Investigating Determinants of Private Consumption in the Euro Area

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August 2024

Abstract

How have the COVID-19 and energy price shocks influenced long- and short-run dynamics of private consumption in the Euro area? By using an error-correction model (ECM) to estimate long-run trends both excluding and including the period since 2020, we find that consumption is largely driven by income and financial wealth variables. Moreover, the long-run relationship between consumption and financial wealth has reversed, indicating an aggregate increase in financial wealth despite an initial decrease in private consumption. Principal components extracted from consumer sentiment data included as additional control variables had very little predictive power in the estimation that included post-2020 shocks.

*Formerly, Deutsche Bundesbank. This project was undertaken during my time as an intern during June - August 2024 in the Directorate General Economics, International and Euro Area Economy department. The results in this paper were presented to the department in late August. I would like to thank the department direcor, Dr. Johannes Hoffmann, my supervisors Dr. Kirsten Lommatzsch and Dr. Laura Wichert, as well as all of my former colleagues in the department for their kind welcome, invaluable guidance and support during my time in Frankfurt. All errors are my own. Since this remains an ongoing project, replication files can be made available only upon request under lionel.chambon@sciencespo.fr. For further information, please contact johannes.hoffmann@bundesbank.de

1 Introduction

Private consumption has decreased sharply in the wake of the COVID-19 pandemic in 2020, and has since only recovered very gradually, following inflationary dynamics and energy price shocks in early 2022. Meanwhile, aggregate saving rates have remained above their pre-pandemic level. The aim of this project is to investigate changes in the relationship between private consumption and its long- and short-run determinants. By isolating long- and short-term effects, we hope to better understand recovery dynamics of private consumption in the current business cycle.

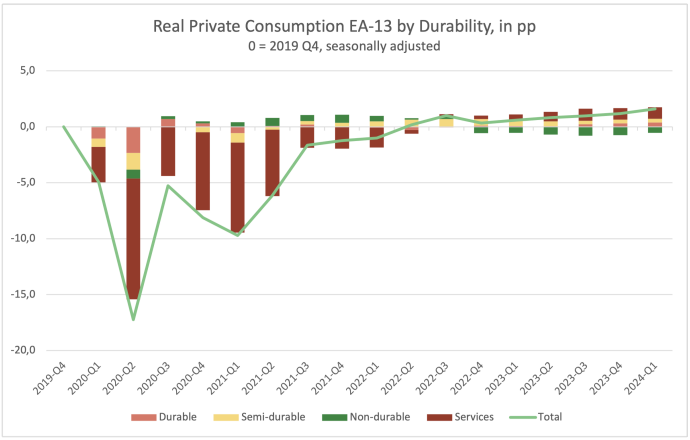
Beraja and Wolf (2021) show that the precise recovery path is influenced considerably by the durability of consumer goods. Figure 1 shows that the large decline in 2020 was largely driven by a decrease in consumption of services. Beraja and Wolf (2021) argue that this lead to "pent-up demand" effects, as consumption of services cannot be delayed to a later date, as opposed to durable goods. Thus, the recovery of services is much slower compared to the more immediate "overshoot" of durable goods consumption, as subfigure 1b shows. Thus, this could reduce the likelihood of a consumption-driven upswing in the business cycle.

Additionally, household saving rates have increased sharply following the onset of the pandemic, and have remained elevated since. This is plotted in figure 1c. According to preliminary analyses by Dossche et al. (ECB, 2021), this increase in saving rates was a consequence of involuntary saving following lockdown measures. Hence, it was suggested that once these restrictions were lifted, this excess saving would be consumed by households, thereby providing a temporary boost.

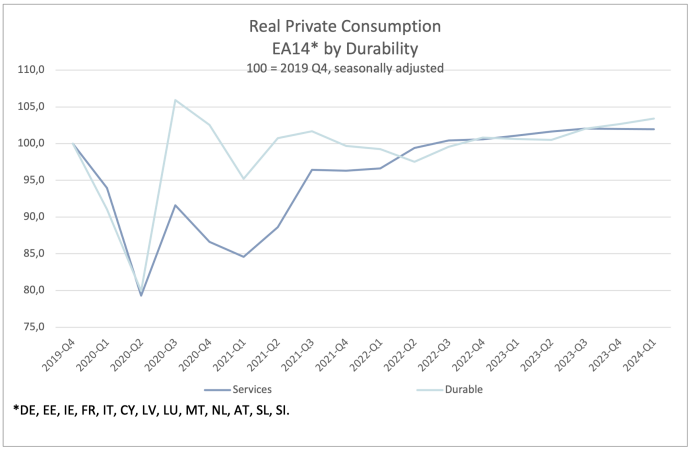
However, given both a rise in interest rates and Russia's invasion of Ukraine, saving rates have remained at higher levels, thus dampening the possibility for a temporary upswing in consumption. It must also be noted that while saving rates may remain higher on aggregate, they are unevenly spread out in the income distribution (see Battistini et al. (ECB, 2023)). Thus, if households with a larger marginal propensity to consume (MPC) are households with low saving rates, this further decreases prospects of a consumption-driven boost for the business cycle. This is exacerbated by the fact that lower-income households were more exposed to energy price shocks in 2022[1].

To better understand and disentangle these dynamics, we estimate an error-correction model (ECM) in the following steps. First, we estimate a consumption equation by ordinary least-squares (OLS) from 2000 - 2019 and from 2000 - 2023. Then, we refine the model by including several dummy and control variables to isolate short-term effects of the COVID and energy shocks. We do so by using both the long-run relationship *until* and *beyond* 2019. Thereby, we attempt to better understand whether the past shocks could have a long-lasting effect on private consumption behaviour, or whether recent trends in consumption can be explained by shot-term variations during the past two years.

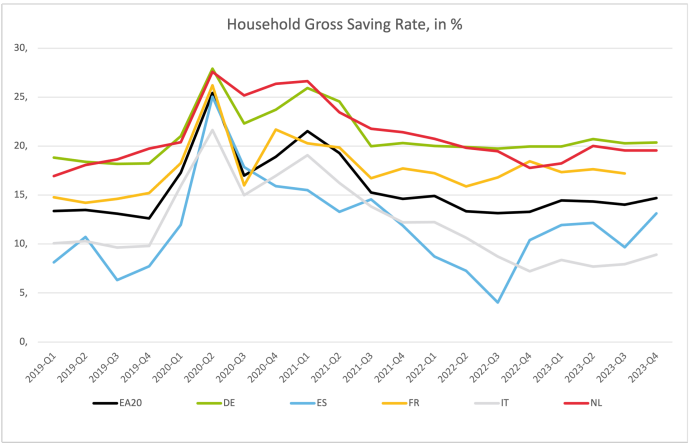
[1] See See Dossche et al.



(a) Total



(b) Durables vs. Services



(c) Household Saving Rates

Figure 1: Source: Eurostat.

2 Empirical Strategy and Estimation

2.1 Data and Methodology

All data are taken from Eurostat and the European Commission. Data of financial wealth is taken from European financial accounts provided by the Deutsche Bundesbank. In order to capture potential effects of income heterogeneity, given the uneven distribution of saving rates across the population, we extract principal components from the EU Commission's *Business and Consumer Survey*, which provides data on consumer sentiment by income quartile. The motivation is to test for potential explanatory power of spending-related survey data by comparing across different income groups.

First, we estimate the long-run relationship of private consumption and its determinants through OLS. We do this for two periods: From 2000 - 2019, and from 2000 - 2023. In doing so, we wish to compare the long-run relationship before and after the post-2020 shocks. Then, we use these results to estimate an error-correction model (ECM), including additional control variables and dummies for the COVID-19 and energy price shock, using both the long-run relationship until and beyond 2019. This is a theoretical exercise to construct a hypothetical time series of private consumption *assuming* that the long-run determinants of consumption have not structurally[2] changed, which we then compare with the realized path of private consumption.

2.2 The Long-Run Determinants of Private Consumption

The long-run determinants of private consumption are selected according to existing literature, namely, Bundesbank (2022) and de Bondt et al. (2019). These are wages, self-employed incomes, financial wealth, and non-financial wealth. All time series are in real terms and normalized to log levels, whereby 2000 is the reference year.[3]

Figure 2 shows the evolution of private consumption (in black) and its long-run determinants. We successfully check for cointegration using the unit root test. OLS regression results comparing the between both samples are reported in table **??**.

The results show that the selected determinants work well in predicting private consumption, as all explanatory variables maintain their statistical significance. A preliminary result is that when including the post-2020 shocks, wages and incomes of the self-employed now show a stronger effect, while the relationship between private consumption and financial wealth has changed signs. This is consistent with what is shown in the descriptive data from figure 2.

[2] We do, however, not test for structural breaks, as we believe it to be too soon to do so. The goal of this exercise is to provide an intuition on if and how the long-run relationship of private consumption and its determinants has changed.

[3] Some graphs are unfortunately not available in English.

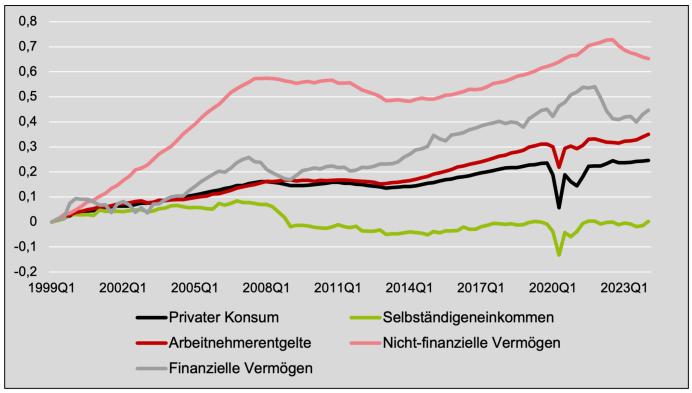


Figure 2: Long-term determinants of private consumption. Source: Deutsche Bundesbank and author's calculations.

Dependent Variable: Real Private Consumption		
	(1)	**(2)**
Intercept	0.004***	0.01
	(4.6)	(1.5)
Wages	0.46***	0.68***
	(25.6)	(9.7)
Self-employed	0.10***	0.17***
	(10.8)	(3.5)
Financial wealth	0.06***	-0.16***
	(5.7)	(-3.7)
Non-financial wealth	0.11***	0.12***
	(31.8)	(6.8)
R-squared	0.99	0.93
Residual unit root test	-4.122***	-3.502***

N= 72 (1) and 84 (2). t-statistics in parentheses.
**** p<0.01, ** p<0.05, * p<0.1*

Table 1: Comparing long-run determinants of private consumption from 2000 until 2019 (1) and 2023 (2).

2.3 Estimating the ECM

Next, we estimate the ECM using the long-run relationship until 2019. This is a theoretical exercise to see what private consumption could have looked like if the pre-2020 relationship were still intact even after the pandemic and energy price shocks. We specify the following consumption equation:

$$\Delta rpc\_ea_t = \alpha + \beta_1 \Delta \mathbf{X_t} - \gamma \left(rpc\_ea_{t-1} - \lambda \begin{pmatrix} \mathbf{X_{t-1}} \\ \mathbf{FW_{t-1}} \end{pmatrix} \right) + \theta \mathbf{\Pi_t} + \epsilon_t \qquad (1)$$

X_t and FW represent the determinants of private consumption both in the short- and long-run component of the equation, where λ represents the cointegration coefficient. Π_t is a vector of controls. We include the unemployment and the long-term interest rate as business cycle components, and also test using variables for state transfer payments, the *Confidence Indicator* published by the European Commission, and principal components extracted from the Commission's *Business and Consumer Survey*. We include both the largest principal component and the difference of that component across the top and bottom income quartile, to see whether we can capture any distributional effects of income heterogeneity.

Table **??** reports the results. We find that prior to 2020, income variables, interest rates, and consumer confidence have significant explanatory power of private consumption. Conversely, state transfer payments[4] and the first principal component do not, only the difference between quartiles 4 and 1 is significant in this specification. This provides us with intuition on which explanatory variables could be relevant for our next specifications. It is noteworthy that even before the shock period, our principal components extracted from survey data have little explanatory power regarding private consumption.

We use these results to construct a theoretical time series of private consumption supposing that the long-run relationship has not changed since 2019, which we show in figure 3. The green line is the hypothetical consumption time series predicted by the long-run relationship until 2019, whereas the blue line is the observed private consumption data. We find that until 2019, our model is a good fit for the development of real private consumption. However, as expected, this specification is insufficient to fully account for the decline in consumption post-2020.

[4]State transfer payments as defined by Eurostat. The fact that this variable is insignificant is consistent with the fact that most income stabilization programs during the pandemic occurred through wage payments or partial unemployment, which is instead captured by the wage variable.

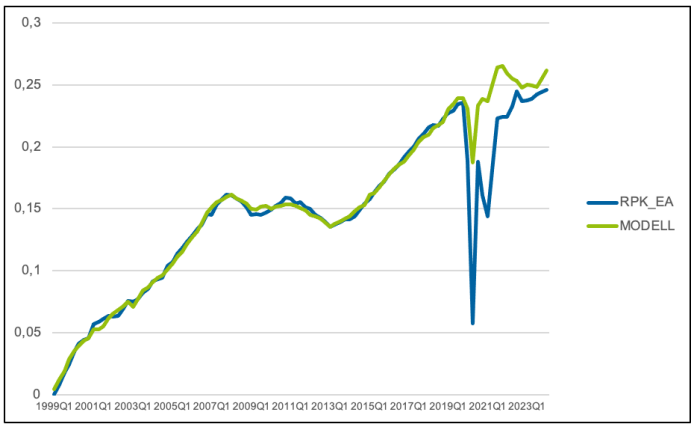


Figure 3: Predicted vs. observed time series of private consumption. Source: Deutsche Bundesbank and author's calculations.

Therefore, we extend our ECM by dummy variables and interaction terms to control for the pandemic and energy shock quarters. Thus, the consumption equation becomes:

$$\Delta rpc\_ea_t = \alpha + \beta_1 \Delta X_t + \beta_2 \Delta \mathbf{X_t} \circ \mathbf{D'} - \gamma \left(rpc\_ea_{t-1} - \lambda \begin{pmatrix} X_{t-1} \\ FW_{t-1} \end{pmatrix} \right) + \theta \Pi_t + \epsilon_t \tag{2}$$

Here, we interact all income and wealth variables with our pandemic and energy shock dummies. We also add a Google mobility indicator as an additional control variable, which uses data from Google Maps and other Google applications to index private consumption behaviour. Finally, we interact our dummy variables with the *Consumer Confidence* indicator. Results are reported in table **??** and table **??**. We estimate the ECM using both long-run relationships with the same explanatory variables, dummies and interaction terms. We discuss our results in the final section.

ECM Until 2019

	(1)	(2)	(3)	(4)	(5)
Intercept	0.02	0.02	0.01	0.02	0.03***
	(1.8)	(1.7)	(1.0)	(1.7)	(2.8)
$Longrun_{(-1)}$	-0.40***	-0.40***	-0.36***	-0.61***	0.59***
	(-4.6)	(-4.6)	(-4.3)	(-5.3)	(-5.9)
Δ Wages	0.22***	0.22***	0.21***	0.21	0.19**
	(2.3)	(2.2)	(2.3)	(2.4)	(2.1)
Δ Self-employed	0.12***	0.12**	0.09**	0.07	0.13***
	(3.8)	(3.7)	(2.7)	(2.2)	(4.1)
Interest	-0.0025*	-0.0025***	-0.0022***	0.0044***	0.0039***
	(-3.6)	(-3.5)	(-3.2)	(-3.6)	(-5.0)
Unemp	-0.002	-0.002	0.007	0.0007	-0.0005
	(-0.3)	(-0.3)	(0.8)	(-0.3)	(-0.7)
Δ Transfers		-0.001			
		(-0.001)			
Confidence Indicator			0.003**		
			(2.7)		
PC1				0.001	
				(1.55)	
Diff. PC1 (RE1-RE4)					0.005***
					(3.2)
R^2	0.69	0.69	0.73	0.76	0.74

Note:
PC1 refers to the first principal component in levels.
Diff. PC1 refers to the difference of that component computed between the top and bottom income quartile.
N= 72. t-statistics in parentheses.
**** p<0.01, ** p<0.05, * p<0.1*

Table 2: ECM with various short-run variables.

ECM Until 2023 With Old Long-Run Relationship

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	-0.01	-0.01	-0.01	-0.001	-0.003	0.003	0.00
	(-1.1)	(-1.1)	(-1.2)	(-0.4)	(-0.9)	(1.1)	(-0.1)
$Longrun_{(-1)}$	-0.49***	-0.50***	-0.50***	-0.59***	-0.56***	-0.34***	-0.22***
	(-8.2)	(-7.9)	(-8.1)	(-13.1)	(-13.8)	(-8.9)	(-4.5)
Δ Wages	1.11***	1.11***	1.11***	0.74***	0.74***	0.25**	0.45***
	(14.7)	(14.5)	(14.6)	(10.7)	(11.1)	(2.6)	(6.7)
Δ Self-employed	0.22***	0.21***	0.21***	0.24***	0.24***	0.16***	0.15***
	(3.5)	(3.3)	(3.5)	(5.4)	(5.4)	(3.7)	(4.0)
Interest	0.0008*	0.0009	0.0007	0.0002	0.0001	0.000	0.0001
	(1.9)	(1.6)	(1.6)	(1.6)	(0.3)	(-1.2)	(0.2)
Unemp	0.0002	0.0002	0.0003	0.0001	0.0000	0.000	0.0001
	(0.3)	(0.4)	(0.4)	(0.4)	(0.2)	(0.0)	(0.5)
D_COVID	-0.0319***	-0.0318***	-0.0322***	-0.0141***			
	(-7.1)	(-7.0)	(-7.1)	(-3.7)			
D_Energy	-0.0045*	-0.0039	-0.0035	-0.0039**			
	(-1.2)	(-1.1)	(-1.2)	(-2.0)			
Confidence Indicator		0.000			0.000		
		(0.24)			(-0.98)		
Diff. PC1 (RE1-RE4)			0.002				
			(0.9)				
Google Mobility				0.001***	0.001***	0.001***	0.001
				(8.7)	(6.6)	(12.6)	(13.0)
<u>Interaction terms</u>							
Δ Wages × COVID						0.30**	
						(2.6)	
Δ Self-employed × COVID						0.39***	0.54***
						(5.0)	(7.2)
Δ RNFW × COVID							0.62***
							(3.2)
Δ RFW × Energy							-0.22***
							(-5.6)
Conf. Ind. × COVID					0.0015***		
					(4.607)		
Conf. Ind. × Energy					0.0002		
					(1.689)		
R-squared	0.95	0.97	0.95	0.97	0.98	0.98	0.99

PC1 refers to the first principal component in levels.
Diff. PC1 refers to the difference of that component computed between the top and bottom income quartile.
N= 72. t-statistics in parentheses.
**** p<0.01, ** p<0.05, * p<0.1*

ECM Until 2023 With New Long-Run Relationship

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	-0.05***	-0.05***	-0.05***	0.04	0.04***	0.03***	0.03***
	(-3.0)	(-3.0)	(-2.8)	(-0.4)	(2.7)	(3.2)	(3.1)
$Longrun_{(-1)}$	-0.60***	-0.60***	-0.58***	-0.61***	-0.57***	-0.32***	-0.23***
	(-8.9)	(-8.5)	(-8.8)	(-12.4)	(-13.6)	(-8.8)	(-4.5)
Δ Wages	1.15***	1.14***	1.15***	0.77***	0.73***	0.10	0.38***
	(15.3)	(15.2)	(15.3)	(10.7)	(11.5)	(1.0)	(5.6)
Δ Self-employed	0.25***	0.25***	0.25***	0.25***	0.19***	0.11***	0.10***
	(4.1)	(3.9)	(4.1)	(5.4)	(4.2)	(2.8)	(3.2)
Interest	-0.0001	-0.0002	-0.0005	-0.0016*	-0.0025***	-0.003***	-0.0020***
	(-0.1)	(-0.1)	(-0.3)	(-1.7)	(-3,0)	(-3.9)	(-3.3)
Unemp	0.0041***	0.0042***	0.0039***	0.0010	-0.0017	-0.001	-0.0010
	(3.4)	(3.4)	(3.3)	(1.5)	(-1.6)	(-1.6)	(-1.7)
D_COVID	-0.0312***	-0.0310***	-0.0312***	-0.0128***			
	(-7.1)	(-7.0)	(-7.1)	(-3.3)			
D_Energy	-0.0037	-0.0026	-0.0022	-0.0006			
	(-1.2)	(-0.6)	(-0.6)	(-0.3)			
Confidence Indicator		0.000			0.000		
		(0.4)			(-1.06)		
Diff. PC1 (RE1-RE4)			0.002				
			(0.9)				
Google Mobility				0.001***	0.001***	0.001***	0.001***
				(8.1)	(7.0)	(15.4)	(15.3)
Interaction Terms							
Δ Wages × COVID						0.40***	
						(3.9)	
Δ Self-employed × COVID						0.45***	0.60***
						(6.6)	(8.5)
Δ RNFW × COVID							0.58***
							(3.2)
Δ RFW × Energy							-0.20***
							(-5.6)
Conf. Ind. × COVID					0.002***		
					(5.3)		
Conf. Ind. × Energy					0.0001		
					(1.0)		
R-squared	0.96	0.96	0.96	0.98	0.98	0.98	0.99

PC1 refers to the first principal component in levels.
Diff. PC1 refers to the difference of that component computed between the top and bottom income quartile.
N= 72. t-statistics in parentheses.
**** p<0.01, ** p<0.05, * p<0.1*

3 Results and Discussion

We find that across both specifications, that is, using both long-run relationships, the coefficients of our income and wealth variables have increased. The result that the correlation between private consumption and financial wealth has reversed signs is also confirmed. As expected, the interaction coefficient between our shock dummies and main variables is highly significant. In the specification until 2023, long-term interest rates are also statistically significant. However, the principal components from survey data are not and seem to lose explanatory power when including the shock period. We hypothesize that this is due to the subjective nature of survey data, which might dilute income-specific variations in consumer sentiment.

However, we cannot come to conclusions about potential structural breaks yet. Nevertheless, we compare both models by looking at their respective residuals and what they predicted relative to the observed value of private consumption. We do so in table 5. We can see that specifications (6) and (7) minimize residuals most, which are the equations including our dummies and interaction terms. We also find, perhaps surprisingly, that both model make opposite predictions for private consumption in 2023, which is indicated by the residuals' opposite signs. The model with the long-run relationship up to 2019 predicted a weaker level of consumption that was actually observed, while the model including our shock quarters predicted the contrary. We argue that while we cannot precisely identify the nature of this change and that it is too early to investigate possible structural breaks, our main finding is that the COVID-19 pandemic and energy price shocks have had a significant, and *potentially* longer-lasting effect on private consumption, driven by income and wealth variables.

However, it must be noted that this project has worked with EU aggregate data. Future research could conduct a similar investigation in a cross-country setting. Our colleagues at the Bundesbank have suggested to include an additional inflation expectations variable and the dispersion of survey data as a measure as opposed to their levels, to more accurately isolate quartile-specific variation. Overall, our results are consistent with the arguments put forward by Beraja and Wolf (2021), and we believe there is little reason to expect a sudden dynamization of private consumption, as saving rates in the Eurozone remain high. This raises questions about potential redistribution effects, especially if saving rates are unequally distributed within the population. Should financial wealth remain a strong driver of private consumption, potential for an upswing would be reduced further, as financial assets tend to be found in higher income groups with lower marginal propensities to consume. Auclert et al. (2023) have suggested that this could be due to a "trickling up" effect of excess savings, whereby fiscal stimuli during the crisis temporarily increase consumption, but ultimately "trickle up" as excess savings of the very wealthy in the medium- to long run. Further analyses could be conducted on such potential redistributive effects in the Eurozone.

	Specification						
Long-term Relationship	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Until 2019							
Observed Growth Rates RPC							
2022	0.31	0.31	0.31	0.31	0.31	0.31	0.31
2023	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Residuals (Model)							
2022	0.34	0.35	0.30	0.44	0.35	0.24	0.02
2023	-0.34	-0.35	-0.30	-0.44	-0.46	-0.46	-0.25
Until 2023							
Observed Growth Rates RPC							
2022	0.31	0.31	0.31	0.31	0.31	0.31	0.31
2023	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Residuals (Model)							
2022	0.22	0.24	0.17	0.30	0.14	0.22	0.07
2023	-0.22	-0.24	-0.17	-0.30	-0.18	0.02	0.07

Table 5: Model Comparison with Both Long-Run Relationships.

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