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Unravelling the dynamics of trade policy uncertainty and China's backward integration

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ABSTRACT

This paper studies the dynamics of trade policy uncertainty and China's backward integration. Theoretical and empirical investigations show that there are numerous benefits accrued to participation in backward integration. However, empirical findings on the effect of trade policy uncertainty on backward integration are non-existence. Therefore, this paper adds to the existing literature on global value chains and the impact of trade policy uncertainty. An empirical investigation was conducted through the use of the dynamic autoregressive distributive lag on data covering the period 2000Q1–2018Q4. Findings show that trade policy uncertainty (TPU) and the real interest rate have significant short-term and long-term negative effects on China's backward linkage (foreign value added). External debt has a significant short-run positive effect on backward integration. The findings further show that foreign direct investment has significant short-run and long-run positive effects on backward integration.

1. Introduction

For over two decades, international trade and globalisation of supply chains have been one of the key ingredients of growth and development in economies around the world and are often considered easy routes to industrialization (see Foster-Mcgregor, 2019; Baldwin, 2016). This is done by enabling economies to develop certain stages of production where only some units of the production processes are developed, thus avoiding the problems associated with creating whole industries (see Foster-Mcgregor, 2019). This structure is characterised by a sophisticated and spatially dispersed arrangement where production sites are located in low-cost developing countries and closely connected with producers of finished goods situated in developed countries (Kano et al., 2020). This pattern shows a collaboration among trading partners for the production of a single product that passes through different stages of production and across several

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borders in the form of intermediate goods for the production of a final export good. The debate over the importance of this pattern, therefore, shows that its integration is generally beneficial.

As international trading activities have become much more organised in favor of global value chains, their importance in the literature has also gained a lot of awareness owing to their positive effects on the volume of exports (Goldar et al., 2020). Global GDP growth has also been found to be greatly impacted by GVC-related activities (Dollar et al., 2017). China's economy, being the second largest in the world, has been found to be influenced by global value chains, which is a consequence of the world's largest firms having production plants situated in China. This has led to China having the capacity to produce half of the world's output (Lu, 2009) and being named the production capital of the world. China has thus exploited to a great extent the gains of having a good number of local and foreign companies operating in her country, producing intermediate and final consumer goods, leading to her total exports reaching US$2.5 trillion in 2019 (Sui et al., 2022). The choice of China as the destination of top-rated firms for intermediate goods, which are later transformed into exportable final consumer goods, has improved productivity. The economy's low level of trade policy uncertainty has also contributed to these improvement (Sun et al., 2022).

However, given the essential role of trade policy uncertainty on economic indicators, its impact on the global value chain has been insufficiently studied. Our study attempts to fill this gap by providing empirical evidence of the TPU-GVC nexus in a large developing economy. We therefore examine how the reduction of trade policy uncertainty may have affected China's GVC occasioned by China's accession to the World Trade Organisation (WTO).

Before the 2000s, China's trade ties with the US operated under a temporary normal trade relationship, granting access to the US market at lower tariff rates. However, this arrangement came with uncertainties, as Chinese exporters were under constant threat of arbitrary non-NTR tariffs if the temporary status was revoked (Handley and Limao, 2015). In 2000, China achieved permanent normal trade relationship (PNTR) status, a success that catalysed remarkable growth in Chinese trade statistics (Pierce and Schott, 2016; Feng et al., 2017).

Our study thus delves into the impact of the reduction in trade policy uncertainty that accompanied China's accession to the World Trade Organisation on China's global value chains. Utilising data from the UNCTAD-Eora database spanning 2000Q1 to 2018Q4 for global value chains, we employ a dynamic autoregressive distributed lag (ARDL) estimation, following the methodology of Constantinescu et al. (2020b). The analysis focuses on exploring the effect of the reduction in trade policy uncertainty on global value chains, revealing a promotion of global value chains attributed to their negative relationship with TPU reduction. Our study contributes to the existing literature on various fronts, expanding the analysis of policy uncertainty and, notably, examining the interconnection between trade policy uncertainty and advanced economies (Cui and Li, 2023; Handley and Limao, 2015; Aslan and Kumar, 2021). Given the significant role that TPU has assumed in economic analyses, particularly in light of the unprecedented trade policies during the Trump administration and their impact on events like Brexit, there is a critical need for an in-depth exploration of the effects of TPU on economic decisions and outcomes.

Our study makes several other noteworthy contributions amidst the realistic scenario of trade policy uncertainty impacting China's economy. Firstly, it diverges from prior research where the impact of TPU was examined on total trade volumes but specifically on the export goods facilitated by the importation of intermediate inputs (FVA). Secondly, we introduce a variable that captures the geopolitical dynamics of the Chinese economy in the face of uncertain trade policy (FDI). Thirdly, the study employs the Davis et al. (2019) index to gauge the degree of China's trade policy uncertainty. Lastly, the analysis utilises dynamic autoregressive distributed lag (ARDL) and non-linear ARDL methodologies.

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2. Literature review

2.1 Determinants of China's trade policy uncertainty (TPU)

China's accession to the WTO in 2001 was the turning point in her history of trade policy. Before becoming a member of the WTO, China's status with the US was only a temporary Normal Trade Relations (NTR), which was subject to review on a yearly basis by the US Congress, with the condition that if it failed to pass the review, the consequence would be a high tariff for Chinese products. China's trade environment has therefore faced serious uncertainties given the threats revoke China's NTR by the US Congress in the past. But the permanent normal trade relations (PNTR) status granted to China foreclosed the need to accept a review from the US Congress each year, and that has led to a reduction in trade policy uncertainty for Chinese companies and the business environment (Sun et al., 2022).

An analysis of China's trade relations with the US shows some level of distrust between the two parties given the consistent criticism and threats of tariff reviews towards Chinese products, as a result of China's trade policies, which the US has accused of not following the world's best practices in the form of openness and market-oriented policies. The US is the biggest importer of Chinese products, with an import value of US$578.9 billion, which is estimated at 17.2% of China's total exports (Workman, 2017). As such, any change in US trade policies, knowingly or otherwise, affects China's trade decisions.

According to Irwin (2019), revenue, restriction, and reciprocity are the tenets of China's trade policy. A tariff is a mechanism used to protect domestic industries from foreign competition. Through trade policy, economies generate revenues, but the reliance of China on revenue generation through tariffs is decreasing as the economy expands. Nonetheless, the Chinese economy still maintains high tariff barriers between local and foreign producers, where China has a comparative disadvantage. But in industries where China has a comparative advantage, the level of protection is generally lower (Wang, 2022). The Chinese economy thus had three phases of different trade policies, with the first phase focusing on trade reciprocity. This particular phase was between the 1990s and 2008. The period saw China having a skyrocketed export value coupled with a rise in GDP growth and a significant reduction in import tariffs when China entered the WTO in 2001.

For China to expand overseas exports at that time, it had to reciprocate and lower its own tariffs. The period thus saw China's most favoured nations (MFN) rate remains stable. The MFN equally remained stable during the second phase from 2009 to 2017, though adjustments were made to China's trade policy by bypassing the most favoured nations rates. The rates could not be raised above the binding rate agreed upon in the WTO talks, but the country had the prerogative of lowering the rates. This period was primarily known for the application of different tariff rates, primarily from interim duties and conventional duties. The former was used to target tariff reductions on specific goods that were meant for developmental objectives, and such rates could be cancelled and reverted back to their initial rates. The conventional rate was also employed during this period to serve the purpose of charging specific tariffs on specific countries, and that varies from one trading partner to the next and from one product to another. The third phase, which began from 2018 until date, focused on US-specific tariff rates, which were a result of the trade war between the US and China through retaliatory tariffs (Wang, 2022). It has thus led to a rise in the level of uncertainty in China's trade policy.

2.2 Global value chains (GVCs) and backward integration

The advent of GVCs has had a significant impact on the nature and determinants of international trade patterns. It is well known that the entire production line for the production of goods and services is no longer situated in a single country but is more fragmented, with corporations diffusing activity over numerous countries and companies (Feenstra, 1998; Johnson and Noguera, 2012). Many companies only produce a small portion of the value chain in their native nation, rather than the complete product, and are

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increasingly collaborating with international value chain partners in order to produce final goods and services. As a consequence of such an initiative, trade in intermediate inputs now accounts for nearly two-thirds of all international trade (Johnson and Noguera, 2012).

To be integrated in backward integration, companies interact with international value chain partners by importing intermediate inputs and other capital goods, which are then employed to manufacture the products for the purpose of selling them overseas. The Organisation for Economic Co-operation and Development (OECD) and the World Trade Organisation (WTO) produced the Trade in Value Added (TiVA) data collection, which provides aggregate insights into a country's backward and forward participation in GVCs (De Backer and Miroudot, 2014). Simple global value chains represent domestic or foreign value added that is exported or imported and directly absorbed by trade partners, whereas complex global value chains represent domestic or foreign value added that crosses at least two borders before being consumed (Mouanda-Mouanda, 2019). When a country engages in the earliest stages of production, it is active in upstream activities, and its forward linkage participation may be higher than its backward linkage participation. In contrast, a country engaged in downstream operations specialises in the last stages of production; therefore, backward linkage accounts for the majority of its global value chain participation (Mouanda-Mouanda, 2019).

2.3 Where does China stand in backward integration within the context of global value chains?

The participation of countries in backward integration is increasingly directly related to their integration into the global economy. One indicator for countries participation in backward integration shows what percentage of a country's exports are of foreign value added, that is, looking back along the value chain and measuring foreign inputs and value added included in a country's exports (OECD, 2013). China has therefore emerged as the world's largest exporting nation with more than 1.4 trillion pounds annually (The Global Value Chains Research Center, 2021) given its deep integration through backward integration, which has also made it the champion of high-tech exports (Grimes, 2021). The deep integration has equally made the country the he d largest importer of goods in the world behind the United States (Wang, 2022). China's remarkable export success, contributing to over 90% of its total exports, is predominantly driven by the manufacturing sector operating within global value chains (GVCs). These chains systematically eliminate traditional barriers to international market entry for products made or assembled in China. This facilitated the extensive infiltration of Chinese goods into both established and developing countries markets, marking the realisation of China's export miracle (Grimes, 2021).

Figure 2, which depicts the map of foreign value added (FVA) from 1990 to 2018, illustrates the challenges that accompany this success narrative. The graph shows that China's Foreign Value Added (FVA) peaked in 2011 at 340 million dollars, a record that has yet to surpass. Even in 2018, the FVA remained at 277 million dollars, indicating an 18.5% decrease from the 2011 peak. This underscores the evolving dynamics and complexities within China's export landscape.

2.4 The relationship between trade policy uncertainty and backward integration

Backward integration could be described as a production model based on the division of labour in which different enterprises across different nations take on distinct duties (Grossman & Rossi-Hansberg, 2008). One of the distinctive features of backward integration is the internationalisation of production, which demonstrates a highly complex network of worldwide production. (Olasehinde-Williams and Oshodi, 2021). This production structure involves the importation of intermediate goods that a country lacks for the production of a final good. The proportion of foreign value added reflected in a home country's exports forms the level of backward linkages in a country. As a result, backward integration of cross-border transactions have grown to be an important component of cross-border commerce. And it has thus been identified as a determining factor in the organisation of value chains (Del Prete and Rungi, 2019). It has also been found that the primary reason contributing to backward integration expansion is the reduced

trading expenses, which are due to the moving of intermediate goods to areas where there are relatively cheap factors, and other inputs of production for the production of the final goods for export purposes (OECD, 2012).

Uncertainties in trade policies have been obstacles hampering trade growth. Recent analyses attribute the trade slowdown in varying degrees to some factors, of which an increase in trade protectionism is among them (see Constantinescu et al., 2020a; Hoekman 2015; Haugh et al., 2016; International Monetary Fund, 2016). Ways in which backward integration may also be affected by trade policy uncertainty are also highlighted. First, a rise in trade policy uncertainty reduces economic performance (Kyriazis, 2021). Whenever uncertainty arises, firms may suspend investment decisions, consumers may reduce their spending given the uncertainty in prices and earnings. The cost of lending may also rise to serve as precautionary move by lending institutions. The trade policy uncertainty may have a direct effect on trade by affecting firms' decisions to source inputs internationally. Therefore, we have found that trade policy uncertainty (TPU) negatively affects trade, but its impact on backward integration remains unclear. But since trade policy uncertainty affects individual choices, it is bound to have an effect backward integration. This is because consumer goods are also produced through backward integration, and investment in these goods is likely to be sensitive to changes in trade policies.

2.5 Impact mechanism

The impact of trade policy uncertainty on backward integration occurs through the ways and manners in which firms react to changes in trade policy. Firms adjust their production and management practices to mitigate the operational risk resulting from trade policy unpredictability. When trade policy uncertainty increases, it can induce firms to delay investment and hiring when it is costly to undo investment projects or to hire and fire workers. (Bernanke 1983). Precautionary spending cuts by households and an increase in the cost of finance are also reasons why uncertainty has a dampening effect (Pastor and Veronesi, 2013).

Kyriazis (2021) also pointed out the effects of trade policy uncertainty on the economy and financial markets. The outcome of his study shows that trade policy uncertainty leads to lower-quality and more expensive products, coupled with weak participation in international trade. In contrast, Cebreros et al. (2018) and Imbruno (2019) found positive effects of TPU on capital goods import and export promotion.

In addition to exploring the direct impact of TPU on backward integration, the study acknowledges the intricate transmission mechanism of trade policy uncertainty. It examines how FDI, serving as an indicator of trade tension and geopolitical dynamics, interacts with various factors within the model, including TPU and other explanatory variables, to shape the outcomes of global value chains. In alignment with the analytical framework proposed by Constantinescu (2020b), the study aims to comprehensively examine the nuanced impact of trade policy uncertainty on the dynamics of backward integration within the global value chain.

2.6 Theoretical perspectives on trade policy uncertainty and global value chains

Economic theories explain that commodities are produced through the use of inputs that are either made domestically or imported. The emergence of the movement of these inputs from one production point to another has given credence to the growth of global value chains, which connect one economy to another. Therefore, uncertainties in trade policies impact the free flow of these inputs. However, economic theories do not provide a clear-cut picture of the relative effect of TPU on global value chains.

Handley and Limao (2014) and Osnago et Al. (2015) were of the view that TPU may harm the performance of trade. While some authors argued that, it is not in all cases that TPU harms trade, as it has been found to have a positive effect on trade in Mexico and Australia (see Cebreros et al., 2018; Handley, 2017). TPU thus embodies an imperfect condition characterised by the unpredictability and ambiguity resulting from fluctuations and modifications in trade policies, encompassing aspects like tariffs, quotas,

and trade agreements. Its utmost implication lies in the significant impact it has on trade operations and activities (Osnago et Al., 2015).

The literature on trade shows that trade liberalisation improves trade outcomes, as openness to trade is one of the fundamentals of smoothness in the GVC (Shu and Steinwender, 2019). According to the literature on growth theory, economic openness encourages GVC participation, which may result in economic growth through a change in economies of scale, better resource allocation, and advancement in technology (Krueger, 1985; Helpman & Krugman, 1985; Rodrik, 1988; Salal-Martin & Barro, 1995). This implies that integration into the global value chains may accelerate efficiency in production. However, as noted earlier, there are divergent views on the impact of TPU on trade. Grossman and Helpman (1991) suggest that protectionism, as a crucial factor influencing trade policy uncertainty, has the potential to foster economic growth and provide protection against external pressures. Moreover, protectionist measures can incentivize investments in industrial research and development, driving innovation in particular sectors and potentially enhancing a country's global value chains (Ajide, 2023).

The increased uncertainty may also prompt businesses to adopt a more cautious stance, reevaluate their global production networks, and look for ways to reduce possible risks (Bernanke, 1983). As a result, GVCs may become more fragmented as businesses seek more regionalized production and sourcing methods to lessen their vulnerability to ambiguous trade policies. Such a change might result in shorter and more regionalized value chains, which might improve resilience and lessen reliance on distant suppliers (de Soyres et Al., 2021). Conversely, trade policy uncertainty can pose challenges for GVCs, impeding long-term planning and investment decisions by disrupting the predictability of trade flows and market conditions. Due to trade policy uncertainty, businesses that operate in GVCs may experience challenges in managing supply chains and production coordination (Caldara et Al., 2019). Because of this, it may become more expensive, less efficient, and less competitive for GVC participants. In addition, increased uncertainty may dissuade businesses from joining or increasing their participation in GVCs, which would reduce chances for the transfer of knowledge and technology. Regardless of the expected effects of TPU on GVC, proactive steps must be taken to reduce risks, promote adaptation, and create an environment that will support long-term growth and development.

3. Model specification, data description and estimation technique

3.1 Model specification

This paper derived its empirical model from the literature of Constantinescu et al. (2020b). Therefore, to examine the effect of trade policy uncertainty on backward integration of global value chains in China, we specify equation (1):

$$LFVA_t = \beta_0 + \beta_1 TPU_t + \sum_{k=1}^{4} \beta_k X_{k,t} + \varepsilon_t \tag{1}$$

where β_0 indicates the intercept of the regression. The rest of the βs represent the parameters of the regression equation to be estimated. LFVA is the foreign value added in exports (backward integration). TPU is the trade policy uncertainty index of China. X_t is the vector of the control variables which includes domestic credit (D-CRE), foreign direct investment (LFDI), real interest rate (R-INT), external debt (LE-DEBT) and ε_t indicates the residual term.

Foreign value added in exports (FVA) serves as the dependent variable in the empirical analysis. It was used as a proxy for the backward linkages, which measure a segment of global value chain integration. The main independent variable for which the study intended to see its impact on backward integration is trade policy uncertainty (TPU). It is measured using China's trade policy uncertainty index given by Davis et al. (2019), as obtained from http://www.policyuncertainty.com/. The historical measure of the China trade

policy uncertainty is created from monthly newspaper searches for a set of three terms, namely: Uncertainty (uncertain / uncertainty / not certain / unsure / not sure / hard to tell / unpredictable / unknown), economic (economy / business) and trade policy (import tariffs / import duty / import barrier / WTO / world trade organisation (2) trade treaty / trade agreement / trade policy / trade act / Doha round /Uruguay round /GATT / General Agreement on Tariffs and Trade / dumping / protectionism / trade barrier / export subsidies). The number of times these were found monthly was divided by the total number of newspapers that produced the raw data for the month and normalized to a mean of 100.

The independent variables in the equation also include domestic credit, foreign direct investment, the real interest rate, and external debt. Domestic credit is included to control for the uncertainties that may arise in the importation of intermediate goods from credit accessibility, and it is measured by domestic credit to the private sector (% of GDP). Foreign direct investment is also included to control for geopolitical dynamics, which can impact investment in China's backward integration sector. It is measured by foreign direct investment, net inflows (BoP, current US$). The interest rate is included to control the amount of money in circulation. A higher rate of interest indicates a decrease in borrowing and consequently a decrease in imports of foreign inputs by domestic producers, and it is measured in percentages (Alderman, 2023). External debt is also included as a control source of financing for governmental projects (Panizza, 2008). The Chinese economy, being an economy tilted towards a command system, indicates that the government is a major stakeholder in economic decision-making and, as such, relies on foreign inputs for the production of some commodities. This is measured by the total external debt stock (Disbursed and Outstanding Debt, current US$) (Ma et al., 2020).

3.2 Data description

The study made use of time series data from 2000Q1 to 2018Q4 (the longest available data set for backward integration–FVA) was sourced for the variable in the equation above. FVA was sourced from the UNCTAD-Eora Global Value Chain Database (https://worldmrio.com/unctadgvc/). Casella et al. (2019) provided a full description of the empirical methods used to create the foreign value-added data. The China trade policy uncertainty index (ChinaTPU) is the Davis et al. (2019) index as obtained from www.policyuncertainty.com. Data on domestic credit, foreign direct investment, the real interest rate and external debt were sourced from the World Development Indicators of the World Bank (https://databank.worldbank.org/source/world-development-indicators). The logarithmic forms of some of the variables were done to make them symmetric (LFVA, LFDI and LE-DEBT) while the remaining variables were left at levels (D-CRE, R-INT and TPU). This is because variables in units of time, interest rates or in ratios are left at levels (Wooldridge, 2006).

Table 1. Summary statistics

	LFVA	TPU	D-CRE	LFDI	R-INT	LE-DEBT
Mean	18.966	100	126.887	25.640	1.990	27.070
Maximum	19.640	512.838	157.812	26.400	5.531	28.300
Minimum	17.660	10.727	102.004	24.460	-2.306	25.710
Std. Deviation	0.674	116.082	17.975	0.643	2.408	0.884
Skewness	-0.869	2.734	0.518	-0.589	-0.350	-0.014
Kurtosis	2.306	9.859	2.039	1.933	1.786	1.446
No. of Observations	76	76	76	76	76	76

Source: Authors' computation

Table 1 above shows the summary statistics of the variables. The dependent variable FVA, ranges between 46.9 million USD and 340 million USD, and with the mean value of 207 million USD. As regards the independent variables in the study, TPU ranges between 10.7 and 512.8 with a mean value of 100.

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Domestic credit and R-INT ranges between 102 and 157.8 and 5.5 percent and -2.3 percent and with mean values of 126.9 and 1.9 percent respectively. And lastly, FDI and E-DEBT ranges between 42.1 billion USD and 291 billion USD and 146 billion and 1.9 trillion USD with mean values of 163 billion USD and 812 billion USD respectively.

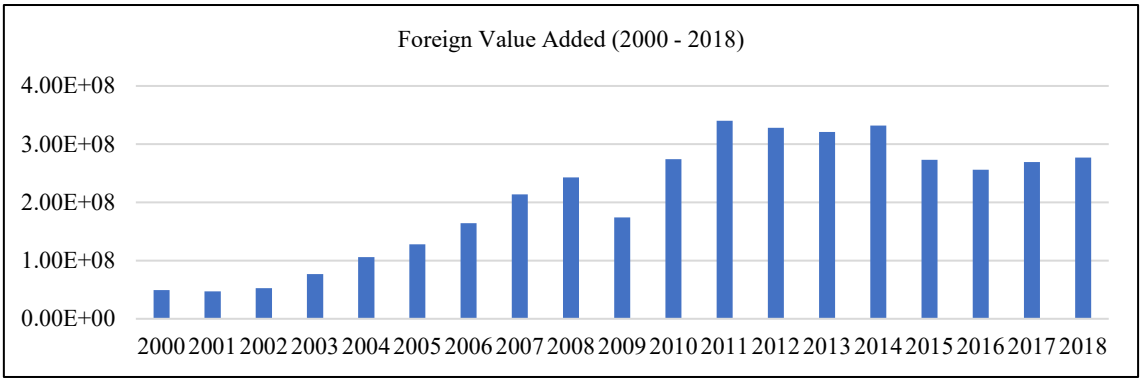

Fig. 1. Time series plots of foreign value added in exports (FVA)

Fig. 2. Time series plot of China's trade policy uncertainty (TPU)

The plots of the variables of interest are shown in figure 1 and 2 above where dependent variable – FVA is plotted on figure 1 and the main independent variable – TPU plotted in figure 2. Figure 1 reveals the steady increase in foreign value added (FVA) from 2003 till 2008 before a sharp decline in 2009 but the decline did not last long as considerable rise was experienced from 2009 to 2011 before a small decline in 2012 and little fluctuations which lasted till 2014 before a big fall in 2015. The FVA figure has therefore been relatively stable from 2015 to 2018. But it has yet to reach the peak of 2011.

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The plot of TPU shows that it has been relatively stable averaging 64.5 between the year 2000 and 2016 but had a sudden increase in 2017, reaching an all-time high in 2019. This was the period of high trade war between China and the United States occasioned by the change in United States trade policies.

3.3 Estimation technique

Empirical investigations commonly use the ARDL model of Pesaran et al. (2001) due to its utility in testing a variety of theoretically relevant theories (Jordan & Philips, 2018). The ARDL technique has two major advantages. First, regardless of whether the variables are integrated of order I(0), I(1), or mutually co-integrated, it can produce reliable results (Pesaran et al., 2001). But the challenge to this conventional ARDL approach is that the result tends to suggest the absence of cointegration even when it is present whenever it is applied to small time series data (for instance, 80 time points and below) (Olasehinde-Williams and Oshodi, 2021).

Jordan and Philips (2018) have therefore presented the dynamic ARDL model to solve the issues of ARDL models' complicated the dynamic structure. This method is a versatile process for dynamic simulation of various ARDL models. Rather than using traditional hypothesis testing for parameter estimates, dynamic simulations use counterfactual scenarios to report the importance of the results. The method may calculate, simulate, and visualise changes in the explanatory variable as a function of changes in an independent variable (Olasehinde-Williams and Oshodi, 2021).

The error correction form of the dynamic ARDL simulation of the econometric model defined in equation (1) is as follows:

$$\Delta LFVA_t = \beta_0 + \beta_1 LFVA_{t-1} + \beta_2\, \Delta TPU_t + \beta_3 TPU_{t-1} + \beta_4 \Delta D - CRE_t + \beta_5 D - CRE_{t-1} + \beta_6 \Delta LFDI_t + \beta_7 LFDI_{t-1} + \beta_8 \Delta R - INT_t + \beta_9 R - INT_{t-1} + \beta_{10} \Delta LE - DEBT_t + \beta_{11} LE - DEBT_{t-1} + \varepsilon_t \quad (2)$$

3.4 Estimation Results

3.4.1 Preliminary Investigation

In order to conduct the dynamic ARDL, certain preconditions must be met. The dependent variable must be strictly of the first order of integration, i.e. I(1). Secondly, the independent variables must not be integrated of an order greater than one, which means, the regressors can only be of I(0) and I(1) series. And lastly, there must be cointegration among the variables included in the model (Sarkodie and Owusu, 2020).

In order to ensure that the first two conditions are met, the stationary properties of the variables were conducted using the Augmented Dickey Fuller and Phillip Peron tests. The outcome of the result is given in table 2 below which shows that, all the variables except the real interest rate [I(0)] is integrated of order I(1).

Table 2. Unit root results

Variables	LFVA	TPU	D-CRE	LE-DEBT	LFDI	R-INT
ADF	-1.820	2.630	-0.268	-0.535	-1.663	-2.995*
Dadf	-8.916***	-12.830***	-8.735***	-3.134*	-8.807***	-
PP	1.857	0.658	-0.231	-0.669	-1.672	-3.188*
dPP	8.938***	-12.727	-8.737***	-9.758***	-8.811***	-

*, **, *** denote the rejection of the null hypothesis of nonstationarity at 10%, 5% and 1% significance levels respectively

Table 3. Pesaran, Shin and Smith bounds testing

		10%		5%		1%	
Model	F-stat	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
lfva =f(tpu, d-cre, le-debt, lfdi, r-int)	20.780	2.380	3.515	2.802	4.065	3.772	5.213

Source: Authors' computation

The study proceeded to check whether the third condition is satisfied. The Pesaran et al. (2001) bounds test was employed to determine the cointegration status of the variables given to the fact that, it is the most appropriate method for obtaining the critical upper and lower bounds for variables of order zero [I(0)] and order one [I(1)] (Sarkodie & Adams, 2018). The results of the cointegration therefore shows that since the F-statistic gotten from each equation exceeds the upper bound critical values, then we hereby reject the null hypothesis of no cointegration in the model. This clearly shows that there exists cointegration among the variables in the model.

Table 4. Estimation based on dynamic ARDL for China

Variables	Coefficients	Std. Error	P-value
$LFVA_{t-1}$	-0.125	0.587	0.037**
ΔTPU_t	-0.0002	0.00009	0.076*
TPU_{t-1}	0.00002	0.00008	0.854
$\Delta D\text{-}CRE_t$	-0.003	0.0022	0.211
$D\text{-}CRE_{t-1}$	0.001	0.00121	0.410
$\Delta LE\text{-}DEBT_t$	0.270	0.08631	0.003***
$LE\text{-}DEBT_{t-1}$	-0.041	0.04768	0.399
$\Delta LFDI_t$	0.354	0.079	0.000***
$LFDI_{t-1}$	0.151	0.06642	0.026**
$\Delta R\text{-}INT_t$	-0.027	0.00559	0.000***
$R\text{-}INT_{t-1}$	-0.005	0.00409	0.279
_cons	-0.515		
R-squared	0.772		
Adj. R-squared	0.733		
Prob > F	0.000		
Diagnostic Tests			
Prob > Jarque Bera	0.132		
Prob > Archlm	0.5849		
Prob > Breusch Godfrey	0.5657		

*,**,*** denote statistical significance at 10%, 5% and 1% respectively, Source: Authors' computation

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Table 5. Alternative estimation of the dynamic ARDL for China (Nonlinear ARDL Estimation)

Variables	Coefficients	Std. Error	P-value
Short–Run Estimates			
D(LNEXT_DEBT)	0.160399	0.031246	0.0001
D(LNEXT_DEBT(-1))	0.00168	0.033162	0.9603
D(LNEXT_DEBT(-2))	0.00278	0.033154	0.9343
D(LNEXT_DEBT(-3))	0.846594	0.036489	0.0000
D(LNFDI)	0.540865	0.045831	0.0000
D(LNFDI(-1))	0.000268	0.03474	0.9939
D(LNFDI(-2))	-0.002343	0.034704	0.9471
D(LNFDI(-3))	-1.196034	0.047985	0.0000
D(LNREAL_INT)	-0.160805	0.005861	0.0000
D(LNREAL_INT(-1))	-0.000548	0.005222	0.9178
D(LNREAL_INT(-2))	-0.000951	0.004905	0.8489
D(LNREAL_INT(-3))	0.0964	0.006781	0.0000
D(LNTPU)	-0.009467	0.004859	0.0703
D(LNTPU(-1))	0.005478	0.00477	0.2688
D(LNDOM_CRE)	2.653677	0.148389	0.0000
D(LNDOM_CRE(-1))	0.062993	0.110342	0.5765
D(LNDOM_CRE(-2))	-0.07189	0.115884	0.5443
D(LNDOM_CRE(-3))	1.421576	0.18548	0.0000
CointEq(-1)	-1.023389	0.031649	0.0000
Long-Run Estimates			
LNEXT_DEBT	-0.665011	0.021549	0.0000
LNFDI	1.699315	0.021817	0.0000
LNREAL_INT	-0.251269	0.009267	0.0000
LNTPU	-0.02554	0.005924	0.0006
LNDOM_CRE	1.168023	0.090826	0.0000
C	-11.962591	0.330838	0.0000
Diagnostic Tests			
Prob > Jarque Bera	0.462		
Prob > Archlm	0.617		
Prob > Breusch Godfrey	0.1000		

Source: Authors' computation

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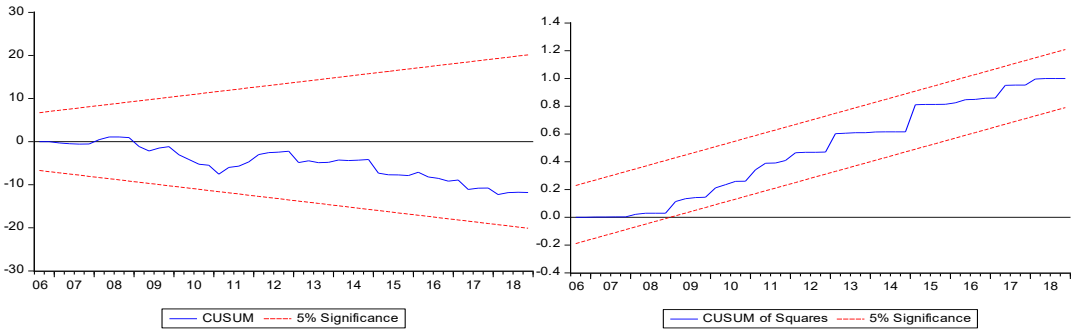

Fig 3. Cumulative sum (CUSUM) and CUSUM square test for stability

3.4.2 Regression estimates

After meeting the precondition requirements, the dynamic ARDL was estimated, which shows the short-run and long-run effects of trade policy uncertainty, coupled with other control variables of the Chinese economy, on the backward integration of global value chains. Table 4 reports the estimations. As shown in the table, only four variables were significant in the short-run, while only one was significant in the long-run. This shows that uncertainty has short term effects (Heise et al., 2019). In the short run, China's trade policy uncertainty (TPU) is statistically significant but negative. To be specific, a percentage rise in TPU causes China's FVA to reduce by 0.0002 percent (this outcome is significant at $p < 0.1$). A percentage increase in external debt causes China's FVA to grow by 0.270 percent (the result is significant at $p < 0.0.1$). A percentage rise in the real interest rate leads to a decline in FVA by 0.027 (this outcome is significant at $p < 0.01$). And as regards FDI, it has both short-run and long-run effects on China's FVA. A percentage increase in FDI leads to 0.353 and 0.151 increases in FVA in the short run and long run respectively (the results are significant at $p < 0.01$ and $p < 0.05$, respectively). The implication of this finding is that the backward linkage into the global value chains is affected negatively by the uncertainty in the trade policy of China. What this means is that, as the level of uncertainty in trade policy decreases, backward linkages into the global value chains appreciate. Reports have shown that China is behind only Germany in terms of foreign value-added exports and risks a further decline with uncertainty in its trade policy. This would affect sectors that rely heavily on foreign inputs in order to produce at an optimal level. On the other hand, a reduction in TPU will give confidence to the business sector.

Considering other independent variables, external debt has a significant and positive short run impact on backward integration into global value chains. This implies that the country's external debt is put to good use in such a way that production facilities and other inputs gotten from such external financing have positively impacted the production of exportable commodities, and as such, much of the growth of the Chinese economy has been propelled through debt financing (Graceffo, 2021). This position is also supported by Cetin and Kalayci (2012), who claim that the use of external financing for the purpose of establishing production facilities contributes to and facilitates a reduction in imports as well as improving the level of exports occasioned by these facilities. The result of the interest rate shows that it has a significant and negative short-run impact on backward integration. This means that, an increase in the rate of interest hinders the growth of backward integration. So, as the rate of interest grows, backward integration declines, and vice versa. FDI has both short-run and long-run positive impacts on backward integration. This result shows that FDI in China positively impacts export value through backward integration into the global value chains. The implication of this result is that as China accumulates more FDI, export values through backward integration expand.

In order to conduct a robustness analysis, we have re-estimated the specification in equation (1) using the nonlinear autoregressive distributive lag (NARDL) approach introduced by Shin et al. (2014). The

benefits of using the nonlinear autoregressive distributive lag (NARDL) approach are that it does not require that all variables be of the first order, i.e,. I(1), and the cointegration test can be performed in as much as none of the variables is I(2). It is also good for analysis that involves a small sample size.

The major difference in the regression results of the dynamic ARDL and NARDL is that the former did not provide a long-run relationship between TPU and FVA, while the latter shows that trade policy uncertainty has a negative long run effect on foreign value addition. The diagnostic tests of the NARDL conform to the dynamic ARDL with the inclusion of the results of the cumulative sum (CUSUM) and CUSUM square tests, which also indicated structural stability in the model.

4. Conclusion

China's backward integration is important given the export orientation of the economy. The country has been able to accrue these monumental achievements in exportation owing to the good business climate that has made firms make China the hub of intermediate goods for subsequent exports of finished goods. But uncertainty in trade policy, which has had some steady trends at some times, and fluctuations at other times has been found to affect global value chains in general, but studies have yet to investigate how it affects backward integration in specific terms. This paper therefore empirically examines the short-run and long-run effects of China's trade policy uncertainties on its backward integration into global value chains over the period of 2000Q1 – 2018Q4.

Empirical investigation shows that the Pesaran et al. (2001) bounds test confirms that a short run relationship exists between trade policy uncertainty (TPU) and backward integration, along with other control variables, and only foreign direct investment has a long-run relationship with backward integration. The short-run and long-run dynamics were examined with the use of the dynamic ARDL model. And some fascinating results were recorded. The outcome of the estimation showed that trade policy uncertainty has both significant and short-run decreasing effects on backward integration (foreign value added) and a long-run negative effect when the NARDL is employed.

The Implication of this study is that trade policy uncertainty affects the progress of backward integration in China, which means that as TPU increases, backward integration diminishes. It thus means that its negative effects on intermediate goods outweigh its positive effects on capital goods. Since China benefits from backward integration, it should find means of reducing the incidence of trade policy uncertainty to the barest minimum so that more intermediate goods can flow in and consequently lead to an increase in exportation. The resilience of China's global value chains should also be enhanced through diversification of sourcing strategies, a reduction in foreign input dependency, and the development of domestic capabilities, especially in sectors that are heavily affected by trade policy uncertainty. Given the positive effect of FDI on backward integration into the global value chains, policies should aim at providing a favourable business climate coupled with a better ease of doing business in order to attract and facilitate foreign direct investment in China.

The positive short-run effect of external debt on backward integration shows that the external financing has been put to good use in supporting production facilities and the acquisition of inputs. Nonetheless, external debt must be carefully managed in order to ensure sustained economic growth and lower the risks of debt accumulation. The negative effect of interest rates also suggests the importance of maintaining an affordable rate of interest. Government policies should aim at creating an environment for affordable credit and good financing options, which can promote investment and backward integration. By implementing these policies, China could find ways to curb trade policy uncertainty, draw FDI, strengthen resilience in global value chains, maintain favourable interest rates, optimise external debt management, and foster innovation for long-term growth and development. And lastly, the use of NARDL, an alternative econometric approach to the dynamic ARDL, in the analysis provided additional insights and strengthened the reliability of the results.

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The limitation of the study include the unavailability of14hee required data. The data period ended in 2018 due to the fact that the dependent variable data did not extend beyond that period. The study therefore relied on what was available. Up-to-date data could provide a more robust analysis of the regression outcomes. The analysis was equally conducted on the overall backward integration of China's global value chains. Future research could focus on the backward integration of specific sectors in China to see if the outcome of the study remains the same.

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Conflict of interest statement

The author affirms that this study was undertaken without any personal, commercial, or financial gains in mind.

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