The changing slope of the Phillips Curve before and during the Pandemic in the US

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Abstract

This article delves into the examination of the Phillips curve's slope variations before and during the pandemic in the United States. Following the identification of the most suitable proxy for the expectation of inflation, regression analysis is employed to discern that the Phillips curve's slopes change during the pandemic. The steeper slope is attributed to the labour market tightness as well as the other structural change inherent in the nonlinear NKPC. Additionally, this article makes an empirical contribution to the ongoing discourse, supporting the notion that the Phillips curve exhibits nonlinearity.

1 Introduction

The abrupt inflation surge, succeeded by a rapid and unexpected decline amid the pandemic, raises additional inquiries about the validity of the Phillips curve. Another indication of a shift in the Phillips curve's slope or its failure during the pandemic is the characterization of the U.S. economy as "resilient." This resilience is manifested in the unemployment rate's decrease following interest rate hikes, despite what the Philips curve predicted.

The New Keynesian Philips curve widely used is from Friedman.

$$\pi_t = E\pi_t + \kappa x_t + s_t$$

where π_t is the inflation rate, $E\pi_t$ is the expectation of inflation, x_t is the output gap, and s_t is the supply shock. Friedman's Philips curve incorporates supply shocks and the output gap into the original Phillips curve, which is consistent with intuition. When the economy is operating above its full-employment level, it means that resources are being utilized more than the equilibrium. In such a situation, demand may outstrip the economy's ability to supply them efficiently. This excess demand can lead to upward pressure on prices, contributing to inflation. Similarly, when the economy experiences a negative output gap, inflation will go down. Supply shocks are also an important factor in deciding inflation, which results in increased production costs for businesses, who may pass these costs onto consumers in the form of higher prices for goods and services, leading to cost-push inflation.

Friedman first measured the output gap with the unemployment gap, which is defined as the difference between the actual unemployment rate and the natural unemployment rate. In this empirical study, the natural unemployment rate used to be measured by the non-accelerating inflation rate of unemployment (NAIRU), which now is renamed the Natural Rate of Unemployment (NROU) from Congress Budget Office(CBO (2021)). The proxy for the natural unemployment rate. NAIRU or NROU, combined with Friedman's Philips curve had great success and became the backbone model before the pandemic.

However, criticisms have been raised regarding NAIRU, including Bernanke Parkinson (1989) and Ball Mankiw (2002). These critiques centre around the lack of a solid macroeconomic theoretical foundation and the difficulty in accurate estimation. The pandemic's failure scenarios prompt a reconsideration of NROU or even the unemployment gap. Reflecting on the original concepts of Friedman and Keynes, such as the unemployment gap or other proxies, these metrics essentially gauge the "slack" in an economy. When demand exceeds supply, the economy experiences "slack", and when supply surpasses demand, there is an "economic surplus". What necessitates estimation is, in fact, the measure of slack rather than merely the unemployment rate.

The primary theoretical limitation of NAIRU lies in its exclusive consideration of labor supply, assuming that labor demand remains relatively constant and exogenous. The reliability of this assumption about labor demand is questionable. To address this, labor market tightness, measured by the ratio of job vacancies to unemployed workers, is introduced to rectify the oversight. Pissarides (2000) featured a Beveridge curve, elucidating the inverse relationship between job vacancies and unemployment. Additionally, Michaillat Saez (2022) incorporated labor market tightness into the calculation of the natural unemployment rate. Domash Summers (2022) underscore the significance of the job vacancy rate in predicting wage inflation using aggregate regional data. Benigno Eggertsson (2023) introduces an Inv-L NKPC model, leveraging labor tightness to incorporate a time-varying slope into the

NKPC.

$$\pi_t - E\pi_t = \beta_1 Lnv + \beta_2 Lnv\mathbf{I}_{(v>1)} + s_t$$

where Lnv is the log of labour tightness and $\mathbf{I}_{(v>1)}$ is the dummy variable that equals 1 when the labour tightness is larger than 1 and equals 0 otherwise. The interaction term appears in the 1 to demonstrate the nonlinearity because the effect of the output gap on inflation can vary when labour tightness changes. In other words, when the labour market tightness is larger than 1, the Philips curve becomes steeper.

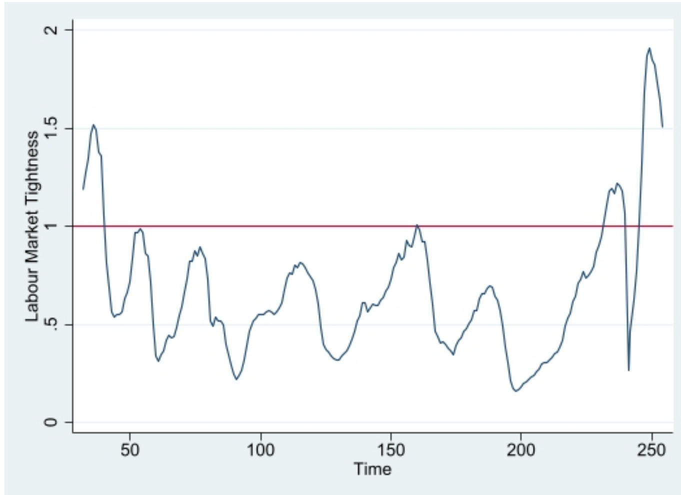
From subfigure (a) in Figure 1, it's of no surprise that the role of labor market tightness in the Philips curve has been ignored. Labor market tightness has been always below the threshold of 1 from 1970 to 2018. From subfigure (b) and (c) in Figure1, the nonlinearity of the Philips curve is also clear. When the labour market tightness is larger than 1, the slope of the Philips curve changes. However, it cannot be determined whether it becomes steeper or more flattened from Figure 1.

To answer the research problem of whether the slope of the Phillips Curve changes or not during and after the Pandemic in detail, several variables of the given dataset are useful. Variables *SPF_Inflation*, *Michigan_Inflation*, *Swap_xyear* are used as different proxies for the expectation of inflation. The percent change of variables *pcepi*, *pcepilfe* (core PCE), *GDP_def*, *cpiaucsl*, *cpilfesl* (core cpi) can be used to construct different measurements for inflation. The supply shock can be constructed from variables *POILBREUSDM* and *import_def*. Slacks of the economy can be measured by either laour market tightness or the employment gap. The former is measured by the variable *V_U* while the latter needs variable *unrate* and *nrou* to construct.

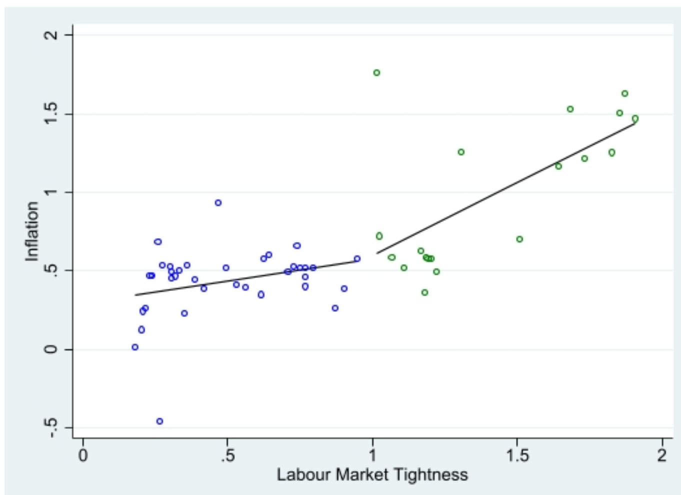
In the main section, we will initially summarize the data and specify inflation expectations before delving into the variations in the Phillips curve slopes during different periods. Additional evidence supporting the non-linear NKPC as opposed to the linear NKPC will be presented in the final segment of the main section. The conclusion serves to bring the article to a close.

2 Main Section

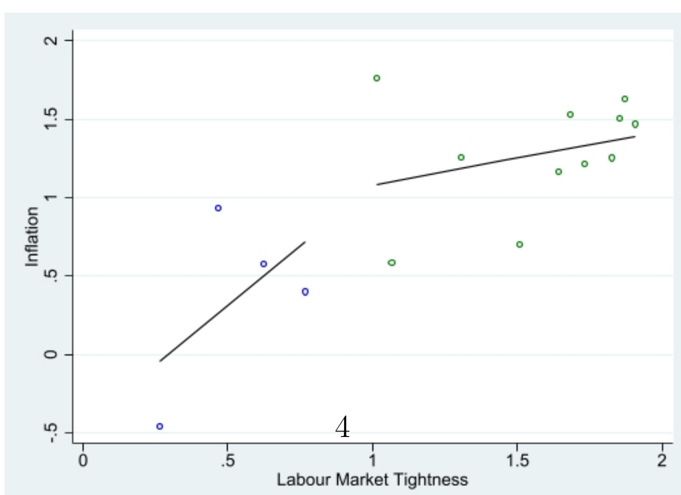
The failure of the Philips curve to predict may be due to the structural change or the incorrect specification of the Philips curve. The examination or estimation process necessitates a dual focus on both the specified model and the underlying hypothesis. Thus, it becomes imperative to specify the model and the measures employed. This comprehensive approach is necessary to answer the question at hand whether the slope of the Philips curve changes or not. In this section, we will



(a) Time Series of Labour Market Tightness from 1968Q1 to 2023Q3



(b) From 2010 to 2023



(c) From 2020 to 2023

Figure 1: Stylized Facts about π and v

summarize the data. After the specification of the expectation of inflation, the slope of Philips before and during the pandemic are analyzed.

2.1 Data

The data used is provided. Data are retrieved from FRED to guarantee correctness. The time range of the data is from the quarter data from the first quarter of 1960 to the third quarter of 2023. Some variables of interest began to be recorded from 1968. Michigan Survey Consumers' expectation of inflation were not recorded until 1978. From 2004, all variables of interest began to be recorded.

As mentioned in the Introduction, the measures of inflation *PCE*, *CPCE*, *DGDP*, *CCPI*, *PCI* are the percent change of *pcepi*, *pcepilfe*, *GDP_def*, *cpiaucsl*, *cpilfesl*. Supply shocks *shock_oil* and *shock_imp* are constructed by the percent change of oil price *POILBREUSDM* and import deflator *import_def*. Labour market tightness *Lnv* is measured by the log of *v_u*. The employment gap *Unem_gap* is calculated by the difference between the unemployment rate *unrate* and the noncyclical rate of unemployment *nrou*.

Table 1: Descriptive Statistics

Variable	Count	Mean	Std	Min	Max
SPF	202	3.337	1.330	2.030	8.250
MSC	184	3.596	1.612	1.067	10.200
Swap1	78	1.881	1.130	-2.393	5.269
Swap5	78	2.217	0.516	0.633	3.323
Swap10	78	2.419	0.369	1.391	3.006
CPI	255	0.929	0.765	-2.290	3.946
CCPI	255	0.918	0.650	-0.462	3.698
PCE	254	0.815	0.641	-1.596	3.004
CPCE	254	0.800	0.538	-0.190	2.857
DGDP	222	0.871	0.609	-0.403	2.942
Shock_import	222	0.799	2.524	-10.829	15.728
Shock_oil	198	2.596	16.276	-51.784	69.572
Lnv	223	-0.525	0.509	-1.840	0.647
Em_gap	224	0.626	1.686	-2.451	8.499

In Table 1, it is evident that the Michigan Survey of Consumers *MSC* exhibits greater fluctuation compared to other inflation expectations, while *Swap10*, representing the 10-year swap yield rate, displays the least volatility. Specifically, the standard deviation of MSC is approximately five times higher than that of *Swap10*. Various inflation measures demonstrate similar trends, with comparable standard variations and means. Core Consumer Price Index *CCPI* and core Personal Consumption Expenditures *CPCE* exhibit slightly higher volatility than CPI and PCE, aligning with our intuitive expectations. Additionally, the analysis reveals that oil prices experience greater fluctuation than the import deflator. It is noteworthy that labor market tightness *Lnv* and the employment gap *Em_gap* not only differ in economic interpretation but also magnitude. Thus a direct comparison of their coefficients is inappropriate.

2.2 The Specification of Expectation

Coibion Gorodnichenko (2015) pointed out that the estimated slopes of Philips are sensitive to the choice of proxy for expectation. Therefore, it is important to choose the appropriate expectation of inflation. There are several proxies of inflation expectation, including SPF Inflation, the Michigan Survey of Consumers' expectation of inflation, and the yield rate of swaps with different terms.

To specify the right proxy, we use the method from Coibion Gorodnichenko (2015) to do the specification of proxies.

$$\pi_t = \beta_1 E_1 \pi_t + \beta_2 E_2 \pi_t + \beta_v ln_v + \beta_c ln_v \mathbf{I}_{(v>1)} + s_t$$

where $E_1\pi_t$ and $E_2\pi_t$ are two different proxies for inflation expectation. When $E_1\pi_t$ is the better proxy, $\beta_1 \approx 1$ and $\beta_1 \approx 0$. When $E_2\pi_t$ is the better proxy, $\beta_2 \approx 0$ and $\beta_1 \approx 1$.

The results of the Michigan Survey of Consumers' expectation of inflation and other proxies are in Tabel2. Specifically, we use core CPI as the measure of inflation, the log of labour market tightness v as the measure of slack, and the percent change of implicit price deflator using Imports of goods and services as the measure of supply shock.

From Tabel2, the coefficients are acquired from doing the regression of 2.2 with different inflation expectations in different periods. From Tabel2, the coefficient of the Michigan Survey of Consumer expectation of inflation is always closer to 1 than its counterpart. Its coefficient is also more significant than its counterparts' coefficients. The only two anti-examples happen in the period from 2009-2019. In this period, the inflation and expectation of inflation were relatively stable. In all, the Michigan Survey of Consumers' expectation of inflation is better than the other 5 proxies.

Table 2: Specification of the Proxy

	MSC	SPF	MSC	SWAP1
2009-2019	0.0994	0.1320	0.1650	-0.0738
2010-2023	0.391	0.0287	0.339	0.0798
2018-2023	0.486	-0.303	0.517	-0.160
	MSC	SWAP5	MSC	SWAP10
2009-2019	0.179	-0.157	0.157	-0.175
2010-2023	0.405	-0.0255	0.402	-0.0277
2018-2023	0.610	-0.481	0.582	-0.594
	MSC	Backward		
2009-2019	0.083	0.168		
2010-2023	0.444	-0.249		
2018-2023	0.552	-0.398		

The result is very consistent when variables have different measures. In detail, changing core CPI to CPI, PCE, or core PCE does not change the result that MSC is the appropriate expectation of inflation. The changes in measures of supply shocks and of the slack of the economy also don't affect our result.

2.3 Changing Slopes in Different Periods

With the appropriate proxy for the expectation of inflation, regressions on 1 can be done to analyze the slopes of the Philips curve.

Specifically, we do regression with CCPI as the measure for inflation, Michigan Survey of Consumers' expectation of the expectation of inflation to estimate the slope of the Philips curve.

The outcomes are presented in Table 3. A conspicuous observation is the noteworthy variation in the slope of Lnv, transitioning markedly from approximately 0.3 to 0.9 in Table 3 (a) and from about 0.35 to 0.8 in Table 3 (b). Impressively, there is a substantial increase in the coefficients of $ln_v \mathbf{I}_{(v>1)}$, shifting noticeably from around -1 to approximately -3. The alterations in the slopes of the nonlinear Philips curve across different periods are statistically significant at least at the 5% level, reinforcing the conclusion that the Philips curve slopes indeed undergo meaningful changes. The shift is not solely attributed to the tightened labor market; it also encompasses structural changes.

Another notable finding is that the employment gap proves to be an inferior predictor when compared to labor market tightness, especially during pandemic times. Notably, the $adjR^2$ in Table 3 (b) is significantly lower than when employing labor market tightness as the measure of slack in the periods of 2010-2023 and 2018-2023. This result underscores the inadequacy of the employment gap as a predictor during the pandemic.

The coefficients associated with labour market tightness or the employment gap lack statistical significance in the period spanning from 2020 to 2023. This non-significance is likely attributed to the limited dataset available during this period. With only 12 records at our disposal, the estimation of slopes using 1 is supposed to have considerable fluctuations. To enhance the precision of slope estimation, acquiring data from more extended periods and incorporating regional data into the analysis would be beneficial.

Switching from *CCPI* to *CPI*, *PCE*, *CPCE*, or *DGDP* as measures of inflation, and from import shock to oil shock as measures of supply shock, will cause a little shift in the coefficient and significance. However, the main takeaway is that the slope changes before and during the pandemic remain unaffected. The full result is in the Appendix.

Table 3: Non-linear NKPC

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023
Table 3: (a) CCPI, Tightness, Import Shock					
Lnv	-0.2255	0.3030^{**}	0.6380^{***}	0.9126^{**}	0.6272
Lnv$\mathbf{I}_{(v>1)}$	103.9813^{***}	-1.2486	-3.0734^{***}	-3.6086^{***}	-3.0606^{**}
Shock_import	-0.2920^{***}	-0.0610	-0.0376	-0.0665	-0.0161
Constant	-2.7612^{***}	-2.1915^{***}	-1.9714^{***}	-1.8295^{***}	-2.0681^{***}
$adjR^2$	0.2973	0.2746	0.6604	0.7208	0.6164
Table 3: (b) CCPI, Employment Gap, Import Shock					
Em_gap	-0.0398	-0.1026^{***}	-0.0974^{***}	-0.0471	0.0438
Em_gap$\mathbf{I}_{(v>1)}$	-0.6069^{***}	0.1349	0.3019	0.1467	0.2758
Shock_import	-0.3050^{***}	-0.0544	-0.0892^{**}	-0.0828	0.0220
Constant	-2.5871^{***}	-2.2389^{***}	-2.3476^{***}	-2.4795^{***}	-2.9396^{***}

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Table 3 – Continued

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023
$adjR^2$	0.2944	0.3127	0.1445	-0.1497	-0.1744

Table 3: (c) CCPI, Tightness, Oil Shock

Lnv	-0.5770^{**}	0.3484^{***}	0.6479^{***}	0.8106^{***}	0.5169
Lnv$\mathbf{I}_{(v>1)}$	120.1278^{***}	-1.5815^{*}	-3.1560^{***}	-3.4912^{***}	-2.8401^{**}
Shock_oil	-0.0212^{***}	0.0001	0.0010	0.0002	0.0025
Constant	-3.0779^{***}	-2.1490^{***}	-1.9689^{***}	-1.8865^{***}	-2.1601^{***}
$adjR^2$	0.0884	0.1721	0.6472	0.6895	0.6283

Table 3: (d) CPI, Tightness, Import Shock

Lnv	-0.2150	0.2652^{**}	0.5764^{***}	0.7704^{**}	0.3545
Lnv$\mathbf{I}_{(v>1)}$	120.3949^{***}	-1.0554	-2.6262^{***}	-2.9805^{***}	-2.1701^{*}
Shock_import	-0.1540^{*}	0.0982^{*}	0.1454^{***}	0.1156^{**}	0.1829^{**}
Constant	-2.8390^{***}	-2.2533^{***}	-2.0550^{***}	-1.9589^{***}	-2.3101^{***}
$adjR^2$	0.0867	0.2215	0.5703	0.6560	0.6826

[a] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

2.4 Another Specification of Model

The analysis above illustrates the shifting slope of the Philips curve. Further empirical investigations are essential to bolster the argument that the Philips curve is not linear, especially in the context of the ongoing pandemic.

To assess this, we conducted regression analysis on 1 and compared it with equation 1. Specifically, our regression incorporated the Consumer Price Index (CCPI) as the inflation measure and the Michigan Survey of Consumers' expectations of inflation (MSC) to estimate the slope of the Philips curve within the framework of the linear NKPC.

The results are detailed in Table 4. Notably, while the coefficients of slack were significant between 2009 and 2019, none retained significance in the periods of 2010-2023 and 2018-2023. Moreover, when using labor market tightness as an alternative measure of slack, the sign shifted from positive between 2009 and 2019 to negative between 2018 and 2023, signaling the changing slope of the Philips curve. The finding also reinforces the argument against the linear specification of the Philips curve.

Additional support for this contention arises from the examination of the adjusted R-squared values. A comparison between Table 3 and Table 4 reveals that the adjusted R-squared of the linear model exceeded that of the non-linear model in the period of 2009-2019. However, it reversed in 1969-2010, 2010-2023, and 2018-2023, where the non-linear model demonstrated a notably higher adjusted R-squared. This discrepancy further underscores the inadequacy of the linear NKPC during the pandemic period. The result is still not affected by the choice of measures of inflation and supply shock.

Table 4: Linear NKPC

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023
Table 4: (a) CCPI, Tightness, Import Shock					
Lnv	-0.5442^{**}	0.3011^{***}	0.0725	-0.4917	-0.5950^{*}
Shock_oil	-0.0208^{***}	0.0001	0.0013	0.0036	0.0067
Constant	-3.0502^{***}	-2.2070^{***}	-2.5236^{***}	-2.5840^{***}	-2.9392^{***}
$adjR^2$	0.0901	0.1739	-0.0286	0.0406	0.2077
Table 4: (b) CCPI, Employment Gap, Import Shock					
Em_gap	-0.0455	-0.0952^{***}	-0.0687^{*}	-0.0238	0.0844
Shock_imp	-0.3042^{***}	-0.0567	-0.0793^{*}	-0.0558	0.0726
Constant	-2.5781^{***}	-2.2637^{***}	-2.4403^{***}	-2.5664^{***}	-3.0886^{***}
$adjR^2$	0.2974	0.3272	0.1138	-0.0917	-0.0983
Table 4: (c) CCPI, Tightness, Oil Shock					
Lnv	-0.5442^{**}	0.3011^{***}	0.0725	-0.4917	-0.5950^{*}
Shock_oil	-0.0208^{***}	0.0001	0.0013	0.0036	0.0067
Constant	-3.0502^{***}	-2.2070^{***}	-2.5236^{***}	-2.5840^{***}	-2.9392^{***}
$adjR^2$	0.0901	0.1739	-0.0286	0.0406	0.2077
Table 4: (d) CPI, Tightness, Import Shock					
Lnv	-0.3943	0.2446^{**}	0.0848	-0.2624	-0.3419
Shock_oil	-0.0025	0.0161^{***}	0.0144^{***}	0.0136^{**}	0.0156^{**}

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Table 4 – Continued

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023
Constant	-3.0189^{***}	-2.3074^{***}	-2.5231^{***}	-2.5480^{***}	-2.8246^{***}
$adjR^2$	0.0029	0.4057	0.2770	0.2247	0.4076

[a] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3 Conclusion

The slope of the Philips curve has undergone significant changes. Whether a linear or nonlinear model is specified, the estimated slopes before and during the pandemic exhibit substantial differences. This alteration in the slope appears to be a key factor contributing to the Phillips curve's sub-optimal predictions amid the pandemic.

Our contribution lies in furnishing additional empirical evidence that supports the superiority of the nonlinear NKPC over its linear counterpart. Moreover, our findings indicate that the nonlinear NKPC demonstrates enhanced predictive accuracy, particularly when the labor market is tight.

However, it is crucial to acknowledge the limitations within our study: the scarcity of data. Between 2020 to 2023, which includes the entire pandemic duration, there are at most 12 data points. This limited dataset poses a challenge for making robust inferences. Additionally, our approach to specifying the expectation of inflation lacks a solid econometric foundation. To address these limitations and further analyze the issue, future research should consider incorporating regional data and employing a nonlinear Philips curve model. This would provide a more comprehensive and nuanced understanding of economic slacks and inflation dynamics, especially in times characterized by a tight labour market.

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4 Appendix

The regression result of Equation 1 with different measures of inflation, supply shock and slack are in Table 5

Table 5: Nonlinear NKPC

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023
Table 5: CCPI, Employment Gap, Import Shock					
Em_gap	-0.0398	-0.1026^{***}	-0.0974^{***}	-0.0471	0.0438
Em_gap$\mathbf{I}_{v>1}$	-0.6069^{***}	0.1349	0.3019	0.1467	0.2758
Shock_import	-0.3050^{***}	-0.0544	-0.0892^{**}	-0.0828	0.0220
Constant	-2.5871^{***}	-2.2389^{***}	-2.3476^{***}	-2.4795^{***}	-2.9396^{***}
$adjR^2$	0.2944	0.3127	0.1445	-0.1497	-0.1744
Table 5: CCPI, Tightness, Import Shock					
Lnv	-0.2255	0.3030^{**}	0.6380^{***}	0.9126^{**}	0.6272
Lnv$\mathbf{I}_{(v>1)}$	103.9813^{***}	-1.2486	-3.0734^{***}	-3.6086^{***}	-3.0606^{**}
Shock_import	-0.2920^{***}	-0.0610	-0.0376	-0.0665	-0.0161
Constant	-2.7612^{***}	-2.1915^{***}	-1.9714^{***}	-1.8295^{***}	-2.0681^{***}
$adjR^2$	0.2973	0.2746	0.6604	0.7208	0.6164
Table 5: CCPI, Employment Gap, Oil Shock					
Em_gap	0.0406	-0.1216^{***}	-0.0935^{***}	-0.0064	0.0501
Em_gap$\mathbf{I}_{v>1}$	-0.6617^{***}	0.2420	0.2420	-0.0597	0.2390
Shock_oil	-0.0220^{***}	0.0006	0.0004	0.0035	0.0055
Constant	-2.7394^{***}	-2.1925^{***}	-2.3817^{***}	-2.6479^{***}	-2.9740^{***}
$adjR^2$	0.0584	0.2354	0.0619	-0.1668	-0.1089
Table 5: CCPI, Tightness, Oil Shock					
Lnv	-0.5770^{**}	0.3484^{***}	0.6479^{***}	0.8106^{***}	0.5169
Lnv$\mathbf{I}_{(v>1)}$	120.1278^{***}	-1.5815^{*}	-3.1560^{***}	-3.4912^{***}	-2.8401^{**}
Shock_oil	-0.0212^{***}	0.0001	0.0010	0.0002	0.0025
Constant	-3.0779^{***}	-2.1490^{***}	-1.9689^{***}	-1.8865^{***}	-2.1601^{***}
$adjR^2$	0.0884	0.1721	0.6472	0.6895	0.6283
Table 5: CPCE, Employment Gap, Supply Shock					

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Table 5 – Continued

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023
Em_gap	0.0074	-0.0870^{**}	-0.0592^{*}	0.0043	0.0981
Em_gap$\mathbf{I}_{v>1}$	-0.7230^{***}	0.0714	0.2591	0.0747	0.2230
Shock_import	-0.3179^{***}	-0.0178	-0.0734	-0.0699	0.0331
Constant	-2.7771^{***}	-2.3395^{***}	-2.4929^{***}	-2.6466^{***}	-3.1251^{***}
$adjR^2$	0.2729	0.1760	0.0449	-0.1551	-0.0649

Table 5: CPCE, Tightness, Import Shock

Lnv	-0.4222^{*}	0.2570^{**}	0.5538^{***}	0.7015^{**}	0.4336
Lnv$\mathbf{I}_{(v>1)}$	123.3365^{***}	-0.8681	-3.1822^{***}	-3.6228^{***}	-3.0962^{***}
Shock_import	-0.3020^{***}	-0.0232	-0.0188	-0.0610	-0.0185
Constant	-3.0459^{***}	-2.2983^{***}	-2.0862^{***}	-1.9195^{***}	-2.1463^{***}
$adjR^2$	0.2864	0.1374	0.6884	0.8293	0.7820

Table 5: CPCE, Employment Gap, Oil Shock

Em_gap	0.0923	-0.0969^{***}	-0.0553^{*}	0.0410	0.1002
Em_gap$\mathbf{I}_{v>1}$	-0.7663^{***}	0.1198	0.2049	-0.1127	0.2008
Shock_oil	-0.0217^{***}	0.0025	0.0011	0.0039	0.0057
Constant	-2.9402^{***}	-2.3190^{***}	-2.5243^{***}	-2.7998^{***}	-3.1424^{***}
$adjR^2$	0.0513	0.1792	-0.0111	-0.1586	-0.0065

Table 5: CPCE, Tightness, Oil Shock

Lnv	-0.7892^{***}	0.2830^{**}	0.5565^{***}	0.6088^{***}	0.3256
Lnv$\mathbf{I}_{(v>1)}$	138.4133^{***}	-0.9891	-3.2212^{***}	-3.5171^{***}	-2.8848^{***}
Shock_oil	-0.0208^{***}	0.0022	0.0016	0.0001	0.0021
Constant	-3.3788^{***}	-2.2780^{***}	-2.0884^{***}	-1.9710^{***}	-2.2351^{***}
$adjR^2$	0.0933	0.1295	0.6881	0.8042	0.7882

Table 5: CPI, Employment Gap, Import Shock

Em_gap	-0.0681	-0.0919^{**}	-0.0855^{***}	-0.0192	0.0623
Em_gap$\mathbf{I}_{v>1}$	-0.6937^{***}	0.1241	0.1561	-0.0755	0.0541

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Table 5 – Continued

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023
Shock_import	-0.1696^{*}	0.1044^{*}	0.1055^{**}	0.1367	0.2319^{*}
Constant	-2.6520^{***}	-2.2897^{***}	-2.4057^{***}	-2.6052^{***}	-3.0171^{***}
$adj\,R^2$	0.0875	0.2530	0.1750	-0.0168	0.1887

Table 5: CPI, Tightness, Import Shock

Lnv	-0.2150	0.2652^{**}	0.5764^{***}	0.7704^{**}	0.3545
Lnv$\mathbf{I}_{(v>1)}$	120.3949^{***}	-1.0554	-2.6262^{***}	-2.9805^{***}	-2.1701^{*}
Shock_import	-0.1540^{*}	0.0982^{*}	0.1454^{***}	0.1156^{**}	0.1829^{**}
Constant	-2.8390^{***}	-2.2533^{***}	-2.0550^{***}	-1.9589^{***}	-2.3101^{***}
$adj\,R^2$	0.0867	0.2215	0.5703	0.6560	0.6826

Table 5: CPI, Employment Gap, Oil Shock

Em_gap	-0.0152	-0.0836^{**}	-0.0745^{***}	-0.0368	0.0036
Em_gap$\mathbf{I}_{v>1}$	-0.6316^{***}	0.0200	0.1227	-0.0074	0.2334
Shock_oil	-0.0038	0.0163^{***}	0.0140^{***}	0.0132^{***}	0.0141^{**}
Constant	-2.7660^{***}	-2.3387^{***}	-2.4350^{***}	-2.5561^{***}	-2.7908^{***}
$adj\,R^2$	-0.0184	0.4075	0.3314	0.1500	0.2764

Table 5: CPI, Tightness, Oil Shock

Lnv	-0.4261^{*}	0.2589^{**}	0.4987^{***}	0.8234^{***}	0.6442^{*}
Lnv$\mathbf{I}_{(v>1)}$	116.7960^{***}	-0.4791	-2.2699^{***}	-2.9109^{***}	-2.5187^{***}
Shock_oil	-0.0029	0.0161^{***}	0.0142^{***}	0.0108^{***}	0.0118^{***}
Constant	-3.0458^{***}	-2.2898^{***}	-2.1242^{***}	-1.9664^{***}	-2.1336^{***}
$adj\,R^2$	0.0007	0.3909	0.6364	0.7456	0.7406

Table 5: PCE, Employment Gap, Import Shock

Em_gap	-0.0214	-0.0800^{**}	-0.0510^{*}	0.0187	0.1054
Em_gap$\mathbf{I}_{v>1}$	-0.7971^{***}	0.0696	0.1580	-0.0570	0.0823
Shock_import	-0.2206^{**}	0.0790^{*}	0.0435	0.0548	0.1515
Constant	-2.8011^{***}	-2.3734^{***}	-2.5315^{***}	-2.7134^{***}	-3.1545^{***}

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Table 5 – Continued

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023
$adj R^2$	0.1387	0.2083	0.0105	-0.1679	0.0249

Table 5: PCE, Tightness, Import Shock

Lnv	-0.3728^{*}	0.2324^{**}	0.5062^{***}	0.6090^{**}	0.2632
Lnv$\mathbf{I}_{(v>1)}$	135.6222^{***}	-0.7450	-2.8312^{***}	-3.1565^{***}	-2.4731^{**}
Shock_import	-0.2037^{**}	0.0738^{*}	0.0893^{***}	0.0412	0.0947
Constant	-3.0579^{***}	-2.3399^{***}	-2.1482^{***}	-2.0098^{***}	-2.3034^{***}
$adj R^2$	0.1504	0.1748	0.6151	0.7725	0.7665

Table 5: PCE, Employment Gap, Oil Shock

Em_gap	0.0432	-0.0735^{**}	-0.0432	0.0206	0.0690
Em_gap$\mathbf{I}_{v>1}$	-0.7641^{***}	-0.0102	0.1224	-0.0787	0.1905
Shock_oil	-0.0093	0.0121^{***}	0.0088^{***}	0.0087^{*}	0.0099^{*}
Constant	-2.9343^{***}	-2.4109^{***}	-2.5582^{***}	-2.7348^{***}	-3.0160^{***}
$adj R^2$	-0.0055	0.3167	0.1137	-0.0636	0.0959

Table 5: PCE, Tightness, Oil Shock

Lnv	-0.6378^{**}	0.2273^{**}	0.4577^{***}	0.6089^{***}	0.3964
Lnv$\mathbf{I}_{(v>1)}$	137.5303^{***}	-0.3118	-2.6115^{***}	-3.0899^{***}	-2.6161^{***}
Shock_oil	-0.0084	0.0120^{***}	0.0091^{***}	0.0056^{***}	0.0068^{**}
Constant	-3.3095^{***}	-2.3676^{***}	-2.1919^{***}	-2.0288^{***}	-2.2271^{***}
$adj R^2$	0.0299	0.2965	0.6543	0.8124	0.8044

Table 5: DGDP, Employment Gap, Import Shock

Em_gap	-0.0570	-0.0919^{**}	-0.0623^{*}	0.0331	0.1219
Em_gap$\mathbf{I}_{v>1}$	-0.7639^{***}	-0.0106	0.1775	-0.1365	-0.0347
Shock_import	-0.3199^{***}	-0.0071	0.0120	0.0958	0.2030
Constant	-2.7613^{***}	-2.3422^{***}	-2.4504^{***}	-2.6967^{***}	-3.1426^{***}
$adj R^2$	0.2916	0.1873	0.0053	-0.1321	0.0656

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Table 5 – Continued

	Periods				
	1969-2010	2009-2019	2010-2023	2018-2023	2020-2023

Table 5: DGDP, Tightness, Import Shock

Lnv	-0.2685	0.2940^{**}	0.5285^{***}	0.5396^{**}	0.1644
Lnv$\mathbf{I}_{(v>1)}$	131.2047^{***}	-0.6154	-2.7173^{***}	-2.9757^{***}	-2.2499^{*}
Shock_import	-0.3034^{***}	-0.0112	0.0557	0.0697	0.1339^{*}
Constant	-2.9753^{***}	-2.2774^{***}	-2.0856^{***}	-1.9816^{***}	-2.2965^{***}
$adjR^2$	0.2944	0.1674	0.5326	0.7233	0.7051

Table 5: DGDP, Employment Gap, Oil Shock

Em_gap	0.0294	-0.1009^{***}	-0.0545^{*}	0.0222	0.0673
Em_gap$\mathbf{I}_{v>1}$	-0.7975^{***}	0.0268	0.1296	-0.0964	0.1369
Shock_oil	-0.0209^{***}	0.0041	0.0077^{***}	0.0098^{**}	0.0112^{*}
Constant	-2.9286^{***}	-2.3269^{***}	-2.4832^{***}	-2.6687^{***}	-2.9293^{***}
$adjR^2$	0.0432	0.2199	0.0995	-0.0313	0.0718

Table 5: DGDP, Tightness, Oil Shock

Lnv	-0.6403^{**}	0.3184^{***}	0.4932^{***}	0.5699^{***}	0.3926
Lnv$\mathbf{I}_{(v>1)}$	144.8771^{***}	-0.6670	-2.5755^{***}	-2.9299^{***}	-2.5412^{**}
Shock_oil	-0.0199^{***}	0.0039	0.0080^{***}	0.0067^{***}	0.0080^{**}
Constant	-3.3145^{***}	-2.2620^{***}	-2.1204^{***}	-1.9876^{***}	-2.1528^{***}
$adjR^2$	0.0777	0.1954	0.5994	0.7604	0.7103

[a] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.