Article

Economic Policy Uncertainty, Outward Foreign Direct Investments, and Green Total Factor Productivity: Evidence from Firm-Level Data in China

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Abstract: This paper uses Chinese firm-level data to investigate the effect of China's outward foreign direct investment (OFDI) on green total factor productivity (GTFP) under economic policy uncertainties (EPU). We found a significant positive impact of OFDI on GTFP. Moreover, an increase in EPU was shown to decrease GTFP. We also found that OFDI positively contributes to GTFP for private firms and foreign-invested firms in China. Technology-seeking OFDI contributes greater to GTFP than resource-seeking OFDI and market-seeking OFDI. These results remain robust when considering OFDI from firms in Central and East China as well as Western China. The findings are also robust with green labor productivity (GLP) substituting for GTFP using different econometric techniques. We also discuss potential implications in enhancing green innovation performance and sustainable industrial development in China.

Keywords: sustainable industrial development; green total factor productivity; outward foreign direct investments; economic policy uncertainty; Chinese economy

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1. Introduction

Environmental pollution and natural resource constraints are becoming increasingly challenging as industrialization and urbanization have developed worldwide. As the world's largest developing country, China has been faced with serious environmental problems—such as water, air, and soil pollution—in the past 40 years of rapid industrialization and urbanization. In this context, the Chinese government has launched initiatives for a more environment-friendly growth path, reflected in the government announcements.

Driven by China's economic growth slow-down, rising factor prices, production capacity surplus, and particularly the national strategy of “Go-Global”, Chinese firms have been actively engaged in outward foreign direct investment for a better integration into the global production and management system and a more efficient use of domestic and international resources. China has experienced a rapid growth in outward foreign direct investment (OFDI) from USD 2.855 billion in 2003 to USD 158.29 billion in 2017, the world's second-largest source of OFDI. One important motivation for Chinese firms' OFDI is to obtain advanced environment-friendly (green) technology from the hosting countries to improve the investing firms' capacity for sustainable development [1]. This implies that a growing number of Chinese multinational companies are engaged in clean technology-intensive industries abroad through OFDI to improve green total factor productivity (GTFP) by absorbing green technologies from host countries. Hence, in this context, does China's rapid OFDI growth help the country achieve an improvement in GTFP? If so, does any significant firm-level heterogeneity exist across different firms and investment projects regarding the positive impact of OFDI on GTFP? Does the investing firm's location and the

income level of the hosting country play a role? In light of the above concerns, research on the impact of China's OFDI on the country's green TFP is thought to be of great importance.

An essential factor to which Chinese firms engaged in OFDI have to pay particular attention is the Chinese government's relevant economic policies. Changes in economic policy can be very difficult to predict. Hence, economic policy uncertainty could also exert a considerable effect in shaping Chinese firms' OFDI.

The rest of the paper is organized as follows. Section 2 provides a literature review. Section 3 deals with data processing and computation; Section 4 reports the dynamic panel data estimations' findings. Section 5 provides the robustness checks with different methods and the perspective of heterogeneity. Section 6 concludes.

2. Literature Review

The relationship between OFDI and the home country's total factor productivity (TFP) improvement has drawn a lot of attention from policymakers and researchers. Most scholars believe that OFDI can result in significant and positive increases in TFP. Vahter and Masso [2] conducted an empirical analysis of the 1995–2002 Estonian firm-level panel data, identifying a positive correlation between OFDI and home country TFP. Based on the 1978–1994 British industry-level data, Driffield et al. [3] classified countries into two categories: low R&D intensity countries and high R&D intensity countries. The findings indicated that OFDI in both categories had contributed significantly to TFP increase in home countries. Some scholars used econometric analysis or spatial econometric analysis on the panel data to investigate the impact of OFDI on TFP in China. Zhao and Li [4] investigated the 2010–2014 data of Chinese firms, finding that OFDI effectively enhanced technological innovation and would result in an increasingly significant effect of reverse technology spillover (RTS). The investigation conducted by Sha and Li [5] examines the impact of OFDI-relevant RTS and knowledge management on local TFP indicated that RTS did not contribute significantly or positively to TFP until it had triggered technology absorption. However, some studies found that OFDI was ineffective in enhancing TFP and, in the worse cases, might squeeze on the home country's R&D budgets, discourage home technology development, and produce a crowding-out effect on the home country's TFP. For instance, according to Bitzer and Kerekes [6], while G7 countries did not appear to exhibit significant international technology spillover (ITS), the OFDI of non-G7 countries failed to enhance TFP positively and significantly and proved to be negatively correlated to TFP. Alazzawi [7] pointed out in a study that the positive effect which OFDI exerted on TFP performance might be attributed to the home country's lower technological level. Although OFDI allows the investor to acquire advanced technology, technology acceptance and absorption might be insufficient at home. Therefore, the RTS effect was limited, which resulted in the negative correlation between OFDI and TFP of the home country. Li [8] used firm-level data for an empirical study of the technological advancement and output growth effects of OFDI of Chinese multinational companies, finding that OFDI did not significantly improve technological performance.

Green growth has become very important; some scholars are beginning to investigate the RTS effect of Chinese OFDI from green TFP. Some scholars investigated the province-level panel data with the panel threshold model. It was mainly concluded that while OFDI played a significantly positive role in green TFP improvement or relevant technological innovation, multiple constraints exist, including environmental mechanisms [9,10], export product diversification [11], export quality [12], and human capital [13]. However, some research does not support a positive impact of OFDI on green TFP. OFDI was thought to negatively affect the home country's green innovation efficiency [14,15]. OFDI by China has played an obstructive part in local green TFP enhancement [16]. Using the Data Envelopment Analysis-Slack Based Measure (DEA-SBM) model to estimate Chinese industrial firms' two-stage green innovation efficiency, Nie and Qi [17] empirically studied how OFDI impacted industrial green innovation efficiency at the technology R&D stage. The findings indicated that although OFDI improved efficiency significantly at the R&D stage,

no remarkable efficiency enhancement was found at the technology absorption stage; furthermore, there was an inverse U-shaped relationship between OFDI and home industrial green innovation efficiency. Existing literature on the impact of OFDI on corporate green TFP is largely based on province-level macroeconomic data; therefore, it is impossible to analyze disparity in the effects across different investment projects at the firm level.

Additionally, policy uncertainties are considered an important factor that affects firms' OFDI decisions in the context of a highly globalized world economy. The existing literature is mainly concerned with the effect of economic policy uncertainties on Chinese firms' investment and export decision-making [18–21]. However, few studies have addressed how economic policy uncertainties affect the impact of OFDI on Chinese firms' green total factor productivity. Kang et al. [18] concluded that enterprises' investment behavior is associated with economic policy. The uncertainties of economic policy will have a significant inhibitory effect on Chinese enterprises' investment behavior. Tan and Zhang [21] found that economic policy uncertainties affect corporate investment behavior through two channels: real options and financial friction. Moreover, Rao et al. [22] conclude that an increase in economic policy uncertainties would negatively affect overseas investment. A reduction in investment by home country firms reduces the reverse technology spillover effect of OFDI. Xu et al. [23] tested the effect of economic policy uncertainties on corporate investment behavior, concluding that economic policy uncertainties and corporate investment activities are negatively correlated; in other words, an increase in economic policy uncertainties would lead to a drop in corporate investment activities.

Another line of research in the existing economic policy uncertainties is the effect of economic policy uncertainties on imports and exports. Wei and Liu [24] incorporated economic policy uncertainties into firm heterogeneity theory, arguing that economic policy uncertainties affect exports. Handley and Limão [25] verified the effect of economic policy uncertainties on Chinese firms' export behavior in a general equilibrium model, concluding that a lower economic policy uncertainty level is beneficial to firms' export growth. They also argued that a lower level in trade policy uncertainties positively affects China's export. Wang and Zhou [26] examined the effect of tariff reductions on Chinese firms' exports after China's WTO entry using the Differences-in-Differences (DID) method under economic policy uncertainties. According to the data on China's exports to major trading partners, Lu and Liu [27] investigated the impact of economic policy uncertainties on Chinese firms' exports, finding a negative causal relationship between economic policy uncertainties and China's export growth. Zhang and Zhu [28] argued that an increase in economic policy uncertainties would significantly hinder the country's exported products' quality improvement. This effect is stronger for those capital and technology-intensive products and exports to developed countries. Chen and Feng [29] analyzed the impact of economic policy uncertainties on corporate exports. They concluded that an increase in economic policy uncertainties in a destination country would reduce product exports' value. Wang et al. [30] attempted to explain China's export expansion and export upgrading from the perspective of trade policy uncertainty. They suggest that a reduction in policy uncertainty would promote export expansion and upgrading. Li et al. [31] analyzed the effect of economic policy uncertainties on product imports, indicating that the effect of policy uncertainties on imports varies across products, as it may be both positive and negative. Considering China's WTO accession, Mao [32] used the multiplicative difference method to study the effect of trade policy uncertainty on Chinese firms' imports to find that a lower level in trade policy uncertainties significantly facilitates the expansion of imports.

For the firms investing in foreign countries, economic policy uncertainty tends to increase the cost of external financing and the risk in OFDI. With the deepening of economic globalization and the increasing impacts of macroeconomic policy uncertainty, firm-level OFDI decisions are increasingly shaped by economic policy uncertainties in home and host countries. Existing literature is mainly concerned with the effect of economic policy uncertainties on firms' investment decisions and cross-border trading. However, very few studies have been performed on the effects of economic policy uncertainties on OFDI and

green productivity. Therefore, this paper discusses and analyzes how OFDI affects green TFP under economic policy uncertainties according to the established theories about OFDI mechanisms and green TFP.

Based on Chinese firm-level data processed by static panel data regression and the generalized method of moments (GMM), we studied how the impact of OFDI on green TFP under macro-uncertainties of economic policy depends on OFDI frequency, firm ownership, host country income level (high-income countries and middle- and low-income countries), investment objective (market-seeking, technology-seeking, and resource-seeking) and head office location (East China, Central China, and Western China). Furthermore, the propensity score matching (PSM) method was used to conduct robustness testing of the impact of OFDI on green labor productivity.

The paper delivers three contributions to the existing literature. Firstly, the current literature mainly deals with economic policy uncertainties on Chinese enterprises' investment, decision-making and exports. Simultaneously, few studies have been conducted regarding the effect of such uncertainties on the OFDI-induced green productivity of Chinese enterprises. Secondly, we converted the pollutant yield coefficients of the various industries into the green contribution coefficients multiplied by corporate TFP. The products were employed to construct green TFP to study the real significance of OFDI in a new context. Thirdly, when we studied the impact of OFDI on corporate green TFP, an empirical analysis using static panel data regression and system GMM was made to investigate whether OFDI contributed significantly to corporate green TFP, from the perspective of host country income level (high-income countries and middle- and low-income countries), investment objective (market-seeking, technology-seeking, and resource seeking), firm ownership (state-owned, private or foreign) and head office location (East China, Central China, and Western China).

3. Data Source, Estimated Model and Calculation Methods

3.1. Data Source and Model Processing

To solve the problem of simultaneous bias in Ordinary Least Squares (OLS) estimation, Olley and Pakes (1996) [33] developed an estimation method based on consistent semi-parameters. In this method, the realized value of a firm's productivity in the previous period determines its productivity expectation for the next period. In consideration of sample data processability as well as the simultaneous bias and sample selection bias in OLS estimation, we chose the Olley–Pakes (OP) method (1996) [33] with consistent semiparametric estimates to compute TFP using the constructed data from 2000 to 2013, which matched the China Industrial Enterprise Database with the Ministry of Commerce (MOC) list of Chinese firms investing in foreign countries. The specific industry's deformed pollution coefficient was used to derive the green coefficient, based on which firm-level GTFP was worked out. We also estimated GTFP from 2000 to 2007 and used the 2008–2013 data for labor productivity estimation and robustness testing. According to the General Accepted Accounting Principles (GAAP), the data were merged and filtered, following the method adopted by Brandt et al. [34]. First, samples with zero, negative or missing values in gross output, incremental value, intermediate input, staff size, sales, and fixed assets were removed. Secondly, samples with a negative or missing value of operating profit and wage payable were removed. Thirdly, samples with outliers (e.g., total assets < fixed assets, total assets < liquid assets, age < 0, and principal income < CNY 500) were removed. Additionally, indicators such as gross output, sales value, and government subsidy were processed using the GDP price deflator method based on PPI (producer price index). The year 1999 was set as the base period. As a result, 1,166,478 effective samples and 412,654 firms remained for testing and analysis.

The above analysis of the theories revealed that the effect of OFDI on corporate green TFP is relevant to EPU. For this reason, the effects of both OFDI and EPU on the GTFP of enterprises are not a result of independent influences of variables because the two variables

are certain to have interacted with each other. Therefore, this paper considers the following interaction model:

$$gtfp_{it} = \beta_0 + \beta_1 ofdi_{it} + \beta_2 lnepu_{it} + \beta_3 ofdi_{it} * lnepu_{it} + \beta_4 X'_{it} + v_i + \mu_i + \varepsilon_{it} \quad (1)$$

The relationship between FDI and GTFP might have reverse causality; the lagged variables of GTFP were added to the empirical model to build the following dynamic model:

$$gtfp_{it} = \beta_0 + \beta_1 gtfp_{it-1} + \beta_2 ofdi_{it} + \beta_3 lnepu_{it} + \beta_4 ofdi_{it} * lnepu_{it} + \beta_5 X'_{it} + v_i + \mu_i + \varepsilon_{it} \quad (2)$$

where $gtfp_{it}$ stands for GTFP, i is the enterprise, and t is the year; $ofdi_{it}$ is dummy variable that indicates whether the company has OFDI activities; $lnepu_{it}$ stands for the uncertainty of the economic policy faced by the enterprise in the corresponding year. $ofdi_{it} * lnepu_{it}$ represents the interaction term. X'_{it} indicates the relevant control variables: *profitr* represents profit rate; *expint* shows export intensity; *fincon* is the financial constraint; *ownstr* is the ownership structure; *manage* is the management; *rdint* is the R&D intensity; *govsub* represents government subsidy; *labor* is the labor productivity; *age* stands for the corporate age; v_i is the firm fixed-effects; μ_i is the time fixed-effects, and ε_{it} represents the stochastic disturbance term.

In the system GMM analysis, the error disturbance term was subjected to autocorrelation testing to ensure the regression results' effectiveness. As shown by autocorrelation testing, there was first-order autocorrelation but no second-order autocorrelation; that is to say, GMM as an estimator was applicable. The Sargan test of over-identifying restrictions failed to reject the null hypothesis that all instrumental variables (IVs) were effective, which determined that the IVs were not correlated to the disturbance terms. There was no over-identifying restriction problem with the IVs.

3.2. Calculation Methods

Calculation of GTFP: The firm-level data in this paper were obtained from the China Industrial Enterprise Database, which is substantially different from the macro-data used in the existing literature; therefore, the existing computation method was not applicable. Thus, the Olley–Pakes (OP) method [33] was used to compute the TFP of industrial firms above the designated size based on the 1,166,478 data entries of 412,654 firms collected during the 2000–2013 period. Compared with other methods, the OP method effectively solved the simultaneity problem and the sample selection bias problem caused by the correlation between production factors and labor productivity improvement. The specific industry's deformed pollution coefficient was used as the green coefficient, multiplied by firm-level TFP to work out GTFP.

Calculation of TFP: We estimated TFP by reference to the OP method performed by Song and Du [15]. The OP method involved two steps. First, assuming that an enterprise had known its current productivity (w_{it}) based on which investment decisions to make, the simultaneity bias problem could be solved using current investment as the proxy variable of productivity. Next, the survival probability equation was used to control sample selection bias and work out the consistent estimators of all variables (e.g., capital input). The Stata "opreg" command was used to work out TFP (tfp_{it}). The classic measurement methods of TFP include the traditional non-frontier approach and the frontier approach. The frontier approach refers to non-parametric measurement methods. With the increase in firm-level statistics, China's TFP research trend is from macro-level to micro-level. The traditional simple linear estimation method (OLS) has simultaneous bias and sample selection bias. Moreover, Levinsohn–Petrin's (LP) method cannot control the sample selection bias. The Olley–Pakes (OP) method uses the survival probability model to address these problems by estimating its entry and exit. Moreover, data on firms' intermediate input are highly incomplete. For the above reasons, this study mainly used the Olley–Pakes method to estimate enterprises' total factor productivity.

Calculation of GTFP: To compute GTFP, we used the First National Pollution Survey and the China Environmental Statistics Yearbook 2000–2013. The first step involved the standardization of raw data to eliminate the effect of different dimensions. The green coefficients were geometrically averaged to eliminate the aggregation biased error of different pollutants. The corporate GTFP (GFP) established in this paper was calculated as follows:

$$gtfp_{it} = GC_{kt} * tfp_{it} \quad (3)$$

The method of Li et al. [35] was used to establish and compute the green coefficient (GC) as follows:

$$GC_k = (A_k)^{-1} = \frac{1}{(\bar{E}_k * \bar{P}_k)^{1/2}} \quad (4)$$

Pollution strength k was expressed as the total pollution of an industry divided by its total industry output and P_k stood for pollution magnitude, expressed as the industry's total pollution k divided by all industries' total pollution.

Calculation of OFDI: The paper measured the outward foreign direct investment of Chinese enterprises from whether to carry out OFDI and the frequency of OFDI (*ofdi_times*). We used the Industrial Enterprise Database, matching data with the MOC List of Chinese Investors in the Overseas Market for analysis. If a firm had OFDI activities, the value was 1. Otherwise, the value was 0. We also referred to Li et al. [35] for measuring the frequency of OFDI by selecting the number of host countries for corporate investment. The MOC List of Chinese firms investing in foreign countries includes information on investment destination country, overseas investment firms (institutions), locations and business lines of investing Chinese firms, approval dates, etc. However, no data on the amount of OFDI are available. Although data on the amount of OFDI at the industry-, region-, or country-level are available, they are not useful for this paper's study.

Calculation of the EPU Index: The Macroeconomic Policy Uncertainty Index (EPU) is measured by the EPU Index of economic policy uncertainty for major global economies published jointly by the University of Chicago and Stanford University. The uncertainty index of China's economic policy is constructed by the data from South China Morning Post [36].

The EPU index is constructed by monthly data; therefore, combined with the actual situation of the sample data, we selected the simple average method to convert the monthly EPU data into annual data:

$$EPU_y = \frac{\sum_{m=1}^{12} epu_m}{12} \quad (5)$$

Among them epu_m is the index of economic policy uncertainty in m months, and EPU_y is the annual data after the average value of economic policy uncertainty.

Table 1 shows the variable analysis results based on descriptive statistics.

Table 1. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>gtfp</i>	1,143,150	4.2877	0.8472	1.9238	6.4397
<i>ofdi</i>	1,143,150	0.0014	0.0368	0.0000	1.0000
<i>lnepu</i>	1,143,150	4.6915	0.4121	4.0198	5.4987
<i>profltr</i>	1,143,150	0.0374	0.7592	−86.3778	79.7394
<i>expint</i>	1,143,150	0.1826	0.3527	−1.1716	2.3062
<i>rdint</i>	1,143,150	0.0009	0.0507	−0.2559	52.5157
<i>fincon</i>	1,143,150	0.0549	1.1405	−20.0000	1056
<i>govsub</i>	1,143,150	267.3086	5030.5840	0.0000	1,591,311
<i>ownstr</i>	1,137,648	0.2506	0.4117	−8.0206	54.6891
<i>age</i>	1,166,478	12.2657	11.2451	2.0000	52.0000
<i>manage</i>	1,143,150	1.9259	2.6239	0.0000	272.6563
<i>lnlabor</i>	1,287,837	5.784363	1.0579	0.0085	15.9354

Note: Due to the lack of state-owned capital data on individual firms in the China Industrial Enterprise Database, the sample data of ownership structure are smaller.

Table 2 provides the details of the variables.

Table 2. Definition and calculation methods of main variables.

Variables	Definition	Calculation
<i>profitr</i>	Firm profit rate	operating profit/sales turnover
<i>expint</i>	Firm export intensity	export/sales turnover
<i>fincon</i>	Financial constraint	interest expense/fixed assets
<i>ownstr</i>	Ownership structure	state-owned firm paid-in capital/paid-in capital
<i>manage</i>	Firm management efficiency	primary operating revenue/average total assets
<i>rdint</i>	R&D intensity	new products sales turnover/total sales turnover
<i>govsub</i>	Government subsidy	ln (government subsidy/sales turnover)
<i>lnlabor</i>	Labor productivity	ln (gross industrial output value/annual average employment)
<i>age</i>	Firm age	ln (current year—Year of establishment of the enterprise + 1)

Note: Operating profit, sales turnover, export, interest expense, fixed assets, primary operating revenue, new products sales turnover, government subsidy, and gross industrial output value are all based on the current price.

4. Results

4.1. Baseline Fixed-Effects Results

As indicated by the regression results in Table 3, OFDI had a significantly positive effect on GTFP at a 1% significance level.

The regression coefficient of *ofdi_times* was in line with the expected value. The regression coefficient of EPU was negative. As the EPU index increases, the economy becomes more unstable, and the marginal effect of OFDI on the growth rate of firm green TFP decreases. The cross-term regression coefficient of EPU and OFDI was -0.0723 . It was significant at the level of 5%, indicating that the increase in the level of EPU inhibited the productivity-promoting effect of firms' OFDI. This increased the Chinese multinational companies with comparative advantages investing in the overseas clean technology market in the new global context. China implemented "Come in" and "Go global" strategies and pushed ahead with the green economy. By introducing and learning from advanced green technology of the developed and developing countries, these companies positively impact the green economy and improvement in their GTFP.

4.2. Further Fixed-Effects Results

We studied how OFDI and EPU affected GTFP in terms of (i) investor ownership structure (state-owned, private and foreign); (ii) investment motivation (market-seeking, technology seeking and resource-seeking); (iii) host country (OECD and non-OECD); and (iv) different regions (East China, Central China, and Western China).

As shown by the regression results in Table 4, *priv_ofdi* and *foreign_ofdi* contributed positively to GTFP. However, state-owned enterprises' regression coefficient was not significant, although state-owned enterprises were too few to represent descriptive statistics.

Investment motivation was classified into market-seeking (*market_ofdi*), technology-seeking (*tech_ofdi*), and resource-seeking (*resou_ofdi*). The estimations showed *market_ofdi* to be positively correlated with GTFP. Moreover, *tech_ofdi* improved GTFP, with a positive GTFP growth coefficient at the 1% significance level. Besides, *resou_ofdi* was positively correlated to GTFP.

Table 3. Baseline fixed-effects results.

Variable: $gtfp_{it}$	Total Sample	
<i>ofdi</i>	0.1281 *** (9.26)	
<i>ofdi_times</i>		0.0209 *** (9.45)
<i>ofdi*lnepu</i>	−0.0723 ** (−2.34)	
<i>ofdi_times*lnepu</i>		−0.0225 * (−1.85)
<i>profitr</i>	0.2702 *** (11.39)	0.1907 *** (10.41)
<i>expint</i>	0.0004 (0.14)	0.0003 (0.13)
<i>fincon</i>	0.0047 *** (8.53)	0.0046 *** (8.54)
<i>ownstr</i>	−0.1467 *** (−19.41)	−0.1466 *** (−19.43)
<i>rdint</i>	0.6820 *** (12.51)	0.6819 *** (12.50)
<i>manage</i>	0.0844 *** (110.01)	0.0843 *** (110.02)
<i>govsub</i>	0.0001 *** (3.19)	0.0001 *** (3.20)
<i>age</i>	0.0093 (1.41)	0.0094 (1.59)
<i>constant</i>	0.8821 *** (9.43)	0.8819 *** (9.46)
<i>Industry FE</i>	Yes	Yes
<i>Region FE</i>	Yes	Yes
<i>Observations</i>	1,137,648	1,137,648
<i>R²</i>	0.0904	0.0901
<i>F-value</i>	1308.10	1367.15

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% level, respectively. T values are in parentheses.

Based on the host country's income level, OFDI was classified into OFDI in OECD countries (*oecd_ofdi*) and OFDI in non-OECD countries (*nooecd_ofdi*). The analysis showed both *oecd_ofdi* and *nooecd_ofdi* to be positively contributive to GTFP.

Firms with different investment motivations achieve the OFDI reverse technology spillover through different channels—OFDI and EPU on GTFP also differ across firms. Resource-seeking OFDI drives economic development primarily by obtaining access to rare natural resources, therefore driving up TFP; however, GTFP does not necessarily improve energy consumption growth. Market-seeking OFDI achieves the reverse technology spillover primarily through the effects of economies of scale and marginal products. Compared with technology-seeking OFDI, market-seeking OFDI does not have a significant positive effect on GTFP. The results are also robust to consider different regions (East, Central and Western China).

Under the influence of economic policy uncertainty, the result of OFDI on green TFP is still significantly negative. That is, the increase in EPU would hinder the marginal effect of OFDI on green TFP. In terms of control variables, R&D and innovation intensity at a 1% significance level proved positively correlated to GTFP, and home country R&D investment served as the main driving force on technological advancement at home. Export intensity had an insignificantly positive value. Corporate profit rate contributed significantly to GTFP.

Table 4. Further fixed-effects results.

Variable	Ownership Structure	Investment Motivation	OECD/Non-OECD	Region
<i>state_ofdi</i>	0.0681 (1.45)			
<i>priv_ofdi</i>	0.2518 *** (7.72)			
<i>foreign_ofdi</i>	0.2132 *** (3.59)			
<i>market_ofdi</i>		0.1754 *** (4.91)		
<i>tech_ofdi</i>		0.1891 *** (4.81)		
<i>resou_ofdi</i>		0.0735 * (1.89)		
<i>oecd_ofdi</i>			0.1865 *** (5.41)	
<i>nooecd_ofdi</i>			0.0967 *** (6.39)	
<i>east_ofdi</i>				0.2011 *** (8.49)
<i>cen_ofdi</i>				0.0735 * (1.92)
<i>west_ofdi</i>				0.2018 *** (4.17)
<i>ofdi*lnepu</i>	−0.0625 * (−1.89)	−0.0623 ** (−2.01)	−0.0675 * (−1.91)	−0.0631 ** (−2.09)
<i>profitr</i>	0.2701 *** (11.38)	0.2702 *** (11.47)	0.2705 *** (11.40)	0.2704 *** (11.49)
<i>expint</i>	0.0004 (0.14)	0.0004 (0.14)	0.0005 (0.15)	0.0004 (0.14)
<i>fincon</i>	0.0046 *** (8.52)	0.0047 *** (8.33)	0.0048 *** (8.51)	0.0048 *** (8.47)
<i>ownstr</i>	−0.1465 *** (−19.40)	−0.1463 *** (−18.49)	−0.1464 *** (−19.37)	−0.1465 *** (−19.28)
<i>rdint</i>	0.6819 *** (12.48)	0.6819 *** (12.49)	0.6820 *** (12.51)	0.6820 *** (12.50)
<i>manage</i>	0.0842 *** (99.01)	0.0843 *** (99.04)	0.0844 *** (99.04)	0.0842 *** (99.05)
<i>govsub</i>	0.0001 *** (3.18)	0.0001 *** (3.25)	0.0001 *** (3.24)	0.0001 *** (3.25)
<i>age</i>	0.0092 (1.40)	0.0091 (1.44)	0.0092 (1.47)	0.0091 (1.46)
<i>constant</i>	0.8820 *** (9.49)	0.8821 *** (9.48)	0.8820 *** (9.47)	0.8821 *** (9.48)
Industry FE	Yes	yes	yes	yes
Region FE	Yes	yes	yes	yes
Observations	1,137,648	1,137,648	1,137,648	1,137,648
within-R ²	0.0901	0.0901	0.0901	0.0901
F-value	1326.11	1319.18	1318.27	1312.16

Notes: ***, **, and * denote statistical significance at 1%, 5%, and 10% level, respectively. T values are in parentheses.

4.3. System GMM Estimation Results

As shown by the regression results in Table 5, the current-term GTFP estimates based on the first-order lag were significantly positive. The sub-sample estimates based on system GMM also proved significantly positive. According to business registration procedures and the List of Chinese Investors and Entities in the Overseas Market, the enterprises were classified into three types, i.e., the state-owned enterprises with OFDI (*state_ofdi*), the private enterprises with OFDI (*priv_ofdi*), and the foreign enterprises with OFDI (*foreign_ofdi*). Also, (*state_ofdi*), more politically-driven as a government mission,

was more likely to receive government funding. Since the Reform and Opening-up policy, the local governments have provided preferential policies for *foreign_ofdi*, which plays a limited role in contributing to GTFP. On the contrary, *priv_ofdi* is entitled to fewer policy preferences than *state_ofdi* and *foreign_ofdi*. Note that *priv_ofdi* focuses more on efficiency and has more sharply-defined ownership structures and institutions; therefore, *priv_ofdi* plays a more favorable role in improving GTFP.

Table 5. System generalized method of moments (GMM) results.

Variable	Baseline Regression	Ownership	Investment Motivation	OECD/Non-OECD	Region
<i>gtfp</i> (−1)	0.1822 ** (2.18)	0.2106 *** (2.60)	0.2614 *** (2.85)	0.1231 ** (2.08)	0.2218 *** (2.73)
<i>ofdi</i>	0.6127 ** (2.37)				
<i>state_ofdi</i>		−0.6725 (−1.47)			
<i>priv_ofdi</i>		0.7428 *** (3.69)			
<i>foreign_ofdi</i>		0.5711 *** (2.68)			
<i>market_ofdi</i>			0.4638 ** (2.47)		
<i>tech_ofdi</i>			0.7386 *** (3.58)		
<i>resou_ofdi</i>			−0.4126 (−1.59)		
<i>oecd_ofdi</i>				0.7417 ** (2.49)	
<i>nooecd_ofdi</i>				0.4113 * (1.91)	
<i>east_ofdi</i>					0.7781 *** (2.75)
<i>cen_ofdi</i>					−0.4106 (−0.77)
<i>west_ofdi</i>					0.4943 ** (2.36)
<i>ofdi*lnepu</i>	−0.3216 ** (−2.43)	−0.3214 ** (−2.47)	−0.3215 ** (−2.48)	−0.3215 ** (−2.47)	−0.3217 ** (−2.49)
<i>profitr</i>	0.7893 *** (2.75)	0.789 *** (2.86)	0.9722 *** (3.94)	0.7884 *** (2.85)	0.9724 *** (3.63)
<i>expint</i>	−0.9452 *** (−6.56)	−0.9453 *** (−6.53)	−0.9354 *** (−6.25)	−0.9457 *** (−6.58)	−0.9366 *** (−6.45)
<i>fincon</i>	0.9643 ** (2.32)	0.9654 ** (2.31)	0.2654 ** (1.99)	0.9656 ** (2.38)	0.2678 ** (2.45)
<i>ownstr</i>	−0.6531 *** (−4.57)	−0.6531 *** (−4.57)	−0.7765 *** (−4.64)	−0.6531 *** (−4.57)	−0.7765 *** (−4.64)
<i>rdint</i>	0.9871 ** (2.21)	0.9872 ** (2.23)	0.9835 ** (2.41)	0.9872 ** (2.18)	0.9834 ** (2.40)
<i>manage</i>	0.0613 *** (5.62)	0.0612 *** (5.61)	0.0602 *** (5.93)	0.0611 *** (5.57)	0.0609 *** (5.84)
<i>govsub</i>	−0.0002 (−0.66)	−0.0002 (−0.66)	−0.0002 (−0.69)	−0.0002 (−0.67)	−0.0002 (−0.68)
<i>constant</i>	−0.0327 (−0.65)	−0.0316 (−0.67)	−0.0047 (−0.64)	−0.0345 (−0.64)	−0.0048 (−0.67)
<i>Industry FE</i>	yes	yes	yes	yes	yes
<i>Region FE</i>	yes	yes	yes	yes	yes
<i>AR(1)</i>	0.003	0.002	0.005	0.085	0.002
<i>AR(2)</i>	0.554	0.327	0.849	0.217	0.472
<i>Sargan test</i>	0.226	0.148	0.829	0.963	0.379

Notes: ***, **, and * denote statistical significance at 1%, 5%, and 10% level, respectively. T values are in parentheses.

According to the system GMM estimates, *state_ofdi* had a negative yet insignificant coefficient of influence. This evidence was possibly due to the state-owned enterprises' role in implementing foreign policy through FDI rather than acquiring profit and green technology as their primary goal. The Dynamic Panel Data (DPD) analysis proved *market_ofdi* to be positively correlated with GTFP. The primary goal of *market_ofdi* was to facilitate exports, develop more foreign market demand, and enhance global market share. Home country investors improved GTFP through economies of scale and marginal utility. Moreover, *tech_ofdi* improved TFP, with static/dynamic regression results showing a positive GTFP growth at a 1% significance level. As for such enterprises, investment motivation was to acquire advanced technology and management experience. Talent mobility, R&D cost allocation, return flow of R&D achievements, and similar mechanisms contributed to reverse technology spillovers, which resulted in higher GTFP. The DPD regression results showed *resou_ofdi* to be negatively correlated to GTFP. In this case, investment motivation of seeking natural resources in the host country was significant to home resource security rather than profit maximization. Therefore, *resou_ofdi* failed to contribute to higher GTFP.

The system GMM analysis showed *oecd_ofdi* to be positively correlated to GTFP at a 5% significance level, and *nooecd_ofdi* to be positively correlated to GTFP at 10% significance. *oecd_ofdi* showed a prominently better effect than *nooecd_ofdi* in improving GTFP, probably because investing in developed countries optimized the exploitation of local R&D resources with more obvious reverse technology spillovers. *oecd_ofdi* and *nooecd_ofdi* differed in terms of effects on GTFP, with the former being more contributive than the latter. East China (*east_ofdi*), Central China (*cen_ofdi*) and Western China (*west_ofdi*) have a great disparity in economic development, with East China having a better economic context than Central China and Western China. According to the China OFDI Statistics Yearbook 2018, by the end of 2017, in terms of OFDI of regional enterprises, East China enterprises accounted for 83.2%. Western China enterprises accounted for 9.3%, and central China enterprises accounted for 7.5%. The region-based OFDI difference affected the accuracy of estimations by taking China as the population. As shown by dynamic regression results, system GMM estimates showed an obvious regional difference. While *cen_ofdi* was insignificantly correlated to GTFP, *east_ofdi* had a positive correlation to GTFP at a 1% significance level, and *west_ofdi* had a positive correlation to GTFP at a 5% significance level. Notably, *east_ofdi* had a TFP-contributive effect better than *west_ofdi*, and the regression results balanced primarily with the population. Under the influence of economic policy uncertainty, the result of OFDI on green TFP was still significantly negative. That is, the increase in EPU will reduce the marginal effect of OFDI on GTFP.

5. Robustness Checks

5.1. Green Labor Productivity (GLP) Perspective

In this paper, the overall research hypothesis was that enterprises improved GTFP through reverse technology spillovers in OFDI. For robustness testing of empirical results, the 2008–2013 data were used to estimate green labor productivity (GLP) $glp_{it} = GC_{kt} * \ln labor_{it}$ in the regression results in Table 6.

An enterprise is compelled to face larger markets and fiercer competition in overseas investment and develop higher-tech products and productivity; therefore, the enterprise has to invest in R&D to achieve a comparative advantage to maintain a market foothold. In this course, advanced green technology and management practice, which the enterprise acquires from the host country, has a reverse technology spillover effect on its parent company. The technology and practices are digested, assimilated, and improved, resulting in higher GLP. Therefore, GLP was substituted for GTFP in robustness testing. According to the OFDI-based System Panel Data regression for GLP, the estimates had similarities with the GTFP estimates. Therefore, the estimates of the preceding model were robust. The interaction term's regression results show that economic policy uncertainty inhibits the green productivity effect of corporate OFDI.

Table 6. System GMM results with the green labor productivity (GLP) Perspective.

Variable: $glfp_{it}$	Total Sample	
<i>ofdi</i>	0.1142 *** (−9.51)	
<i>ofdi_times</i>		0.0317 *** (−9.18)
<i>ofdi*lnepu</i>	−0.0954 ** (−2.48)	
<i>ofdi_times*lnepu</i>		−0.0275 *** (−3.16)
<i>profitr</i>	−0.0018 ** (−2.29)	−0.0018 ** (−2.31)
<i>expint</i>	−0.0815 *** (−8.06)	−0.0817 *** (−8.21)
<i>fincon</i>	0.0001 (−0.32)	0.0001 (−0.43)
<i>ownstr</i>	−0.0074 *** (−3.48)	−0.0065 *** (−3.27)
<i>rdint</i>	−0.1725 *** (−4.04)	−0.1718 *** (−7.06)
<i>manage</i>	0.0018 ** (−1.99)	0.0020 *** (−8.75)
<i>govsub</i>	0.0001 *** (−5.81)	0.0001 *** (−4.96)
<i>age</i>	−0.0021 (−0.94)	−0.0023 (−0.82)
<i>constant</i>	−0.9805 *** (−9.26)	−0.9436 *** (−8.39)
<i>Industry FE</i>	yes	yes
<i>Region FE</i>	yes	yes
<i>Observations</i>	1,217,396	1,217,396
<i>R²</i>	0.0137	0.0143
<i>F value</i>	256.19	237.12

Notes: *** and ** denote statistical significance at 1%, 5%, and 10% level, respectively. T values are in parentheses.

5.2. Propensity Score Matching (PSM)-Based Analysis

PSM (propensity score matching) was used to create the control group of OFDI to specify how OFDI affected GTFP. PSM was conducted to analyze how OFDI affected GTFP by using non-overseas Chinese investors as the control group that were comparable in some characteristics to overseas Chinese investors. NNM (nearest neighbor matching), RM (radius matching) and KM (kernel matching) were used to match the enterprises with similar values of the propensity score and study the robustness estimates for GLP of overseas Chinese investors.

The regression results of NNM, RM, and KM in Table 7 showed that a 1% increase in OFDI contributed to an approximately 0.07 percentage point increase in GTFP. All the coefficients of estimation were positive at a 1% significance level. PSM-based estimates further supported the results of the linear regression model.

5.3. The Impact of Age of OFDI on GTFP

Previously, the OFDI was analyzed concerning its effect on GTFP, based on DPD regression analysis, GMM analysis, and PSM. However, OFDI from a dynamic perspective was not investigated based on whether it could affect GTFP significantly or not. The in-depth investigation into the problem helped us assess how OFDI realistically affected GTFP; the ongoing investigation assists in interpreting the growth rate of GTFP and distinguishing the duration of the effect (temporary or sustained).

Table 7. Average treatment effects (ATT) on the treated.

Method	Variable	Sample	Treatment Group	Control Group	ATT	Standard Deviation	T-statistic
NNM	<i>gtfp</i>	Before matching	3.2724	3.2076	0.0648	0.122	0.5311
		After matching	3.2724	3.2015	0.0709	0.026	2.7269 ***
RM	<i>gtfp</i>	Before matching	3.2724	3.2082	0.0642	0.126	0.5095
		After matching	3.2724	3.2016	0.0708	0.0181	3.9116 ***
KM	<i>gtfp</i>	Before matching	3.2724	3.2081	0.0643	0.216	0.2977
		After matching	3.2724	3.2076	0.0648	0.0192	3.3750 ***

Note: The standard deviations were worked out based on 500 replications of the Bootstrap process. NNM refers to the nearest neighbor matching; RM refers to the radius matching; KM refers to the kernel matching. *** denotes statistical significance at 1% level.

As shown by the empirical analysis in Table 8, OFDI and OFDI lags (from the first-order lag to the fourth-order lag) were positive and passed the 1% significance test. The Regression indicated that OFDI had an immediate and sustained positive effect on GTFP. Furthermore, it was observed in research that this effect kept growing stably as OFDI aged. The findings substantiated the previous conclusions. The interaction term's regression results show that economic policy uncertainties would reduce the green productivity effect of OFDI. The above results show that the regression results of this paper are robust and unbiased.

Table 8. The impact of outward foreign direct investment (OFDI) duration on green total factor productivity (GTFP).

Variable: <i>gtfp_{it}</i>	Total Sample	
<i>ofdi</i>	0.1136 *** (8.31)	
<i>ofdi_times</i>		0.0242 *** (10.45)
<i>ofdi*D_1year</i>	0.1526 *** (7.63)	0.0218 *** (7.32)
<i>ofdi*D_2year</i>	0.1341 *** (6.21)	0.0221 *** (8.47)
<i>ofdi*D_3year</i>	0.1625 *** (8.34)	0.0275 *** (6.84)
<i>ofdi*D_4year</i>	0.1632 *** (9.36)	0.0262 *** (6.31)
<i>ofdi*lnepu</i>	−0.1023 (−1.48)	
<i>ofdi_times*lnepu</i>		−0.0167 * (−1.82)
<i>profitr</i>	0.2612 *** (11.41)	0.2583 *** (13.32)
<i>expint</i>	0.0004 (0.98)	0.0003 (0.56)
<i>fincon</i>	0.0032 *** (6.52)	0.0034 *** (6.18)
<i>ownstr</i>	−0.1356 *** (−15.98)	−0.1258 *** (−12.65)
<i>rdint</i>	0.5411 *** (9.36)	0.5437 *** (8.43)
<i>manage</i>	0.0631 *** (8.09)	0.0598 *** (7.82)
<i>govsub</i>	0.0003 ** (2.24)	0.0002 ** (2.25)
<i>age</i>	0.0076 *** (9.81)	0.0078 *** (8.32)
<i>constant</i>	0.8523 *** (8.49)	0.8416 *** (9.36)
Industry FE	Yes	yes
Region FE	Yes	yes
Observations	1,137,648	1,137,648
R ²	0.1231	0.1290
F value	2031.15	1921.65

Notes: ***, **, and * denote statistical significance at 1%, 5%, and 10% level, respectively. T values are in parentheses.

6. Conclusions

We consolidated the data in the China Industrial Enterprises Database and the MOC List of Chinese Investors in the Overseas Market to precisely investigate the impact of Chinese firms' OFDI on green TFP under economic policy uncertainties. The green coefficient based on the deformed pollution coefficients was multiplied by TFP to constitute GTFP. The empirical analysis studied the correlation between OFDI and GTFP. The paper outlined three main conclusions. Firstly, OFDI and *ofdi_times* contributed positively and significantly to GTFP, and this effect kept stably increasing as OFDI aged. The increase in EPU would reduce the marginal effect of OFDI on green TFP. Secondly, OFDI failed to significantly improve GTFP in state-owned enterprises from heterogeneity, while it contributed positively and significantly to GTFP in private enterprises and foreign enterprises. As compared with resource-seeking OFDI and market-seeking OFDI, technology-seeking OFDI contributed more remarkably to GTFP growth; OFDI proved to significantly and positively contribute to GTFP growth. Finally, we found that the OFDI of East China and Western China-based investors could contribute positively to GTFP. Due to the increase in uncertainties in the global macroeconomic environment, the increase in uncertainty in external economic policies has become more obvious in inhibiting the productivity effect of OFDI. We also conducted several robustness checks to confirm these results.

Several policy proposals were provided, considering the empirical findings. For one thing, OFDI should be lessened and improved in quality. Although OFDI impacts significantly on corporate green TFP, this effect applies only to private firms, foreign firms, and technology-seeking firms, indicating the phenomenon that OFDI enhances corporate green TFP with significant heterogeneity from firm to firm. Firstly, a firm should contain its intention of irrational OFDI and center on OFDI quality and performance. Through OFDI, private firms and foreign firms can achieve significantly higher green TFP because they make investments more rationally and reap profit, expand markets, and acquire advanced technology. They work for a more definite goal; hence, higher investment quality and performance. Secondly, technology-seeking OFDI should be increased because advanced technology, especially advanced green technology, is vital to improved green productivity. Green productivity lies at the heart of environmental pollution. As efforts are made to protect China's environment, environmental remediation costs are expected to rise increasingly. This explains why green technology investment helps a firm to elevate itself. Thirdly, increased investment should be made in developed countries, where governments give more importance to environmental protection and remediation, and more advanced technology is adopted. This issue explains why such investments can help the firm promote green growth and improve product competitiveness in the international market.

Finally, a firm should be encouraged to invest in innovation, employ senior professionals, and in R&D investments. The present international division of labor features multinational companies of the developed countries at the core of production by high-value-added, high technology, and high productivity. This explains why they normally acquire most of the earnings. To reverse the trend, Chinese enterprises need to invest more in R&D activities for high technology acquisition. These steps should be taken to employ senior professionals. R&D achievements are inseparable from human capital investment. Indeed, human capital is acquired either internally or externally. Senior professionals, particularly, become more important as a scarce resource. Only by acquiring and introducing senior professionals can a firm make progress in technology, enhance product quality, increase marginal revenue, and achieve continual competitiveness and sustainability.

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References

- Cozza, C.; Rabellotti, R.; Sanfilippo, M. The impact of outward FDI on the performance of Chinese firms. *China Econ. Rev.* **2015**, *36*, 42–57. [\[CrossRef\]](#)
- Vahter, P.; Masso, J. Home versus host country effects of FDI: Searching for new Evidence of productivity spillovers. *SSRN Electron. J.* **2006**, *53*, 165–196. [\[CrossRef\]](#)
- Driffield, N.; Love, J.H.; Taylor, K. Productivity and labour demand effects of inward and outward FDI on UK industry. *Manch. Sch.* **2009**, *77*, 171–203. [\[CrossRef\]](#)
- Zhao, C.; Li, X. OFDI and enterprises' technological innovation—An empirical analysis based on listed companies in China. *J. Int. Trade* **2017**, *6*, 107–119.
- Sha, W.B.; Li, Y. Reverse technology spillover effects of OFDI, knowledge management and regional innovation capabilities. *World Econ. Stud.* **2018**, *7*, 80–94.
- Bitzer, J.; Kerekes, M. Does foreign direct investment transfer technology across borders? New evidence. *Econ. Lett.* **2008**, *100*, 355–358. [\[CrossRef\]](#)
- Alazzawi, S. Innovation, productivity and foreign direct investment-induced R&D spillovers. *J. Int. Trade Econ. Dev.* **2012**, *21*, 615–653.
- Li, Y. A study on the outcome of China's OFDI firms. *Manag. World* **2009**, *9*, 34–43.
- Fang, J.; Gozgor, G.; Lu, Z.; Wu, W. Effects of the export product quality on carbon dioxide emissions: Evidence from developing economies. *Environ. Sci. Pollut. Res.* **2019**, *26*, 12181–12193. [\[CrossRef\]](#)
- Li, G.; Zhang, W.; Wang, Y. OFDI, environmental regulation and green technology innovation in China. *Sci. Technol. Manag. Res.* **2016**, *13*, 227–236.
- Can, M.; Gozgor, G. Effects of export product diversification on quality upgrading: An empirical study. *J. Int. Trade Econ. Dev.* **2018**, *27*, 293–313. [\[CrossRef\]](#)
- Gozgor, G.; Can, M. Does Export product quality matter for CO2 emissions? Evidence from China. *Environ. Sci. Pollut. Res.* **2017**, *24*, 2866–2875. [\[CrossRef\]](#) [\[PubMed\]](#)
- Yin, D.; Zhang, J. Reverse technology spillover effects from China's OFDI: An empirical analysis from the perspective of absorptive capacity. *J. Int. Trade* **2016**, *1*, 109–120.
- Luo, L.W.; Liang, S.R. The spatial effect of international R&D capital technology spillovers on the efficiency of China's green technology innovation. *Econ. Manag. J.* **2017**, *3*, 21–33.
- Song, W.J.; Du, H.Y. Independent research and development, technology spillover and China's green technology innovation. *Res. Financ. Econ. Issues* **2017**, *8*, 98–105.
- Zheng, Q.; Ran, G.H. Effects of two-way FDI on green productivity spillover in China: An empirical test based on dynamic panel model. *Stat. Inf. Forum* **2018**, *33*, 54–61.
- Nie, M.; Qi, H. Can OFDI improve China's industrial green innovation efficiency? Based on the perspective of innovation value chain and spatial correlation effect. *World Econ. Stud.* **2019**, *2*, 111–122.
- Kang, W.; Lee, K.; Ratti, R.A. Economic policy uncertainty and firm-level investment. *J. Macroecon.* **2014**, *39*, 42–53. [\[CrossRef\]](#)
- Feng, L.; Li, Z.; Swenson, D.L. Trade policy uncertainty and exports: Evidence from China's WTO accession. *J. Int. Econ.* **2017**, *106*, 20–36. [\[CrossRef\]](#)
- Lin, J.H.; Ruan, M.K. Economic policy uncertainty and Enterprise financing. *Q. J. Financ.* **2016**, *3*, 1–21.
- Tan, X.F.; Zhang, W.J. The transmission mechanism analysis of the impact of economic policy uncertainty on corporate investment. *J. World Econ.* **2017**, *40*, 3–26.
- Rao, P.G.; Yue, H.; Jiang, G.H. Economic policy uncertainty and firms' investment. *J. World Econ.* **2017**, *2*, 27–51.
- Xu, G.W.; Sun, Z.; Liu, X. The influences of economic policy uncertainty on the preference of enterprise investment structure: Evidence from China EPU index. *Manag. Rev.* **2020**, *32*, 246–261.
- Wei, Y.Y.; Liu, H.D. Study on the influence of economic policy uncertainty on the margins of exports—Theory and empirical evidence from China and its trading partners. *Int. Bus.* **2017**, *1*, 28–39.

-
25. Handley, K.; Limão, H. Policy uncertainty, trade, and welfare: Theory and evidence for China and the United States. *Am. Econ. Rev.* **2017**, *107*. [[CrossRef](#)]
 26. Wang, Y.N.; Zhou, M.T. Trade policy uncertainty, tariff reduction and exporters' product distribution. *J. Quant. Tech. Econ.* **2017**, *34*, 127–142.
 27. Lu, X.D.; Liu, J.J. Uncertainty and China's export growth. *Econ. Res. J.* **2017**, *52*, 39–54.
 28. Zhang, Y.; Zhu, X.M. Impact of economic policy uncertainty on export quality and price. *J. Int. Trade* **2018**, *5*, 12–25.
 29. Chen, S.J.; Feng, Z.X. Can economic policy uncertainty influence firm export? *J. Int. Trade* **2020**, *3*, 71–85.
 30. Wang, Y.N.; Wang, H.C.; Su, H. Quantity and quality effects of trade policy uncertainty on China's product export: Based on free trade agreement background. *Audit Econ. Res.* **2020**, *35*, 111–119.
 31. Li, B.; Lin, A.Q.; Guo, D.M. Product heterogeneous effects of economic policy uncertainty on imports: Big data context analysis based on Chinese newspapers. *Syst. Eng. Theory Pract.* **2020**, *40*, 1578–1595.
 32. Mao, Q.L. Does trade policy uncertainty affect Chinese manufacturing firms' imports? *Econ. Res. J.* **2020**, *55*, 148–164.
 33. Olley, G.S.; Pakes, A. The dynamics of productivity in the telecommunications equipment industry. *Econometrica* **1996**, *64*, 1263–1297. [[CrossRef](#)]
 34. Brandt, L.; Biesebroeck, J.V.; Zhang, Y. Creative accounting or creative destruction? Firm-level productivity growth in Chinese manufacturing. *J. Dev. Econ.* **2012**, *97*, 339–351. [[CrossRef](#)]
 35. Li, C.Q.; Lv, X.F.; Wu, G. R&D investment, financing constraints and green-tech content of Chinese exports. *Sci. Res. Manag.* **2015**, *36*, 28–35.
 36. Baker, S.R.; Bloom, N.; Davis, S.J. Measuring economic policy uncertainty. *Q. J. Econ.* **2016**, *131*, 1593–1636. [[CrossRef](#)]