Modeling & Forecasting
the International Dimensions:
Business cycles, exchange rates, and cross-border flows capital and trade flows
(Day 2 Afternoon)
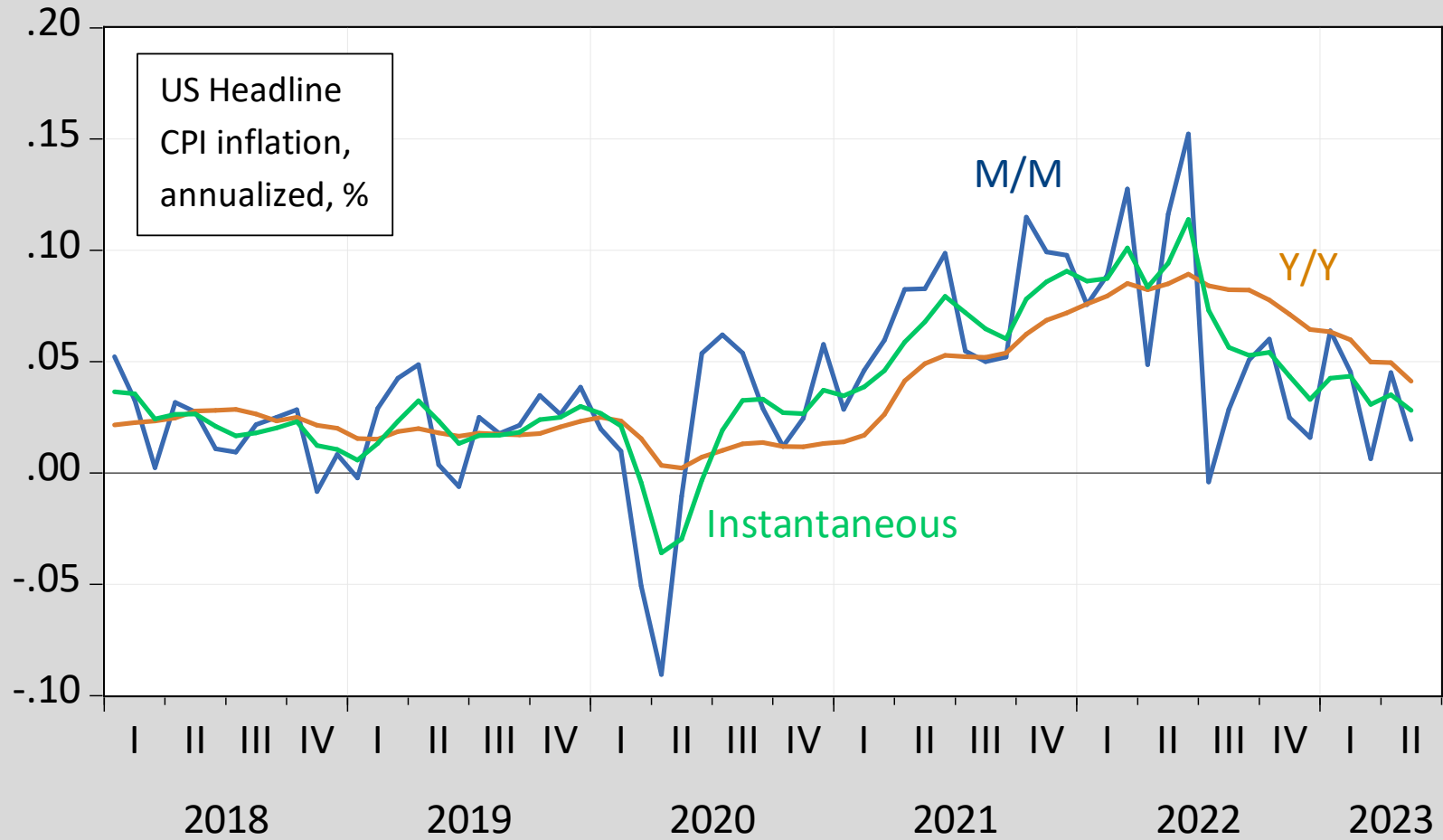
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ISF at Darden School

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Inflation – International Aspects

Inflation

US Headline CPI inflation, annualized, %

How Anomalous Is the Recent Episode?

- Inflation far exceeded the conditional forecasts based on slow recovery, no Russian invasion
- But in the context of an augmented Phillips Curve, perhaps not so surprising
- In the augmented Phillips Curve, inflation depends on
  - 1. slope of Phillips curve
  - 2. size of unemployment/output gap
  - 3. cost-push shock size
 - 4. inflation expectations

Defense of the Phillips Curve

Bernanke and Blanchard, "What Caused the U.S. Pandemic Era Inflation?" (2023):

"most of the inflation surge that began in 2021 was the result of shocks to prices given wages. These shocks included sharp increases in commodity prices, reflecting strong aggregate demand, and sectoral price spikes, resulting from changes in the level and sectoral composition of demand together with constraints on sectoral supply."

Is this all there is?

Cross-Country
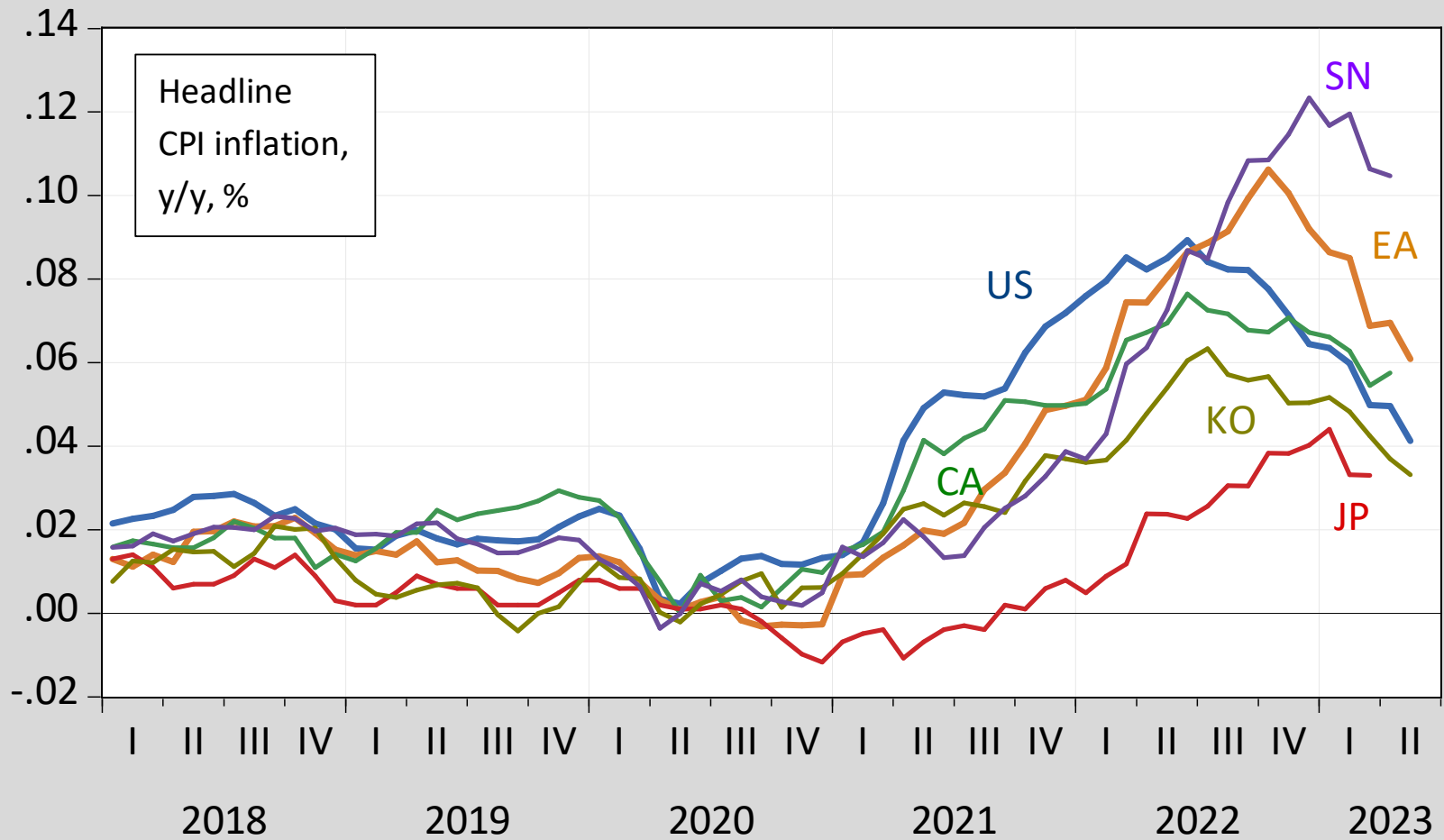
Cross-Country
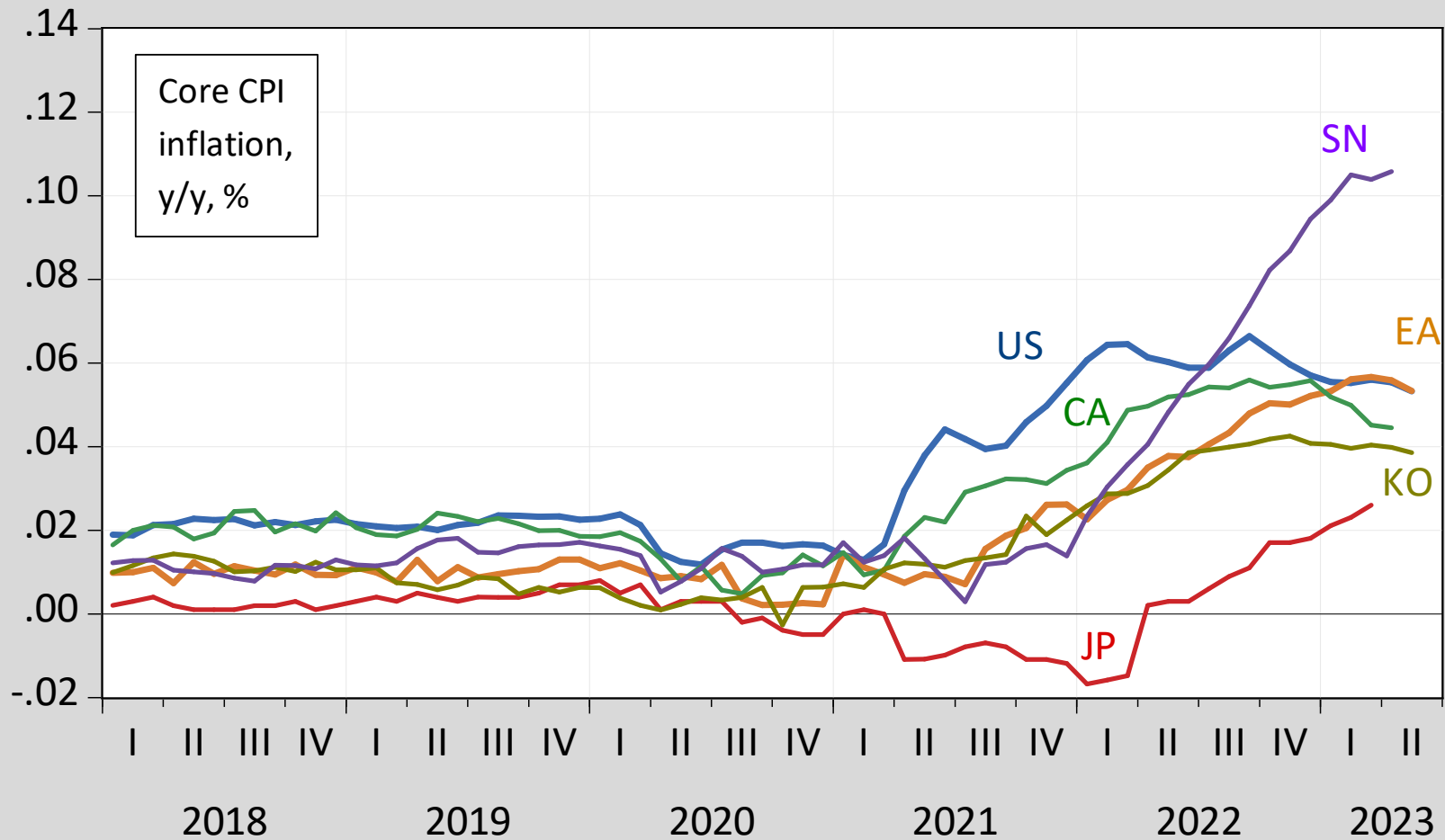
Forbes "Inflation Dynamics" BPEA (2019)

Return of the Phillips Curve

$$(1) \qquad \pi_{i,t} = \beta_1 \pi^e_{i,t} + \beta_2 \pi^L_{i,t} + \beta_3 SLACK^D_{i,t} + \alpha_i + \epsilon_{i,t}.$$

Variables are defined for each country i in quarter t:

— $\pi_{i,t}$ is quarterly CPI inflation, annualized and seasonally adjusted and described in section II.

— $\pi^e_{i,t}$ is inflation expectations, measured by the five-year ahead forecast for CPI inflation from the IMF's *World Economic Outlook*.

— $\pi^L_{i,t}$ is lagged inflation over the previous four quarters (before quarter t).

— $SLACK^D_{i,t}$ is domestic slack, measured as a principal component of seven variables: output gap, participation gap, unemployment gap, and the

percent deviation of hours worked, share of self-employed, share of involuntary part-time employed, and share of temporary employment from the relevant average over the sample.

Phillips Curve (cont'd)

$$(2) \qquad \pi_{i,t} = \beta_1 \pi_{i,t}^e + \beta_2 \pi_{i,t}^L + \beta_3 SLACK_{i,t}^D + \gamma_1 ImpPrices_{i,t} + \alpha_i + \epsilon_{i,t}.$$

$$(3) \qquad \pi_{i,t} = \beta_1 \pi_{i,t}^e + \beta_2 \pi_{i,t}^L + \beta_3 SLACK_{i,t}^D + \gamma_1 Oil_{i,t}^W + \gamma_2 Comm_{i,t}^W$$

$$+ \gamma_3 ER_{i,t} + \gamma_4 SLACK_t^W + \gamma_5 GVC_t^W + \alpha_i + \epsilon_{it}.$$

Definitions for each additional variable are as follows:

— $Oil_{i,t}^W$ is defined above.

— $Comm_{i,t}^W$ is quarterly inflation in an index of world commodity prices (excluding fuel) from Datastream relative to quarterly CPI price inflation, lagged one quarter.

Phillips Curve (cont'd)

$$(4) \qquad \pi_{i,t} = \beta_1 \pi_{i,t}^{\epsilon} + \beta_2 \pi_{i,t}^{L} + \beta_3 \left(SLACK_{i,t}^{D} * ImpSh_{i,t}^{D} \right) + \gamma_1 Oil_{i,t}^{W} + \gamma_2 Comm_{i,t}^{W}$$

$$+ \gamma_3 ER_{i,t} + \gamma_4 SLACK_t^{W} + \gamma_5 GVC_t^{W} + \alpha_i + \epsilon_{i,t}.$$

Equation (4) is the same as equation (3), except $SLACK_{i,t}^{D}$ is interacted with the import share to GDP.[29]

31 countries, 1996-2017

Table 2. Phillips Curve Regressions for Quarterly CPI Inflation, 1996–2017

	Different control variables			
	Domestic only (1)	+ Import prices (2)	+ Oil price (3)	+ All global variables (4)
Inflation Expectations	0.685***	0.717***	0.656***	0.654***
	(0.105)	(0.161)	(0.108)	(0.101)
Lagged Inflation	0.599***	0.679***	0.626***	0.641***
	(0.041)	(0.030)	(0.037)	(0.039)
Domestic Slack	−0.144***	−0.103***	−0.126***	−0.090***
	(0.027)	(0.021)	(0.026)	(0.030)
Import Prices		0.091		
		(0.054)		
World Oil Prices			0.033***	0.029***
			(0.003)	(0.003)
World Comm. Prices				0.030***
				(0.005)
Real Exchange Rate				−0.029***
				(0.007)
World Slack				−0.153***
				(0.036)
Global Value Chains				−0.055**
				(0.026)
Constant	−0.514*	−0.772*	−0.587**	−0.541**
	(0.260)	(0.374)	(0.263)	(0.227)
R^2	0.418	0.498	0.470	0.487
No. observations	2,635	1,366	2,635	2,635

Table 3. Phillips Curve Regressions for Quarterly CPI Inflation, 1996–2007 and 2008–2

	Pre-crisis (1996–2007)				
	Domestic only (1)	+ Import prices (2)	+ Oil prices (3)	+ All global variables (4)	DomSlack × impShare (5)
Inflation Expectations	0.663***	0.720***	0.684***	0.741***	0.696***
	(0.169)	(0.190)	(0.155)	(0.163)	(0.208)
Lagged Inflation	0.556***	0.672***	0.588***	0.589***	0.559***
	(0.065)	(0.048)	(0.064)	(0.067)	(0.081)
Domestic Slack	−0.212***	−0.157**	−0.198***	−0.188***	−0.410**
	(0.054)	(0.058)	(0.050)	(0.061)	(0.155)
Import Prices		0.061			
		(0.057)			
World Oil Prices			0.030***	0.030***	0.031***
			(0.004)	(0.004)	(0.004)
World Comm. Prices				0.004	0.002
				(0.013)	(0.013)
Real Exchange Rate				−0.027**	−0.029***
				(0.011)	(0.010)
World Slack				−0.410***	−0.430***
				(0.092)	(0.091)
Global Value Chains				−0.258***	−0.253***
				(0.068)	(0.072)
Constant	−0.270	−0.700	−0.517	−0.938***	−0.773**
	(0.380)	(0.450)	(0.350)	(0.321)	(0.351)
R^2	0.361	0.497	0.394	0.414	0.365
No. observations	1,404	769	1,404	1,404	1,350
F-Test: joint significance of global variables				32.38***	36.11***

	Last decade (2008–2017)				
	Domestic only (1)	+ Import prices (2)	+ Oil prices (3)	+ All global variables (4)	DomSlack × impShare (5)
Inflation Expectation	0.685	0.408	0.508	0.284	0.324
	(0.425)	(0.506)	(0.373)	(0.274)	(0.273)
Lagged Inflation	0.490***	0.431***	0.519***	0.556***	0.556***
	(0.050)	(0.070)	(0.045)	(0.040)	(0.037)
Domestic Slack	−0.154***	−0.112	−0.157***	−0.105**	−0.171*
	(0.034)	(0.066)	(0.034)	(0.041)	(0.088)
Import Prices		0.136*			
		(0.066)			
World Oil Prices			0.034***	0.026***	0.028***
			(0.003)	(0.003)	(0.003)
World Comm. Prices				0.031***	0.028***
				(0.009)	(0.009)
Real Exchange Rate				−0.039***	−0.040***
				(0.013)	(0.013)
World Slack				−0.434***	−0.517***
				(0.073)	(0.080)
Global Value Chains				−0.357***	−0.407***
				(0.078)	(0.086)
Constant	−0.370	0.254	−0.063	1.142*	1.202*
	(0.858)	(1.150)	(0.761)	(0.606)	(0.607)
R^2	0.252	0.196	0.356	0.419	0.425
No. observations	1,231	597	1,231	1,231	1,181
F-Test: joint significa				71.33***	68.09***

Table 4. The Cyclical Component of CPI Inflation

	Full period			
	Domestic only (1)	+ Oil prices (2)	+ All global variables (3)	DomSlack × impShare (4)
Trend Inflation	0.641***	0.629***	0.636***	0.749***
	(0.089)	(0.086)	(0.089)	(0.047)
Inflation Expectations	0.172	0.234	0.360**	0.310*
	(0.178)	(0.184)	(0.153)	(0.169)
Domestic Slack	−0.189***	−0.181***	−0.162***	−0.264***
	(0.040)	(0.041)	(0.042)	(0.068)
World Oil Prices		0.025***	0.023***	0.024***
		(0.003)	(0.002)	(0.002)
World Commodity Prices			0.018***	0.017***
			(0.006)	(0.006)
Real Exchange Rate			−0.017	−0.024*
			(0.014)	(0.013)
World Slack			−0.083**	−0.082*
			(0.038)	(0.043)
Global Value Chains			0.065*	0.084***
			(0.035)	(0.028)
Constant	0.565	0.411	0.160	0.007
	(0.298)	(0.318)	(0.301)	(0.331)
R^2	0.507	0.537	0.545	0.543
No. observations	2,456	2,456	2,456	2,355
F-Test: joint significance of global variables				

Source: Author's calculations.

Notes: Estimated using fixed effects with robust standard errors clustered by country. See online appendix A for variable definitions and section V for estimation of the trend. ***Significant at the 1 percent level; **significant at the 5 percent level; *significant at the 10 percent level.

	Pre-crisis (1996–2007)				Last decade (2008–2017)			
	Domestic only (5)	+ Oil prices (6)	+ All global variables (7)	DomSlack × impShare (8)	Domestic only (9)	+ Oil prices (10)	+ All global variables (11)	DomSlack × impShare (12)
Trend Inflation	0.550***	0.548***	0.542***	0.715***	0.841***	0.797***	0.781***	0.772***
	(0.099)	(0.099)	(0.099)	(0.059)	(0.148)	(0.135)	(0.145)	(0.145)
Inflation Expectations	0.465**	0.539**	0.635***	0.491	0.076	0.045	−0.026	0.021
	(0.209)	(0.212)	(0.183)	(0.229)	(0.454)	(0.417)	(0.371)	(0.371)
Domestic Slack	−0.282***	−0.277***	−0.238***	−0.355***	−0.178***	−0.196***	−0.165***	−0.329**
	(0.061)	(0.061)	(0.070)	(0.097)	(0.053)	(0.050)	(0.055)	(0.152)
World Oil Prices		0.023***	0.023***	0.024***		0.026***	0.023***	0.024***
		(0.003)	(0.003)	(0.003)		(0.003)	(0.003)	(0.003)
World Commodity Prices			−0.008	−0.007			0.024**	0.021**
			(0.011)	(0.010)			(0.009)	(0.009)
Real Exchange Rate			−0.011	−0.017			−0.033	−0.034
			(0.014)	(0.012)			(0.021)	(0.022)
World Slack			−0.392***	−0.384***			−0.266***	−0.329***
			(0.122)	(0.124)			(0.046)	(0.046)
Global Value Chains			−0.170*	−0.127			−0.075	-0.109
			(0.091)	(0.088)			(0.071)	(0.073)
Constant	0.091	−0.148	−0.562*	−0.652	0.468	0.621	1.141	1.163
	(0.328)	(0.348)	(0.320)	(0.475)	(0.926)	(0.829)	(0.698)	(0.703)
R^2	0.474	0.494	0.506	0.500	0.384	0.444	0.471	0.476
No. observations	1,313	1,313	1,313	1,259	1,143	1,143	1,143	1,096
F-Test: joint significance			16.55***	15.53***			42.74***	44.00***