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Industrialization in the face of economic policy uncertainty: cross-country evidence

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Abstract

The objective of this paper is to analyse the cross-country industrialization effects of global economic policy uncertainty (WUI). To this end, ordinary least squares, Driscroll & Kraay and the system generalised method of moment estimators were applied to a large panel of 140 countries over the 1999–2019 period. Overall, results provide strong evidence of negative effects of both WUI and risk of uncertainty on industrialisation. The magnitude of this impact was higher in developing and emerging countries compared to their developed counterparts.

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1. Introduction

Industrialization is a major driver of economic growth (Szirmai & Verspagen, 2011; Storm & Naastepad, 2005). A key component of successful structural changes in western economies was industrialization (UNIDO, 2013; Tchapchet et al., 2024). Thus, sustainable development cannot be accomplished with a weak industrial structure, according to empirical evidence from developed, newly industrialized, and emerging economies (Akkemik, 2008). In fact, the literature has provided ample evidence of the manufacturing sector's dynamic role as a driver of structural change and economic growth (see Chenery, 1955; Clark, 1940; Kuznets & Murphy, 1966; Lewis, 1954; McCausland and Theodossou, 2012; Ketu & Ningaye, 2024).

However, recent literature has documented a declining trend in industrialisation both for developed countries, termed deindustrialisation (known as a sustained decline in manufacturing employment as a percentage of total employment as well as manufacturing as a percentage of GDP) as well as premature deindustrialisation for developing countries (Rodrik, 2016; Tregenna, 2016). Tregenna (2016) argued that this deindustrialisation trend was mostly as a result of liberalisation policies such as trade liberalization, financial liberalization and austere monetary policies. We contend that these liberal policies are as well responsible for the exacerbation of uncertainty observed in recent decades given that these policies also led to increasing globalisation (Ketu & Nguea, 2024) as an important transmission mechanism of uncertainty.

Since the book "The Age of Uncertainty" by John Kenneth Galbraith was published in 1977, a number of significant events have taken place, causing economic and political uncertainty all over the world (Al-Thaqeb and Algharabali, 2019). We live in a world that is extremely connected, so any event that occurs in one part of the world will undoubtedly have an impact on the other part of the world (Cheng, 2017). The Arab Spring in 2012, the 2008 financial crisis, the European sovereign debt crisis, the migration crisis, Brexit, Donald Trump's election in 2016, the US-China trade war, the coronavirus pandemic and most recently, Russia-Ukraine war are among the recent global causes of uncertainty (Jiang et al., 2019).

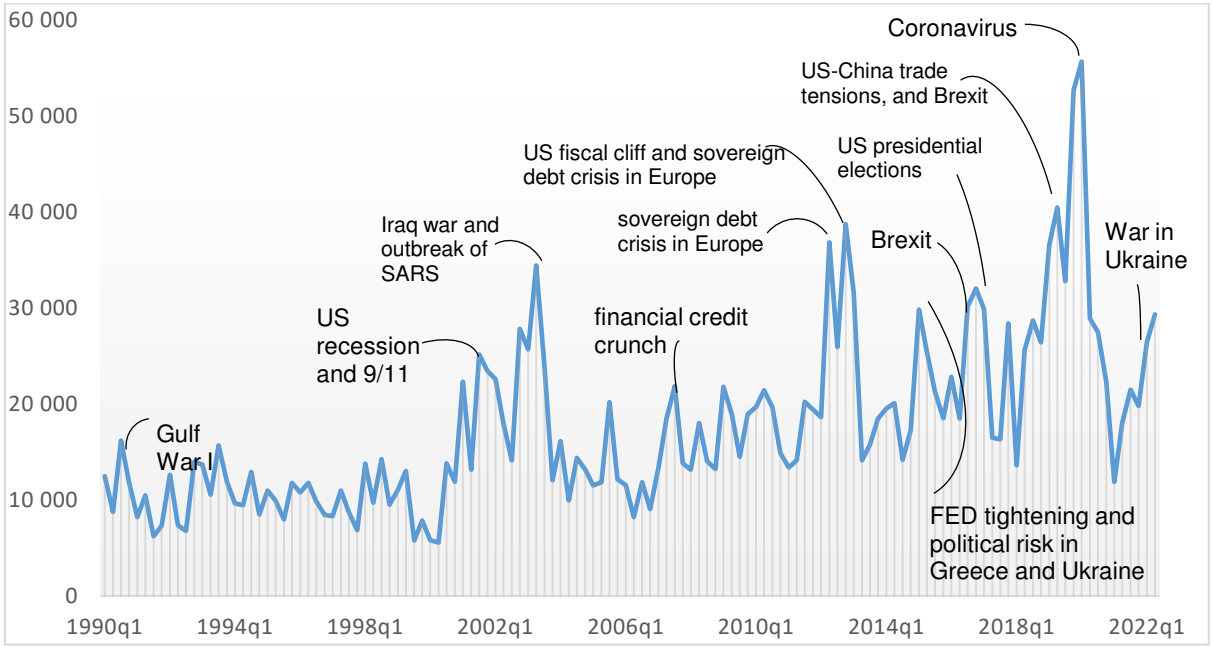
On this basis, adverse macroeconomic effects of uncertainty have been documented. Among others; uncertainty decreases employment (Caggiano et al., 2017), inhibits investment activities (Drobetz et al., 2018; Baker et al., 2016; Gulen & Ion, 2016), and worsens stock market illiquidity (Dash et al., 2021), limits domestic credit (Hu & Gong, 2019), slows economic prosperity (Kang et al., 2019), exacerbates exchange-rate volatility (Krol, 2014) and hinders inflow of foreign direct investment especially to developing countries (Avom et al., 2020). Despite this rich literature, little is known about the effects of global economic policy uncertainty on industrialisation especially in a cross-country framework. Our goal is to fill this lacuna.

The theory of irreversible choice under uncertainty, which Bernanke first developed in 1983, offers a theoretical framework for comprehending cyclical fluctuations in investment as well as for evaluating the effects of uncertainty on investment in general and industrialization in particular. The negative effects of uncertainty on industrialization could thus, theoretically be explained by the volatility of investments and investors' "wait-and-see" attitude. First, according to Keynes (1937), investments are the most erratic part of effective demand because the latter depends more on opinions about future events, and any unfavourable opinions about future events will cause investments to decline. Second, according to writers like Bernanke (1983) and Bloom (2009), the likelihood that businesses will invest is influenced by the degree of uncertainty. As a result, businesses adopt a "wait and see" attitude when there is a lot of uncertainty and if investments are irreversible, which delays their decision-making and may result in a decline in investment rate. According to Rodrik (1991), when reforms are implemented in developing

nations, investment decisions may be put off until there is certainty about the reforms' viability. Uncertainty is therefore likely to have greater effects in developing countries.

On the empirical front, studies linking industrialisation to economic policy uncertainty are still nascent. Of the few studies, the result is inconclusive. On one hand, Kang et al. (2014) show that economic policy uncertainty may increase the manufacturing sector's production rate. Zhu and Yu (2022) argued that uncertainty will stimulate technological progress to enhance positive effects on industrial output based on panel data from 2005 to 2017 of China's industry. Still on China, Hu and Yan (2021) document a positive effect of economic policy uncertainty on manufacturing structural upgrading using firm and province level. On the other hand, a negative relationship between investment and the volatility of a firm's daily stock returns over the course of a year is suggested by Leahy and Whited (1996) for US manufacturing firms over the period of 1981–1987. For US manufacturing firms between 1984 and 2003 and for UK firms between 1972 and 1991, respectively, Baum et al. (2008) and Bloom et al. (2007) report similar results. Zhu and Yu (2022) content that higher levels of economic policy uncertainty will reduce Chinese industrial sector output. This article differs from previous studies and contributes to the literature in several ways. First, to the best of our knowledge, this is the first paper to provide a cross-country effect of global economic uncertainty on industrialisation. Secondly, we used the new world uncertainty index by Ahir et al. (2018) and its volatility available for a large panel which allow this present paper to gain in degrees of freedom unlike previous studies that mostly relied on the EPU index by Baker et al. (2016). Thirdly, we applied the system Generalised Method of Moments to address endogeneity concerns not properly handled by previous studies. Also, we employ the Driscoll & Kraay estimator which is robust to cross-sectional dependence common in today's globalised world. Results show that world uncertainty and its volatility negatively affect industrialisation especially in developing countries.

Figure 1: Evolution of world uncertainty since 1990



Source: Ahir et al. (2018)

Figure 1 reveals rising uncertainty over the past three decades which reached unprecedented level in 2020 with the upsurge of the COVID-19 pandemic.

The rest of the paper is scheduled as follows. Section 2 presents the data, model and estimation strategy while section 3 presents results and discussion then, section 4 concludes.

2. Data, model and estimation strategy

An unbalanced panel dataset consisting of 140 countries[1] spanning from 1999 to 2019 was built for the empirical investigations. Full description of the data is as follows. The dependent variable is industrialisation proxied by industrial value added (including value-added in construction, mining and manufacturing). Data are expressed as a percentage of GDP in current US dollars. For robustness purpose, other proxies such as employment in industry (total) and manufacturing value-added is used. These variables are extracted from the world development indicators database. Several studies investigating the drivers of industrialisation also used these proxies (Nkemgha et al., 2021; Tchapchet et al., 2024; Nkemgha et al., 2024).

Table 1: Summary statistics and variable description

Variable	Brief description	Source	Obs	Mean	SD
IVA	Industrial value added (%GDP)	WDI (2023)	2854	28.329	11.59
MVA	Manufacturing value added (%GDP)	WDI (2023)	2773	13.323	6.278
Emp_Ind	Employment in industry (% total employment)	WDI (2023)	2940	19.571	8.609
WUI	Average world economic uncertainty index	Ahir et al. (2018)	2940	0.177	0.155
WUI_volatility	Volatility (risk) of uncertainty (Standard deviation of WUI)	Authors	2940	0.098	0.071
Log(Population)	Natural logarithm of Population, total	WDI (2023)	2940	16.494	1.344
Log (real GDPpc)	Real GDP per capita, constant 2015 USD	WDI (2023)	2905	8.366	1.486
Resources rents	Total natural resources rents (% of GDP)	WDI (2023)	2922	8.274	12.042
Trade openness	Sum of exports & imports of goods and services(% GDP)	WDI (2023)	2792	80.726	49.441
FDI	Foreign direct investment, net inflows (% GDP)	WDI (2023)	2921	4.378	7.407

Source: Authors

The independent variable of interest, global uncertainty is measured in level and volatility. The level of economic uncertainty (WUI) and volatility of economic uncertainty (WUI_volatility) by Ahir et al. (2018), as proxied in this study by the annual average (level of economic uncertainty)

[1] Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Australia, Azerbaijan, Bangladesh, Belarus, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Democratic Republic of Congo, Republic of Congo, Costa Rica, Cote d'Ivoire, Croatia, Czech IA, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Eritrea, Ethiopia, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Haiti, Honduras, Hong Kong SAR, China, Hungary, India, Indonesia, Iran, Islamic Republic, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea Republic, Kuwait, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, North Macedonia, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian, Federation, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Togo, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Venezuela RB, Vietnam, Yemen Rep., Zambia, Zimbabwe.

and the standard deviation (volatility of economic uncertainty), are computed following suggestions from earlier studies. It includes major economic and political issues (the 9/11 attack, Euro debt crisis, Gulf War II, SARS outbreak) as well as the forecasts and analysis on economic and political conditions in each country, which are created by domestic analysts and the editorial board of The Economist.

Figure 2: Industrialisation and global uncertainty

Source: Authors

In accordance with the extant literature on the determinants of industrialisation and also to circumvent possible omission bias, a set of control variables was considered. These variables include: Population (total), real GDP per capita, total natural resources rents, openness to trade and foreign direct investment. In order to assess the effect of global uncertainty on industrialisation, the following econometric model will be estimated.

$$INDUS_{it} = \beta_0 + \phi INDUS_{it-1} + \beta_1 WUI_{it} + \beta_j X_{it} + u_i + v_t + \varepsilon_{it} \qquad (1)$$

Where $INDUS$ measures the industrialisation of country i at time t, WUI represents global uncertainty measured in level and volatility, X is a vector of controls while u_i and v_t are respectively country and time specific factors, ε_{it} is the error term.

Pooled OLS and fixed effects Driscoll & Kraay[2] estimators are applied for baseline estimates. Though the latter is robust in handling cross-sectional dependence, it may lead to inconsistent estimates due to the lag dependent variable[3] present among the regressors (Nickell, 1981; Wooldridge, 2010)[4]. Another problem with these estimators is failure to account for endogeneity

[2] Driscoll and Kraay (1998) estimator provide standard errors for coefficients estimated by fixed-effects (within) regression. These standard errors exhibit resilience to general forms of cross-sectional (spatial) dependence. This estimator can be applied to panels that are balanced or unbalanced. It can also deal with missing values.

[3] The inclusion of the lag dependent variable among the regressors is to account for the dynamic nature of industrialisation trends. As there is high persistence in the dependent variable (displaying a 0.9756 correlation coefficient with its first lag, far above 0.8 threshold for the rule of thumb), Ketu (2023) suggest to include the latter in lagged form among the regressors as corrective measure.

[4] Thus, when using OLS and Driscoll-Kraay estimators, the lagged dependent variable is excluded from the specification to ensure consistency.

and heteroskedasticity which Baum et al. (2003) highlight the latter as omnipresent in most empirical studies. An efficient way to circumvent these problems is to use the Blundell and Bond (1998) two-step system GMM (first introduced by Arellano and Bond (1991) and later improved by Arellano and Bover (1995)) which according to Roodman (2009), performs better than the one-step estimator. While using this estimator, Roodman (2009) warns against instrument proliferation and proposed to limit them below panels. The system GMM estimator employs simultaneously the equation in differences and the equation in levels by using lagged levels of the variables as instruments in the differenced equation and lagged differences of the variables as instruments in the level equation. The absence of second order serial correlation of residuals and validation of Hansen test guarantees the validity of the system GMM.
Figure 2 indicates a negative relationship between industrialisation and World economic uncertainty. However, econometric analyses would serve to robustly establish this relationship given that correlation might not imply causation.

4. Results and discussions

Baseline estimates of the effects of world economic policy uncertainty and risk of uncertainty are presented in Table 2. Equation (1) is estimated using the OLS and Driscoll-Kraay (1998) FE estimators. Results, consistent with Figure 2, suggest that both global economic policy uncertainty and risk of uncertainty negatively affect industrialisation for both estimators. However, only the Driscoll-Kraay results are interpreted since they are robust compared to OLS. In column (6), a unit increase in average world economic policy uncertainty will lead to 1.6 units fall in industrial output on average.

Table 2: Pooled OLS and Driscoll-Kraay estimates (equation 1)

	Dependent variable: Industrial value added					
	Pooled OLS			Driscoll-Kraay Fixed Effects		
	(1)	(2)	(3)	(4)	(5)	(6)
WUI	-4.341***		-4.088***	-1.710***		-1.618**
	(0.928)		(1.227)	(0.548)		(0.743)
WUI volatility		-6.700***	-0.849		-2.341*	-0.305
		(2.037)	(2.687)		(1.404)	(1.791)
Log(Population)	0.959***	0.922***	0.957***	-2.981***	-3.181***	-2.979***
	(0.114)	(0.114)	(0.115)	(0.711)	(0.703)	(0.711)
Log (GDPpc)	1.981***	1.961***	1.980***	3.224***	3.119***	3.220***
	(0.105)	(0.105)	(0.105)	(0.900)	(0.884)	(0.897)
Resource rents	0.711***	0.712***	0.710***	0.375***	0.376***	0.375***
	(0.0124)	(0.0125)	(0.0125)	(0.0550)	(0.0547)	(0.0550)
Trade openness	0.0304***	0.0305***	0.0303***	0.0269***	0.0257***	0.0268***
	(0.00358)	(0.00359)	(0.00358)	(0.00668)	(0.00670)	(0.00691)
FDI	-0.188***	-0.187***	-0.188***	0.0283**	0.0289**	0.0282**
	(0.0235)	(0.0235)	(0.0235)	(0.0119)	(0.0125)	(0.0120)
Constant	-10.51***	-9.870***	-10.42***	45.59***	49.78***	45.61***
	(2.123)	(2.139)	(2.141)	(12.25)	(11.88)	(12.29)
Observations	2,710	2,710	2,710	2,710	2,710	2,710
R-squared	0.575	0.573	0.575			

Source: Authors. *Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*

Also, column (5) shows that a unit increase in risk of global uncertainty will lead to 2.34 units fall in the value added of industry though the risk of uncertainty becomes insignificant when combined with average uncertainty in column (6). This result is consistent with the belief that investments and thus industrialisation will slowdown in periods of increasing global uncertainty (Avom et al., 2020; Zhu and Yu, 2022).

In Table 3, we re-estimate (1) using the two-step system GMM in order to check the robustness of our baseline estimates. Results in column (1) confirm our previous findings even with the exclusion of outliers in column (2). Diagnostic tests do not reveal any abnormalities. As seen from the p-value of the AR(2), we do not reject the null hypothesis of no second order serial correlation implying that our estimates do not suffer from second order serial correlation. Also, associated P-values of the Hansen test of over-identifying restrictions (OIR) are greater than 10% in all specifications validating therefore the instruments sets. Also, the number of instruments do not exceed panels. Lastly, the Fisher statistics of overall significance reassures consistent estimates.

Table 3: Industrialisation and Global economic uncertainty (different specifications)

	Dependent variable: Industrial value added (% GDP)					
	Annual data		3 years averaged data			
	Full sample	No outliers	Advanced economies	Emerging & developing	Europe & central Asia	SubSaharan Africa
	(1)	(2)	(3)	(4)	(5)	(6)
WUI	-1.113***	-1.020***	-1.046**	-1.683**	-1.018*	-1.385*
	(0.387)	(0.368)	(0.461)	(0.688)	(0.601)	(0.734)
Log (Population)	0.137***	0.156***	-3.535***	0.590***	0.190**	-1.428
	(0.0443)	(0.0389)	(0.453)	(0.145)	(0.0858)	(1.163)
Log (GDPpc)	0.00742	0.00824	1.087*	0.186	-0.0835	5.911***
	(0.0412)	(0.0385)	(0.585)	(0.240)	(0.0560)	(1.499)
Resource rents	0.0292***	0.0405***	0.437***	0.0823***	0.136***	0.291***
	(0.00546)	(0.00449)	(0.0120)	(0.0162)	(0.00662)	(0.0457)
Trade openness	0.000269	0.00364***	0.000581	0.0220***	0.0141***	0.0104
	(0.00180)	(0.00108)	(0.00342)	(0.00619)	(0.00173)	(0.00727)
FDI	0.0164**	0.0200**	0.185***	0.0234	0.0754***	0.144***
	(0.00730)	(0.00803)	(0.0169)	(0.0276)	(0.00747)	(0.0473)
Lagged (IVA)	0.909***	0.901***	0.496***	0.819***	0.855***	0.312***
	(0.00712)	(0.00529)	(0.0157)	(0.0145)	(0.00636)	(0.0423)
Constant	-0.0614	-0.492	59.03***	-8.360***	-0.733	-4.463
	(0.859)	(0.784)	(8.518)	(2.662)	(1.515)	(14.27)
Observations	2,571	2,140	438	338	242	204
Countries	136	132	75	61	41	36
AR(1)	0.000667	0.00191	0.00866	0.00692	0.0393	0.0187
AR(2)	0.331	0.192	0.742	0.187	0.358	0.369
Hansen OIR	0.413	0.110	0.147	0.174	0.148	0.244
Fisher Statistic	200440	259871	3663	11254	72073	2231
Instruments	71	71	49	32	30	29

Source: Authors. *Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*

For further sensitivity analysis, the period 1999-2019 is divided into 7 non-overlapping 3 years averages to avoid the influence of cyclical output fluctuations and business cycles (Ketu et al., 2022) (1999-2001; 2002-2004; 2005-2007; 2008-2010; 2011-2013; 2014-2016; 2017-2019). Following the IMF classification, we split the sample into advanced and emerging economies. Results of this exercise presented in column (3) and (4) show that world uncertainty significantly reduces industrial output of both developed and developing countries though the magnitude of the effects is more severe in developing economies. This result can be explained by the fact that developed countries, which are less sensitive to shocks than emerging and developing nations, have the ability to quickly adjust after an uncertainty shock. This finding is in line with Carrière-Swallow and Céspedes' (2013) findings, which show that uncertainty shocks cause investment to drop sharply in emerging countries but rebound quickly in developed countries after having a much more moderate initial impact.

Regional grouping in columns (5) and (6) show a similar tendency of results. The negative effect of world economic policy uncertainty has a greater magnitude on Sub-Saharan African economies compared to Europe and central Asia, confirming the previous idea that uncertainty shocks are more severe on developing than developed regions. Avom et al. (2020) established a similar result when investigating the effects of world uncertainty on FDI. This is also in line with Rodrik (1991) who document that when reforms are implemented in developing nations, investment decisions may be put off until there is certainty about the reforms' viability.

5. Conclusion

Numerous theoretical and empirical studies have examined how uncertainty affects macroeconomic variables over the last few decades. Surprisingly, little is known on cross-countries industrialization effects of world economic policy uncertainty (WUI). This study adds to the growing body of literature by examining the relationship between industrialization and the global economic policy uncertainty for a large panel of 140 developed and developing nations between 1999 and 2019. Using pooled OLS, Driscoll & Kraay and the system generalised method of moments, results provide strong evidence of negative effects of both WUI and its volatility on industrialisation. Following the IMF classification, the magnitude of this effect was higher in developing and emerging countries than their developed counterparts. Also, Sub-Saharan Africa endures a greater negative impact of global economic policy uncertainty compared to other regions. These results are robust when manufacturing value added and the share of industrial employment are used as alternative proxies of industrialisation.

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Appendix

Table 4: Industrialisation and Global economic uncertainty (Alternative dependent variable)

	FE Driscoll and Kraay (1998)					
	Dep var: Manufacturing value added			Dep var: Industrial Employment		
	(1)	(2)	(3)	(4)	(5)	(6)
WUI	-1.118***		-1.402***	-1.695***		-1.910***
	(0.301)		(0.242)	(0.549)		(0.588)
WUI volatility		-0.840	0.931		-1.702	0.712
		(0.768)	(0.694)		(1.395)	(1.518)
Log(Population)	-3.780***	-3.920***	-3.785***	3.468***	3.256***	3.464***
	(0.839)	(0.842)	(0.833)	(0.483)	(0.485)	(0.485)
Log(real GDPpc)	-2.116***	-2.201***	-2.107***	2.478***	2.367***	2.487***
	(0.307)	(0.300)	(0.305)	(0.211)	(0.205)	(0.201)
Resources rents	-0.0404***	-0.0395***	-0.0404***	0.01000	0.0105	0.0100
	(0.00498)	(0.00501)	(0.00498)	(0.0126)	(0.0123)	(0.0127)
Trade openness	0.0171***	0.0164***	0.0173***	-0.0107***	-0.0118***	-0.0106***
	(0.00469)	(0.00451)	(0.00460)	(0.00397)	(0.00384)	(0.00377)
FDI	0.0233*	0.0239**	0.0235*	0.0235*	0.0243*	0.0236*
	(0.0121)	(0.0120)	(0.0123)	(0.0127)	(0.0134)	(0.0127)
Constant	92.88***	95.84***	92.82***	-57.19***	-52.81***	-57.24***
	(14.35)	(14.26)	(14.13)	(7.320)	(7.639)	(7.415)
Observations	2,638	2,638	2,638	2,774	2,774	2,774

Source: Authors. *Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*