 (0.01)#	0.01 (0.07)	-0.08 (0.01)#	-0.09 (0.01)#	-0.07 (0.01)#	0.005 (0.009)	-0.14 (0.02)#

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D8: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR SOUTH KOREA

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	51.00#	44.08#	43.36#	36.58#	33.62#	56.30#	43.08#
<i>P-value</i>	0	0	0	0	0	0	0
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>	59.81	81.88	59.81	63.85	60.82	59.81	62.72
<i>95%Confidence</i>							
<i>Interval</i>	[59.81, 63.69]	[81.19, 81.88]	[59.26, 63.85]	[59.81, 63.85]	[59.03, 63.85]	[59.81, 63.85]	[59.81, 63.85]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	-0.02 (0.006)#	0.03 (0.009)#	-0.02 (0.003)#	-0.03 (0.006)\$	-0.046 (0.01)\$	-0.04 (0.009)\$	-0.02 (0.007)\$
<i>LEXCH</i>	0.16 (0.02)#	-0.05 (0.01)#	0.09 (0.01)#	-0.007 (0.03)	0.24 (0.05)\$	0.21 (0.03)\$	0.18 (0.02)\$
<i>LINT</i>	-0.08 (0.04)\$	0.01 (0.007)	-0.01 (0.003)#	0.004 (0.005)	-0.07 (0.01)\$	-0.006 (0.008)	-0.003 (0.005)
<i>LPPI</i>	1.08 (0.05)#	0.64 (0.07)#	0.54 (0.03)#	0.77 (0.07)\$	2.09 (0.14)\$	1.41 (0.09)\$	0.88 (0.07)\$
<i>LUMP</i>	-0.007 (0.007)	-0.02 (0.009)\$	0.01 (0.004)#	0.001 (0.006)	0.007 (0.01)	-0.004 (0.01)	-0.01 (0.007)
Upper Regime ($\geq \tau$)							
<i>LOP</i>	0.07 (0.01)#	0.002 (0.03)	0.04 (0.006)#	-0.001 (0.02)	0.12 (0.03)#	0.12 (0.01)#	0.08 (0.02)#
<i>LEXCH</i>	-0.09 (0.03)#	0.04 (0.03)	-0.04 (0.01)#	-0.21 (0.40)	-0.02 (0.07)	-0.08 (0.04)\$	-0.23 (0.05)#
<i>LINT</i>	-0.063 (0.02)#	-0.09 (0.02)#	-0.02 (0.009)\$	-0.07 (0.02)#	-0.15 (0.04)#	-0.08 (0.02)#	-0.08 (0.03)#
<i>LPPI</i>	1.07 (0.06)#	1.39 (1.17)	0.56 (0.03)#	1.09 (0.07)#	2.07 (0.15)#	1.10 (0.71)	1.23 (0.10)#
<i>LUMP</i>	0.02 (0.008)#	0.0005 (0.01)	0.03 (0.005)#	-0.02 (0.01)\$	0.05 (0.01)#	0.04 (0.01)#	3.32 (0.01)#

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D9: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR GERMANY

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	30.95#	23.85#	48.05#	40.24#	45.10#	22.27#	13.61
<i>P-value</i>	0	0.0006	0	0	0	0.0006	0.17
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>	84.28	81.19	81.88	84.28	84.28	51.96	71.04
<i>95%Confidence</i>							
<i>Interval</i>	[81.19, 86.52]	[78.32, 89.16]	[76.59, 86.52]	[84.28, 84.28]	[84.28, 86.52]	[49.51, 88.57]	[16.54, 109.51]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	−0.01 (0.004)	0.02 (0.003)#	−0.01 (0.002)#	−0.02 (0.005)#	−0.03 (0.006)#	−0.01 (0.002)#	−0.02 (0.01)\$
<i>LEXCH</i>	0.16 (0.02)#	0.12 (0.02)#	0.21 (0.01)#	0.11 (0.02)#	0.15 (0.04)#	−0.05 (0.03)*	−0.06 (0.10)
<i>LINT</i>	−0.03 (0.004)#	−0.01 (0.006)*	−0.03 (0.003)#	−0.02 (0.004)#	−0.07 (0.10)	−0.03 (0.005)#	0.01 (0.02)
<i>LPPI</i>	0.67 (0.06)#	1.16 (0.09)#	0.29 (0.04)#	0.93 (0.06)#	1.05 (0.14)#	0.13 (0.03)#	0.24 (0.33)
<i>LUMP</i>	0.007 (0.01)	0.001 (0.01)	0.02 (0.006)#	0.01 (0.01)	0.06 (0.01)#	0.008 (0.01)	−0.11 (0.03)#
Upper Regime ($\geq \tau$)							
<i>LOP</i>	0.01 (0.006)*	0.06 (0.007)#	0.01 (0.02)	0.006 (0.007)	0.01 (0.01)	0.02 (0.005)#	−0.05 (0.04)
<i>LEXCH</i>	−0.06 (0.03)\$	−0.28 (0.04)#	−0.46 (0.08)#	−0.02 (0.03)	0.03 (0.09)	0.16 (0.02)#	0.24 (0.19)
<i>LINT</i>	−0.04 (0.002)#	−0.01 (0.003)#	0.01 (0.005)\$	−0.05 (0.002)#	−0.09 (0.005)#	−0.01 (0.001)#	−0.002 (0.10)
<i>LPPI</i>	0.91 (0.10)#	0.76 (0.16)#	−0.41 (0.21)*	1.33 (0.07)#	2.15 (0.25)#	0.41 (0.07)#	−0.22 (0.48)
<i>LUMP</i>	−0.01 (0.006)*	−0.04 (0.01)#	−0.07 (0.02)#	0.006 (0.007)	0.05 (0.01)#	0.01 (0.01)	−0.24 (0.05)#

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

APPENDIX D10: ESTIMATES OF THE COEFFICIENTS AND DIAGNOSTICS
OF THE THRESHOLD MODEL FOR THE NETHERLANDS

	Global	Transport	Health	Fuel	Food	Equipment	Clothing
Threshold Test							
<i>F</i>	27.27#	28.28#	45.19#	40.34#	30.84#	43.06#	8.47
<i>P-value</i>	0	0	0	0	0	0	0.86
<i>Critical value</i>							
<i>at 5%</i>	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Threshold Estimate (τ)							
<i>Estimate (τ)</i>							
	71.04	73.73	60.82	60.82	74.46	70.97	94.50
<i>95%Confidence</i>							
<i>Interval</i>	[71.04, 84.39]	[71.04, 73.73]	[60.82, 60.82]	[60.82, 60.82]	[71.04, 77.98]	[70.97, 81.88]	[51.37, 102.85]
Lower Regime ($\leq \tau$)							
<i>LOP</i>	-0.02 (0.007)#	-0.008 (0.006)	-0.007 (0.005)	0.0003 (0.006)	-0.04 (0.009)#	-0.01 (0.004)#	0.01 (0.02)
<i>LEXCH</i>	0.45 (0.10)#	0.21 (0.13)	0.91 (0.13)#	0.92 (0.16)#	0.50 (0.10)#	0.23 (0.06)#	0.58 (0.33)*
<i>LINT</i>	-0.08 (0.008)#	-0.07 (0.01)#	0.05 (0.01)#	0.02 (0.01)\$	-0.08 (0.008)#	-0.04 (0.04)	-0.007 (0.02)
<i>LPPI</i>	0.30 (0.06)#	0.55 (0.08)#	0.28 (0.08)#	0.08 (0.09)	0.25 (0.06)#	-0.01 (0.03)	0.31 (0.16)*
<i>LUMP</i>	0.01 (0.01)	-0.005 (0.01)	-0.01 (0.02)	-0.10 (0.02)#	-0.02 (0.01)\$	-0.005 (0.008)	0.10 (0.04)#
Upper Regime ($\geq \tau$)							
<i>LOP</i>	-0.01 (0.01)	0.04 (0.02)\$	.008 (0.009)#	0.10 (0.02)#	-0.009 (0.01)	-0.008 (0.008)	0.72 (0.32)\$
<i>LEXCH</i>	0.007 (0.08)	-0.24 (0.14)*	-0.01 (0.03)	0.31 (0.17)*	0.04 (0.07)	0.04 (0.03)	2.90 (2.00)
<i>LINT</i>	-0.02 (0.01)\$	-0.02 (0.01)\$	-0.02 (0.003)#	-0.13 (0.009)#	-0.009 (.009)	0.02 (0.005)#	0.37 (0.23)
<i>LPPI</i>	0.20 (0.03)#	0.32 (0.07)#	-0.03 (0.03)	0.22 (0.09)\$	0.23 (0.04)#	0.18 (0.02)#	1.57 (2.19)
<i>LUMP</i>	0.14 (0.007)#	0.18 (0.01)#	0.04 (0.004)#	0.08 (0.01)#	0.12 (0.008)#	0.05 (0.004)#	0.06 (0.14)

Notes: * = Significant at 10%, \$ = Significant at 5%, # = Significant at 1%. The numbers in brackets represent the P-values.

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