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Immigration (from Ukraine) and labour market in Poland – evidence from Bayesian VAR models

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The standard disclaimer applies

Agenda

1. Motivation
2. Baseline model (without immigration)
3. Adding immigration proxies
   - total immigration
   - working and non-working immigration
4. Adding energy prices and supply chain disruptions
5. Conclusions

1. Motivation

Motivation

- Since 2014 Poland has experienced significant influx of Ukrainian immigrants, raising many questions about its impact on the Polish economy
- The outbreak of full-scale Russian aggression against Ukraine entailed another spike in the number of Ukrainians coming to Poland

- The LFS unemployment rate in Poland:
  - fell from ~10% in 2014 to ~3% in 2023 (lower than 5% since 2017)
  - seems to be very robust to fluctuations of the economic activity
- The growth rate of real wages lower than the GDP growth rate (on average)

This paper

- analyses the importance of immigration in shaping the unemployment and wages fluctuations in Poland
- estimates several BVAR models using quarterly data from Poland (including newly constructed proxies of immigration size)
- identifies shocks using sign restrictions
- finds that immigration shocks do matter for unemployment rate and both real and nominal wages

Related literature

- In the broader context, studies on immigration based on the aggregate data:
  - SVAR models: Furlanetto and Robstad (2019), Kiguchi and Mountford (2019), Maffei-Faccioli and Vella (2021)
  - theoretical frameworks: e.g., Storesletten (2000), Mandelman and Zlate (2012), Aubry et al. (2016), Caliendo et al. (2021), Kiiashko and Kopiec (2021)

- Empirical papers disentangling technology, demand and labour market shocks:
  - labour supply, wage bargaining and matching efficiency shocks: Foroni et al. (2018), Consolo et al. (2023), Diwambuena and Ravazzolo (2021a)
  - reallocation and matching efficiency shocks: Hairault and Zhutova (2018), Consolo and Petroulakis (2022)
  - automation shock: Diwambuena and Ravazzolo (2021b), Bergholt et al. (2022)

2. Baseline model (without immigration)

Data and method

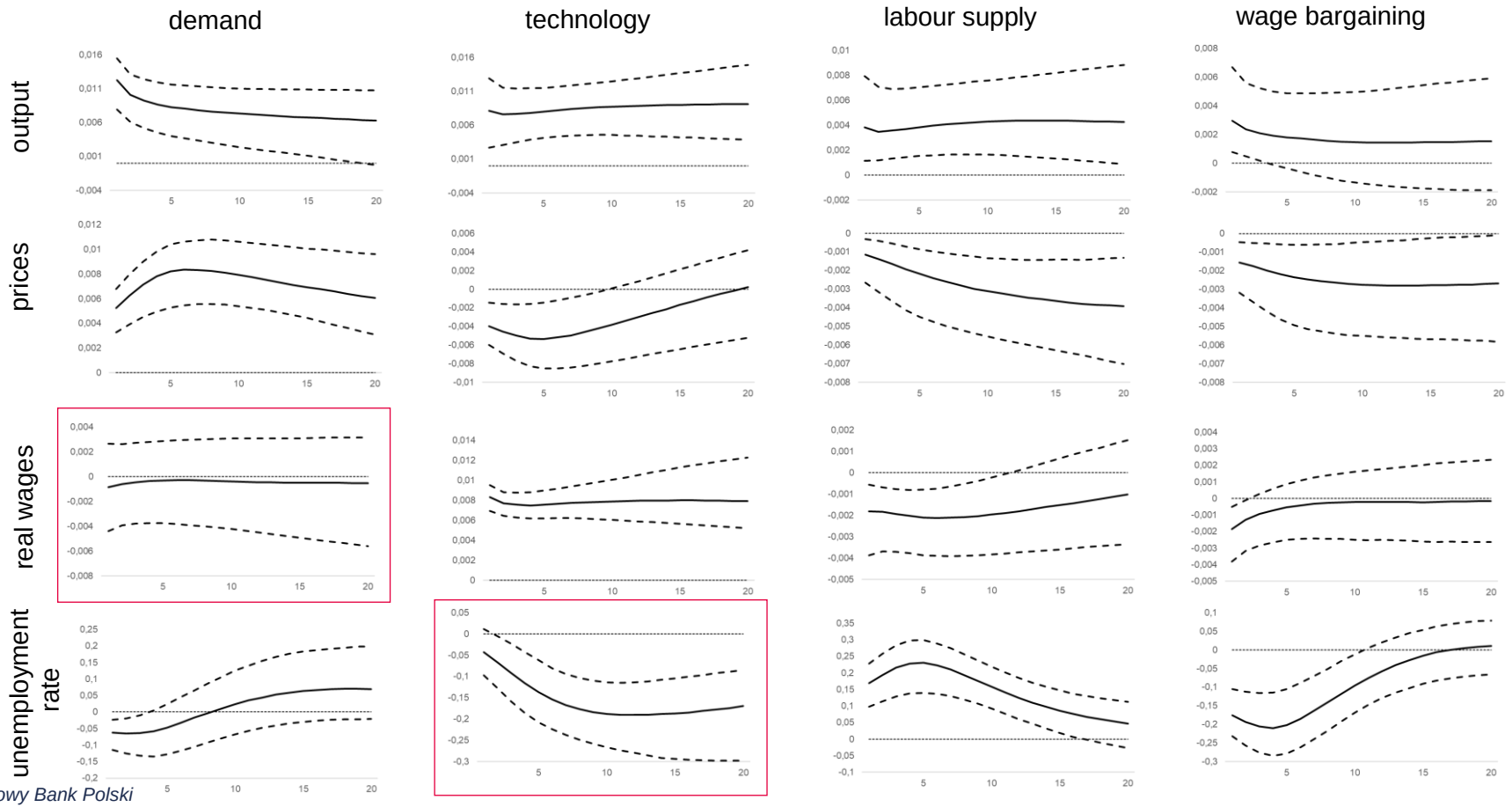
- quarterly data for Poland, 2004q1-2023q3
- baseline BVAR model inspired by Foroni et al. (2018):
  - four variables:
    1. log real GDP
    2. log CPI index
    3. log wages in the national economy deflated by the CPI index
    4. LFS unemployment rate
  - normal diffuse priors with standard parametrization (robust if Minnesota prior)
  - five lags (robust if four lags)
- four shocks identified by sign restrictions (only on the impact response)
- estimation conducted in BEAR (Dieppe et al., 2016)
- we also perform some additional robustness checks (not reported here)

Identification scheme

shocks				
	demand	technology	labour supply	wage bargaining
output	+	+	+	+
prices	+	-	-	-
real wages		+	-	-
unemployment rate	-		+	-

Source: Foroni et al. (2018)

Posterior median impulse responses

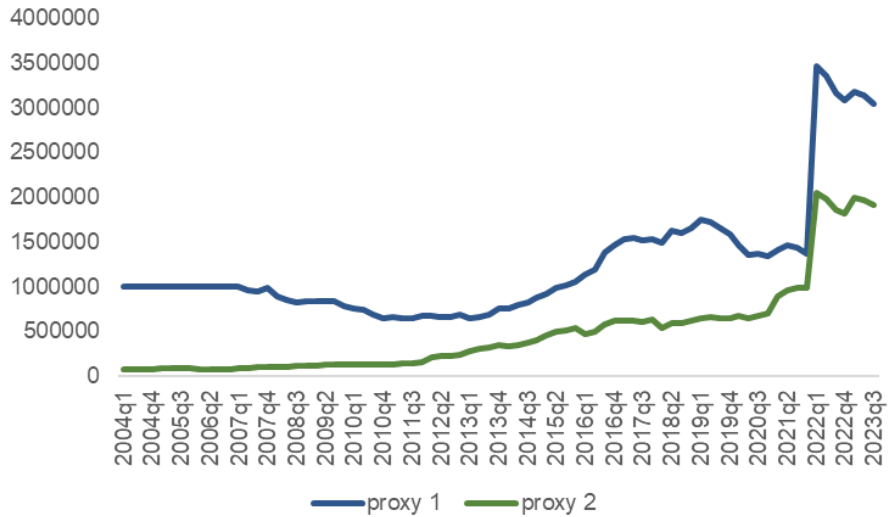


3. Adding immigration proxies – total immigration

Immigration proxies

1. Preferred measure (proxy 1) – quarterly proxy based on the Polish Border Guard data on the cumulative number of Schengen Area border crossings (both ways), backcasted for 2003-2006

2. Robustness check (proxy 2) – annual proxy based on Eurostat data on population, residence permits and temporary protection (the credit goes to Robert Wyszyński and Wojciech Łątkowski, NBP), interpolated into quarterly data using our preferred measure



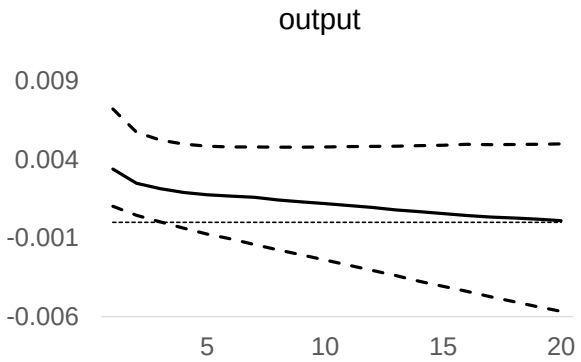
Exact levels are not important – from the perspective of VAR modelling the proxy should satisfy: $true \approx a + b \cdot proxy$

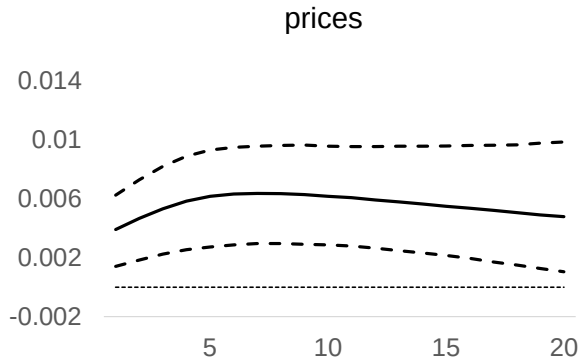
Identification scheme

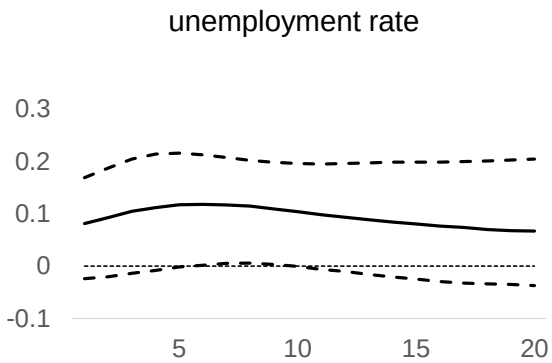
shocks					
	demand	technology	labour supply	wage bargaining	immigration
output	+	+	+	+	+
prices	+	-	-	-	+*
real wages		+	-	-	-
unemployment rate	-		+	-	
immigrants	+		-		+

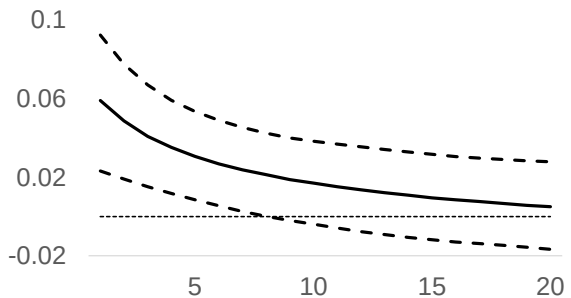
*Virtually the same results if we leave this response unrestricted

Posterior median impulse responses to immigration shock





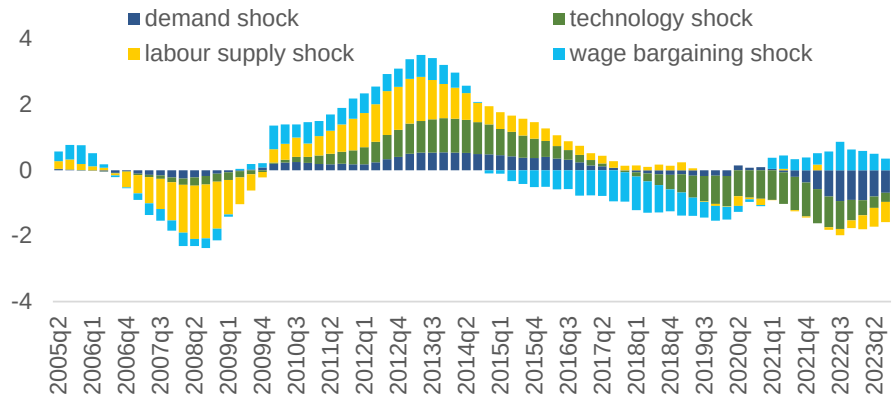




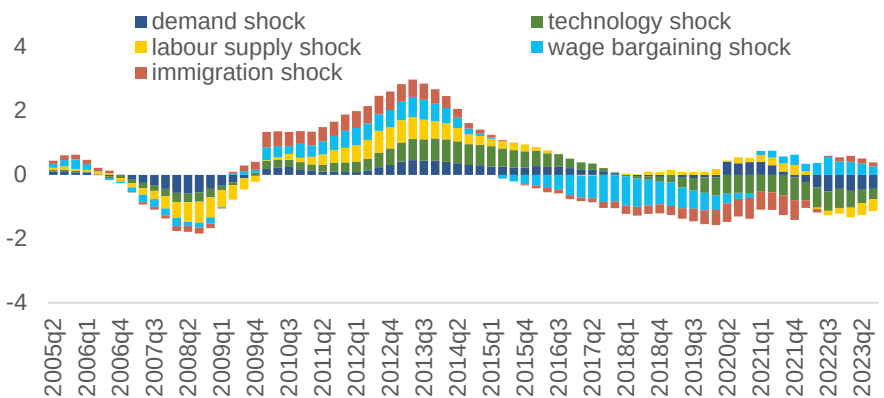
Historical decompositions (1)

unemployment rate

baseline model



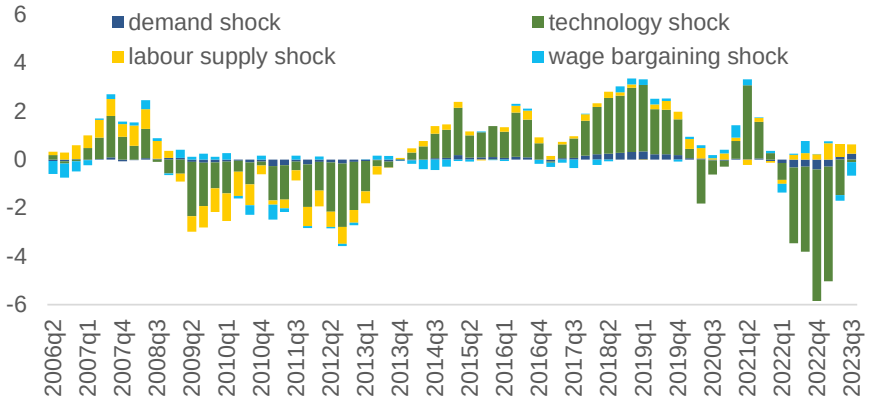
model with immigration



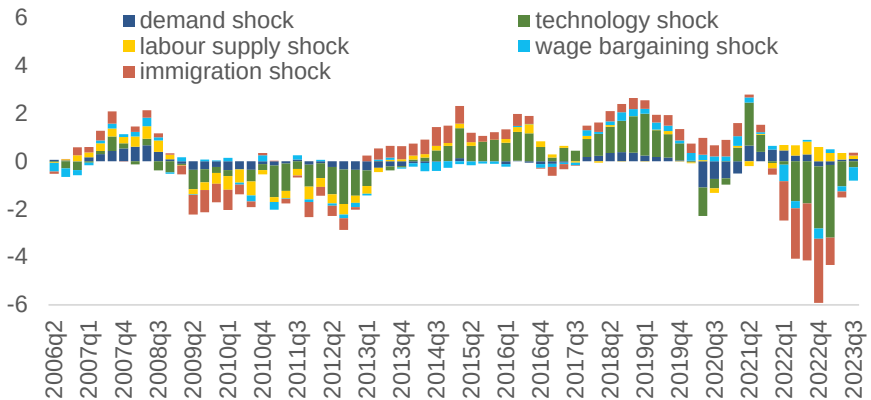
Historical decompositions (2)

annual growth rate, real wages

baseline model



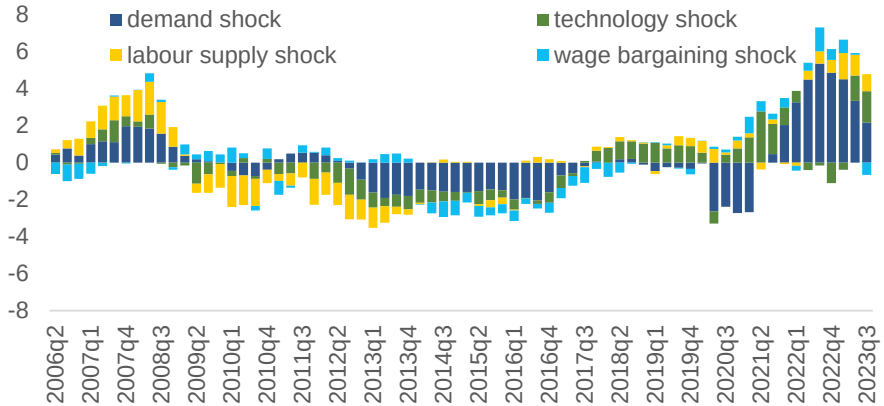
model with immigration



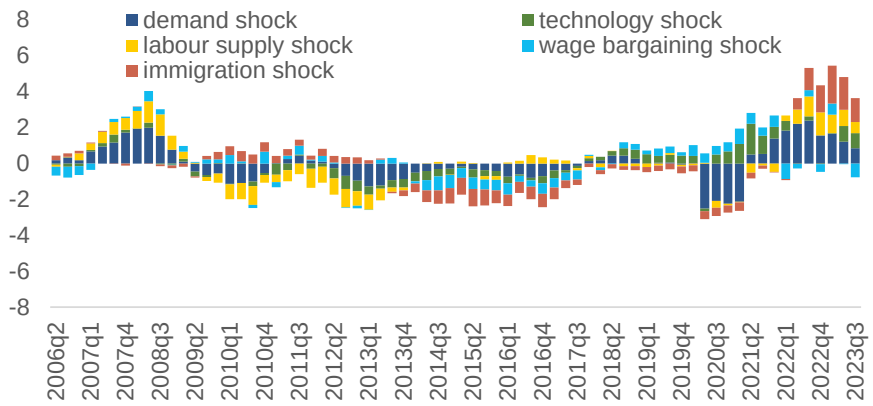
Historical decompositions (3)

annual growth rate, nominal wages

baseline model



model with immigration



3. Adding immigration proxies – working and non-working immigration

Working and non-working immigration

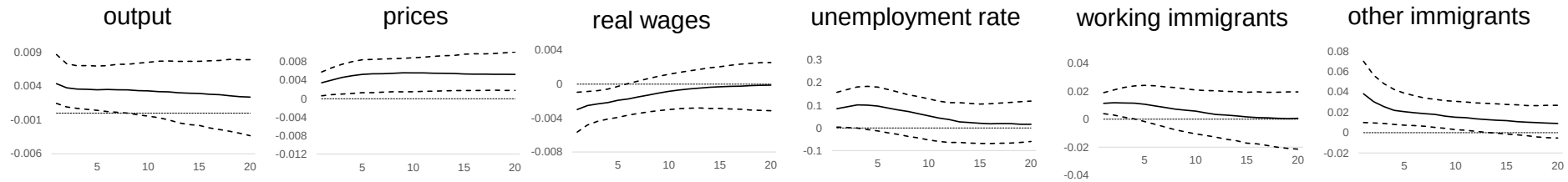
- Preferred measures – quarterly proxies for (1) working immigration and (2) non-working immigration based on data from the Polish Social Insurance Institution (ZUS) on the number of foreign citizens registered for pension and disability insurance (i.e. paying their social contributions), backcasted for 2004-2011
- Robustness check – annual series supplied for GDP and inflation projections by NBP experts (again, the credit goes to Robert Wyszyński and Wojciech Łątkowski, NBP), interpolated into quarterly data using our preferred measures

Identification scheme

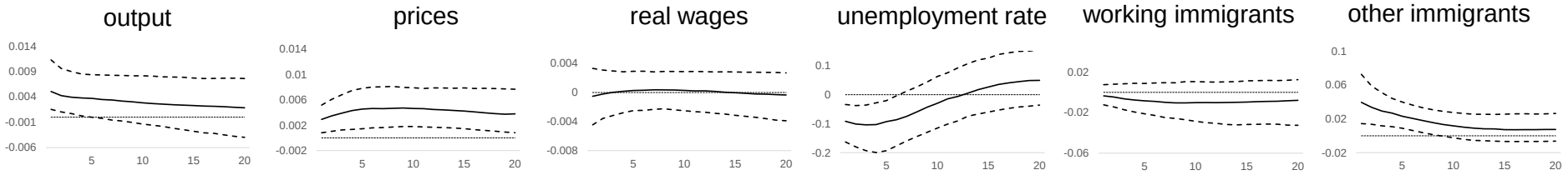
	shocks					
	demand	technology	labour supply	wage bargaining	immigration (1)	immigration (2)
output	+	+	+	+	+	+
prices	+	-	-	-		+
real wages		+	-	-	-	
unemployment rate	-		+	-		-
working immigrants	+		-		+	
other immigrants					+	+

Posterior median impulse responses to immigration shocks

Immigration shock (1)



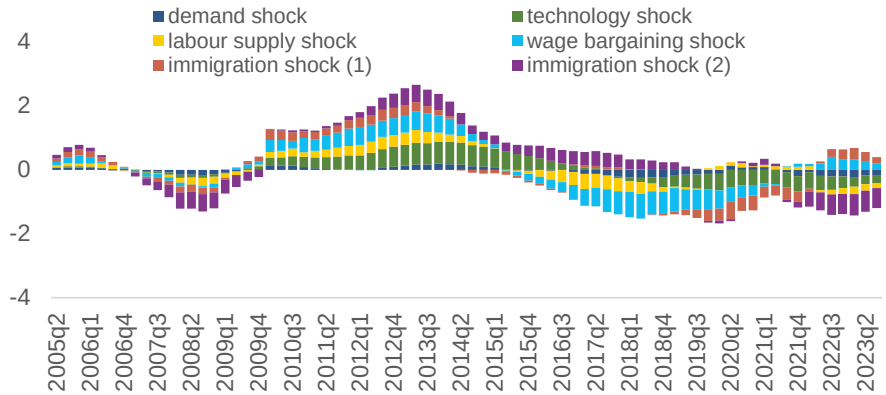
Immigration shock (2)



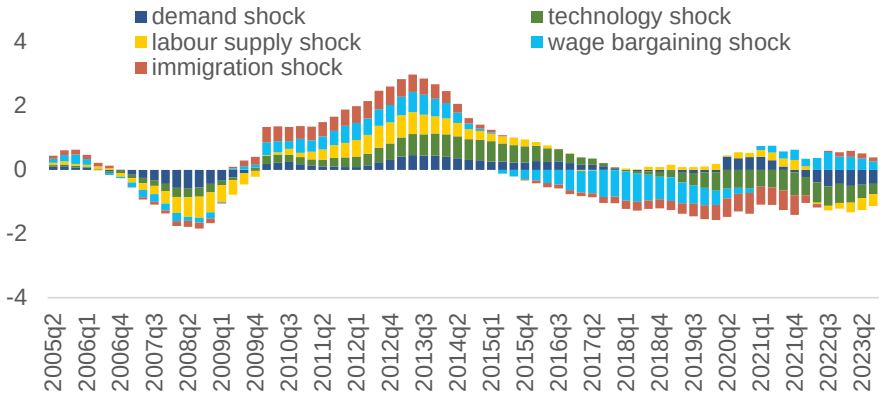
Historical decompositions (1)

unemployment rate

model with two types of immigration



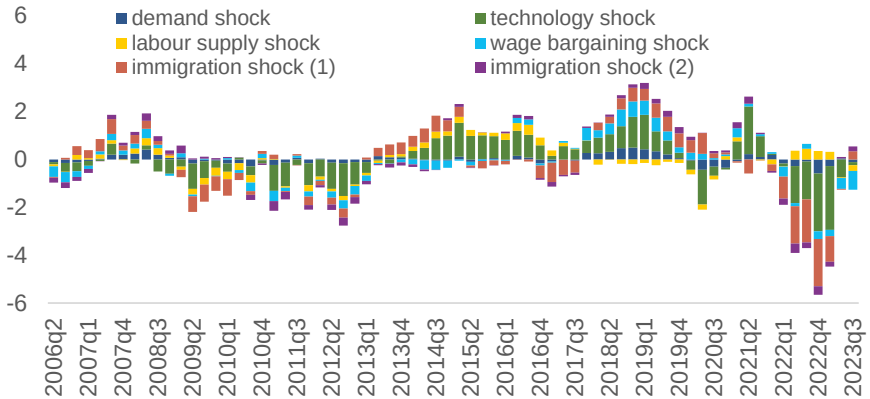
model with total immigration



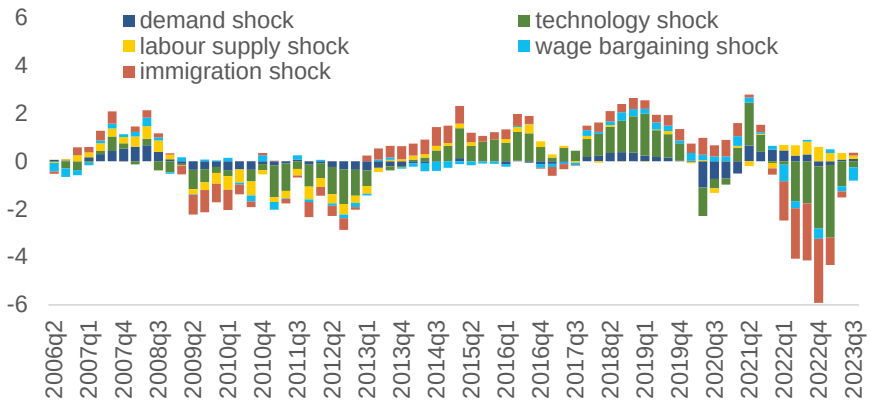
Historical decompositions (2)

annual growth rate, real wages

model with two types of immigration



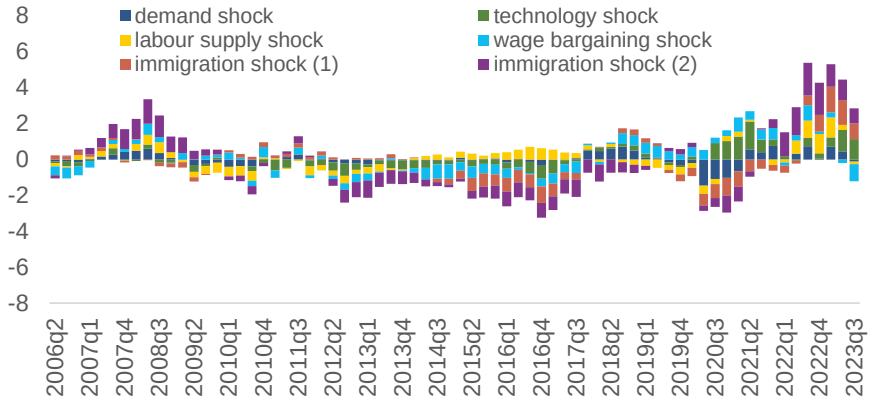
model with total immigration



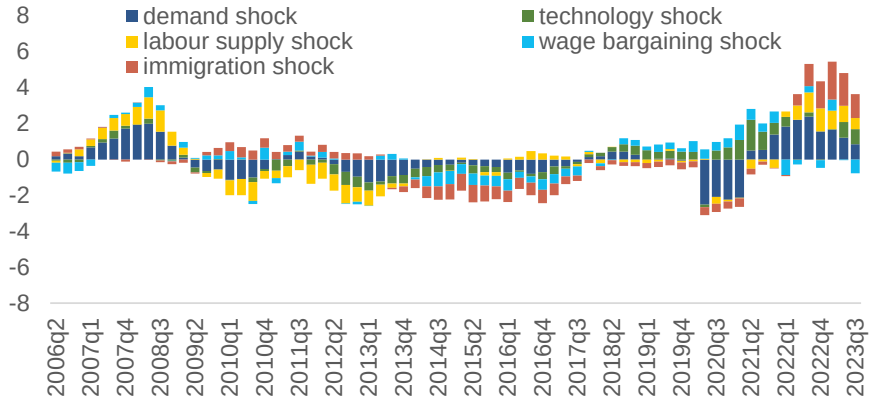
Historical decompositions (3)

annual growth rate, nominal wages

model with two types of immigration



model with total immigration



5. Adding energy prices and supply chain disruptions

Energy prices and supply chain disruptions

- Extending the model with total immigration with energy prices (PPI-energy; robust if we focus on domestic market only or exclude sections D and E) and supply chain disruptions (100 - Suppliers' Delivery Times Index [SDTI])

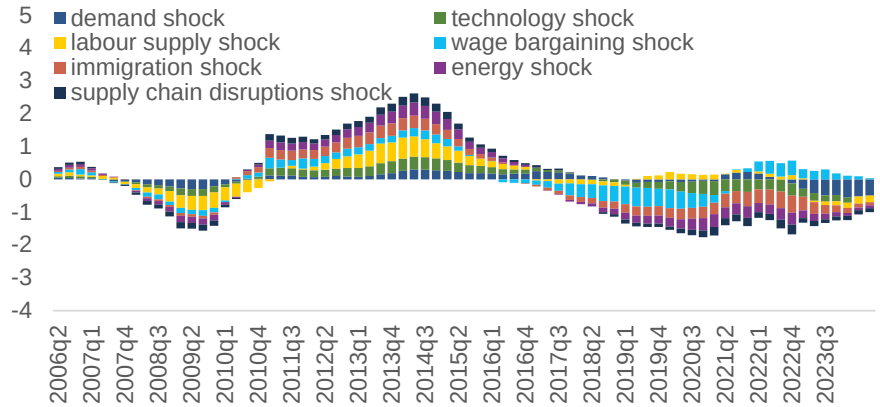
Identification scheme

	shocks						
	demand	technology	labour supply	wage bargaining	immigration	energy	supply chain disruptions
output	+	+	+	+	+	-	
prices	+	-	-	-	+	+	+
real wages		+	-	-	-		
unemployment rate	-		+	-			
immigrants	+		-		+		
energy prices	+		+	+		+	
100 - SDTI	+						+

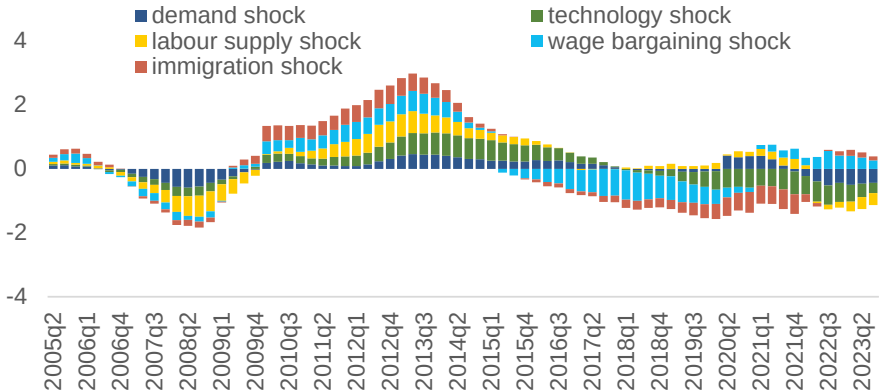
Historical decompositions (1)

unemployment rate

model with energy prices and supply chain disruptions



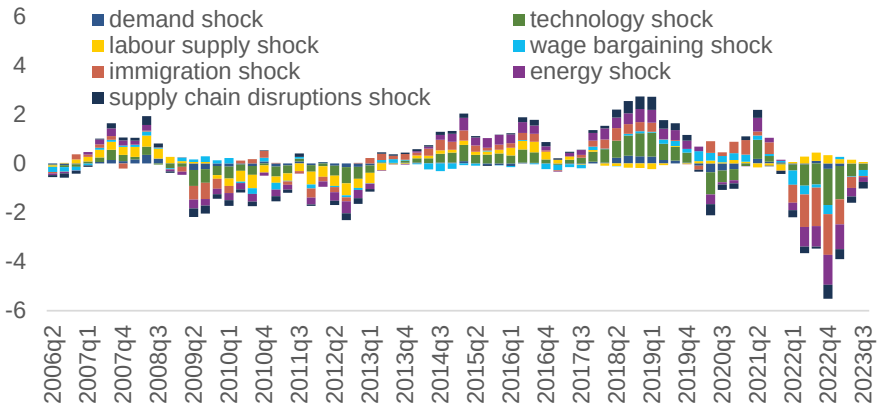
model with total immigration



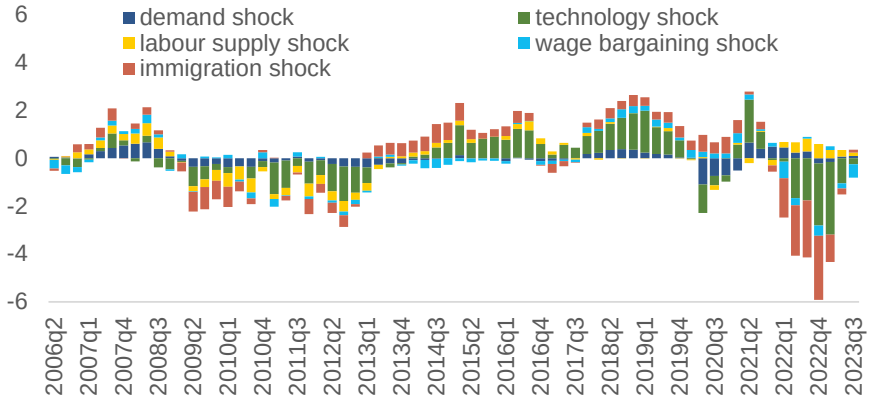
Historical decompositions (2)

annual growth rate, real wages

model with energy prices and supply chain disruptions



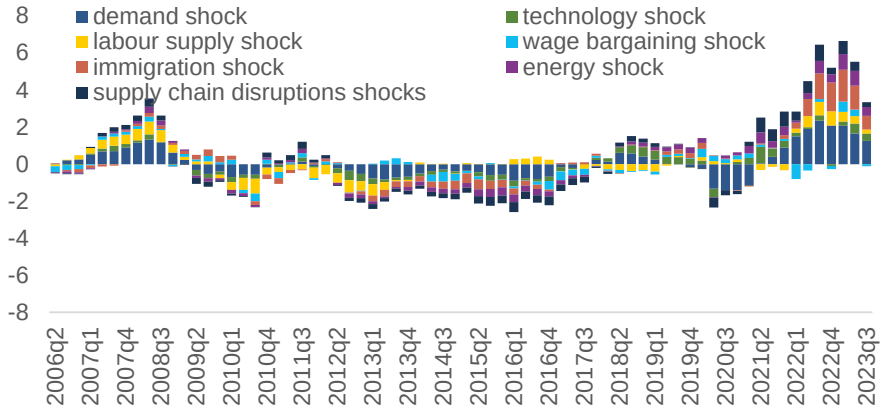
model with total immigration



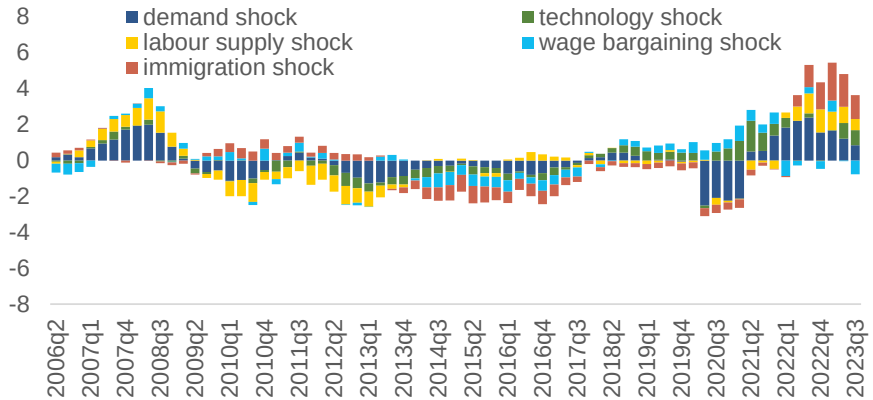
Historical decompositions (3)

annual growth rate, nominal wages

model with energy prices and supply chain disruptions



model with total immigration



6. Conclusions

6. Conclusions

- The baseline model proposed by Foroni et al. (2018) seems to be a nice starting point also in the case of the Polish labour market.
- Estimated effects of immigration:
  - unemployment – moderate positive for years 2010-2014; moderate negative for 2017-2021
  - real wages – moderate positive for years 2013-2020; strongly negative for 2022
  - nominal wages – negative for years 2013-2021; strongly positive for 2022
- Coincidence of immigration shocks with other huge shocks for years 2019-2023 calls for careful robustness checks due to omitted variables/shocks problem:
  - two types of immigration – higher aggregate role of immigration shocks and deeper insight into composition effects but the main economic story remains the same
  - energy prices and supply chain disruptions – the results hold
  - alternative sign restrictions and including zero restrictions – work in progress
  - exchange rate, soft commodities (e.g. wheat), … – TBD

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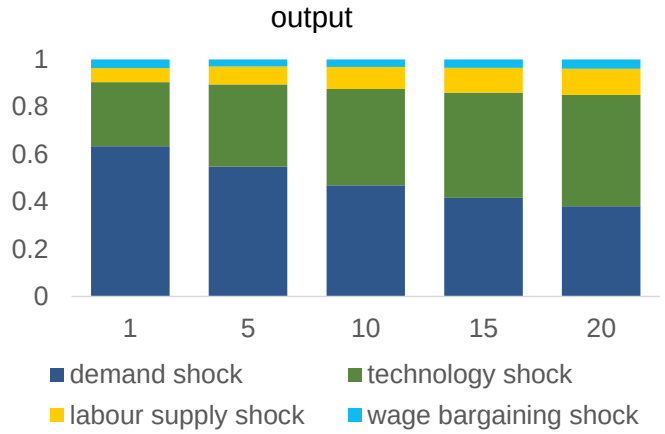
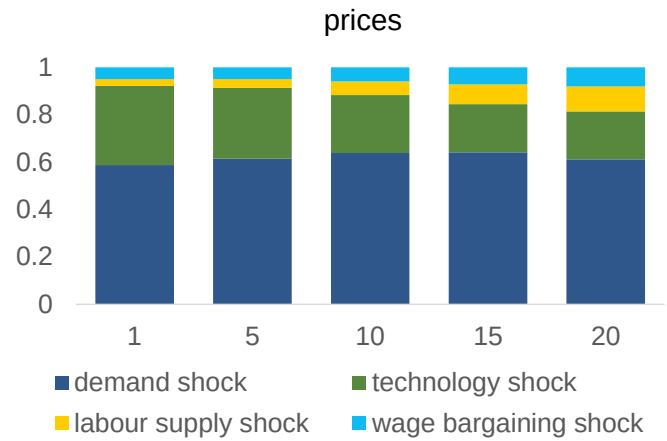
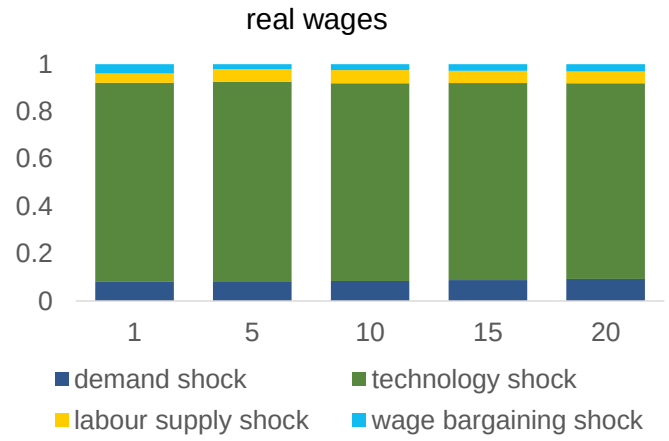
Thank you for your attention!

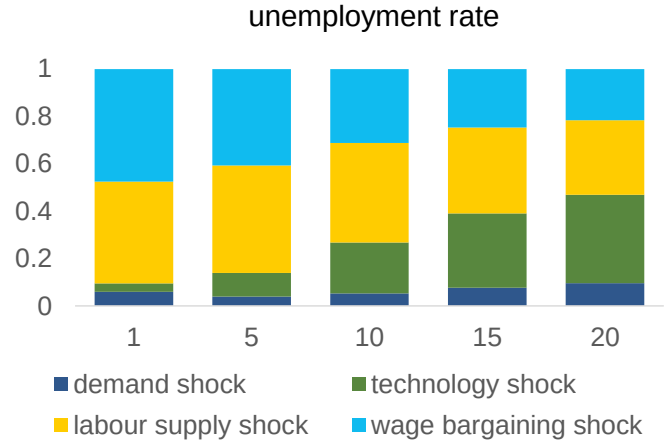
Appendix – FEVDs

Baseline model



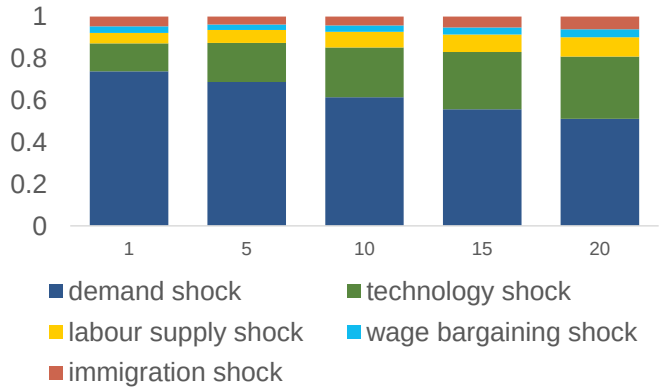




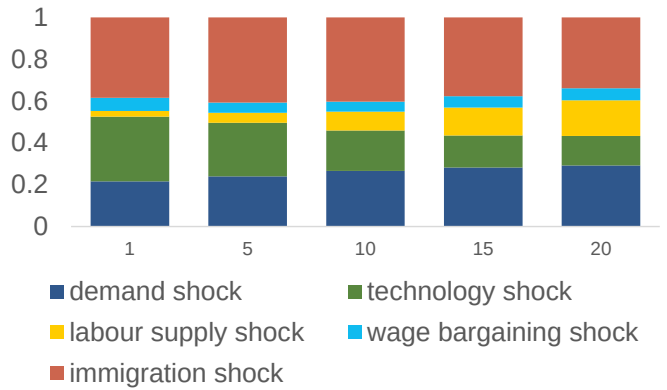


Model with total immigration

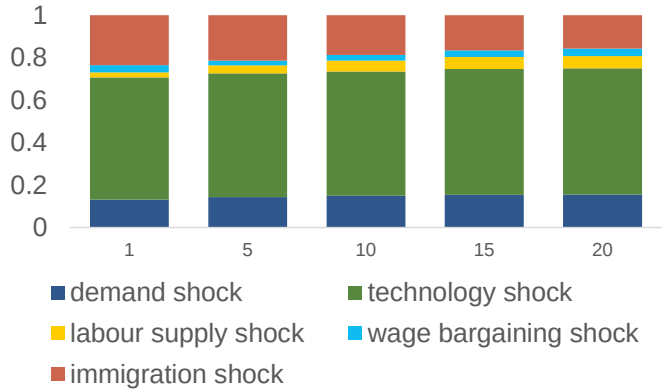
output



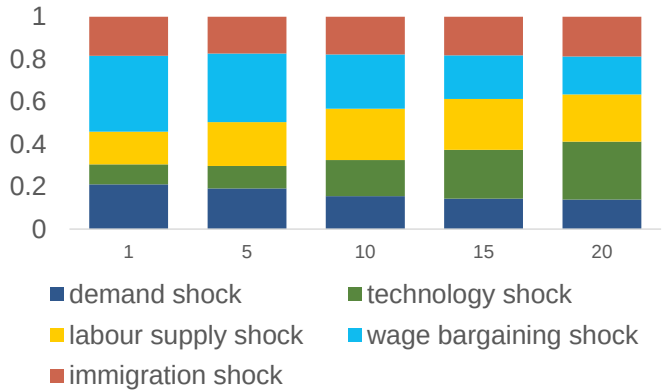
prices



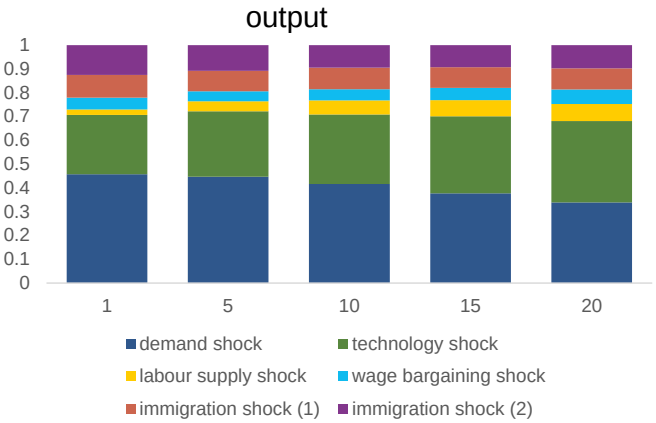
real wages

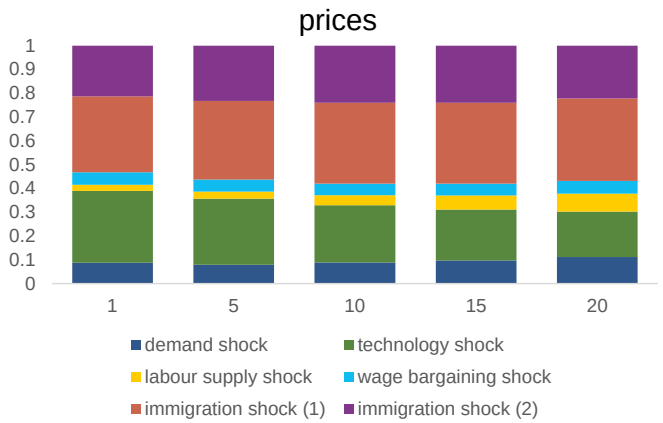


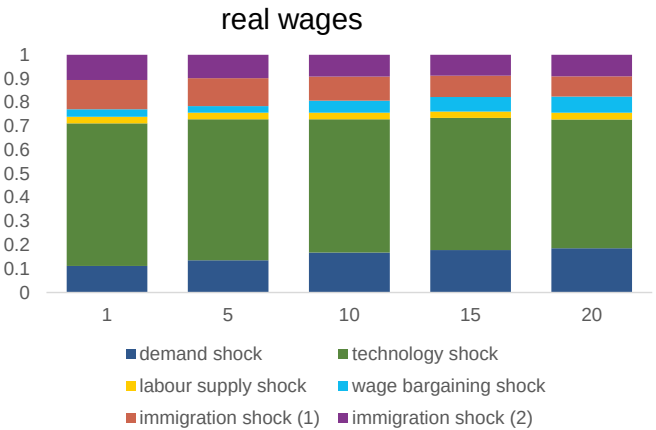
unemployment rate

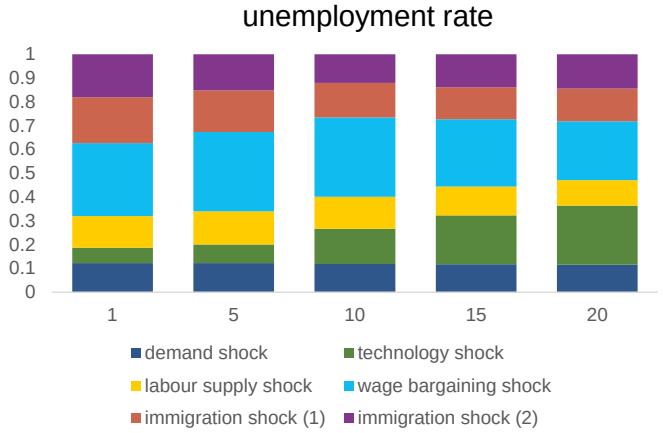


Model with two immigration shocks

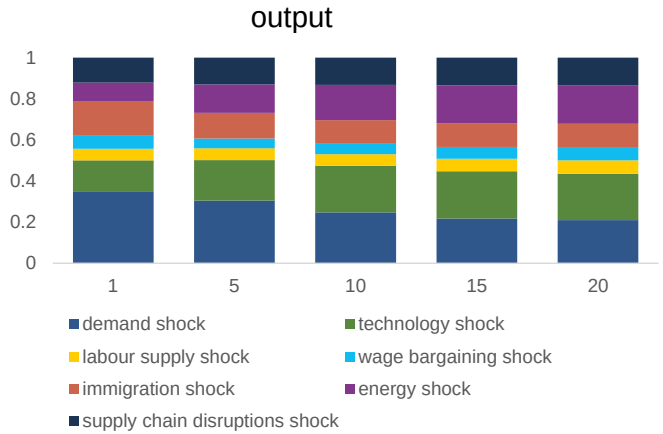


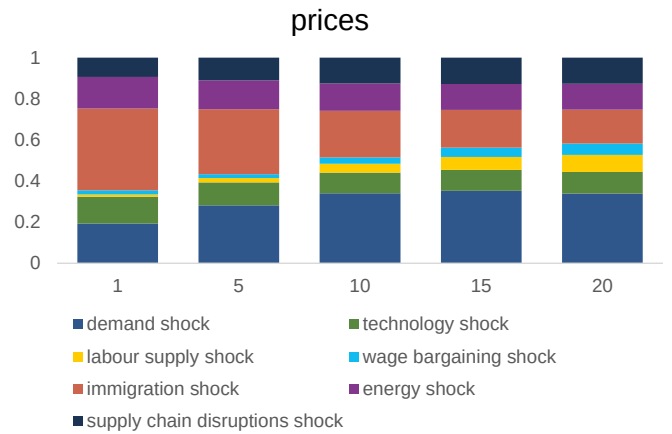


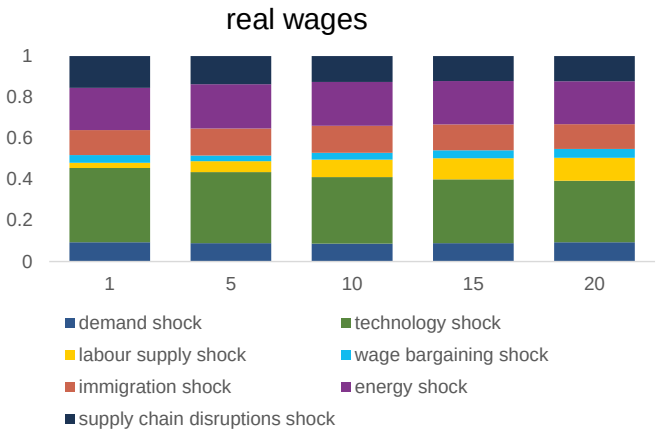


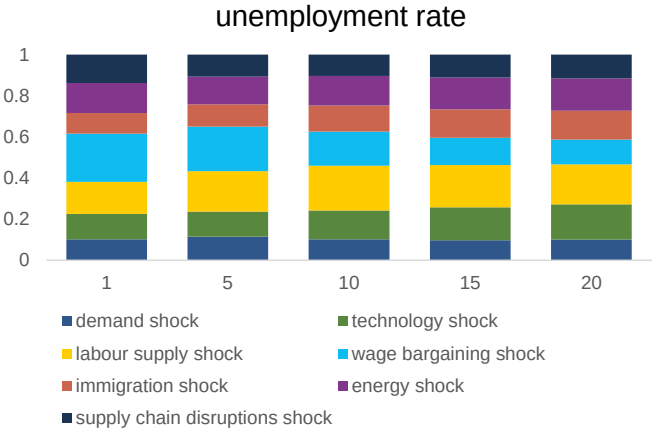


Model with energy prices and supply chain disruptions







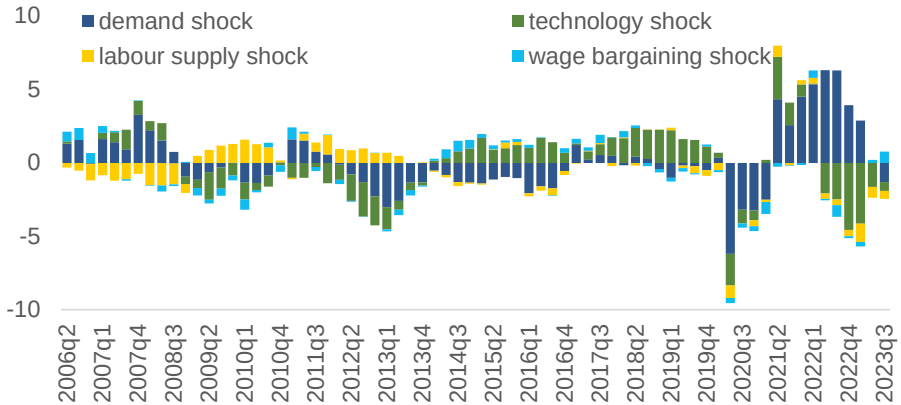


Appendix – historical decompositions of output and prices

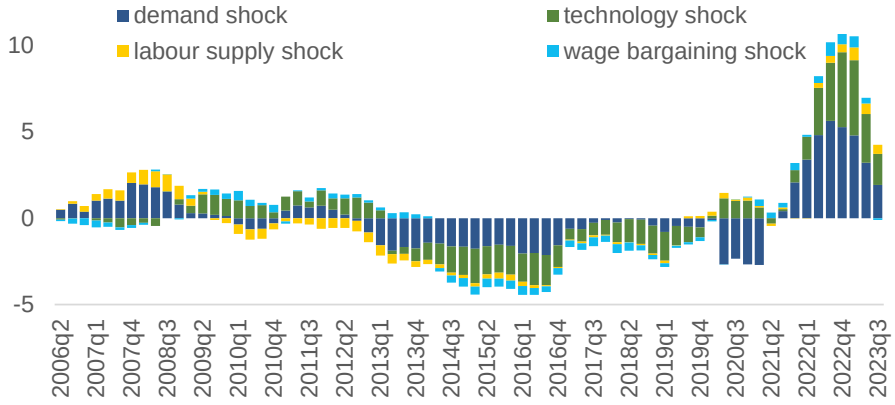
Baseline model

annual growth rate

output



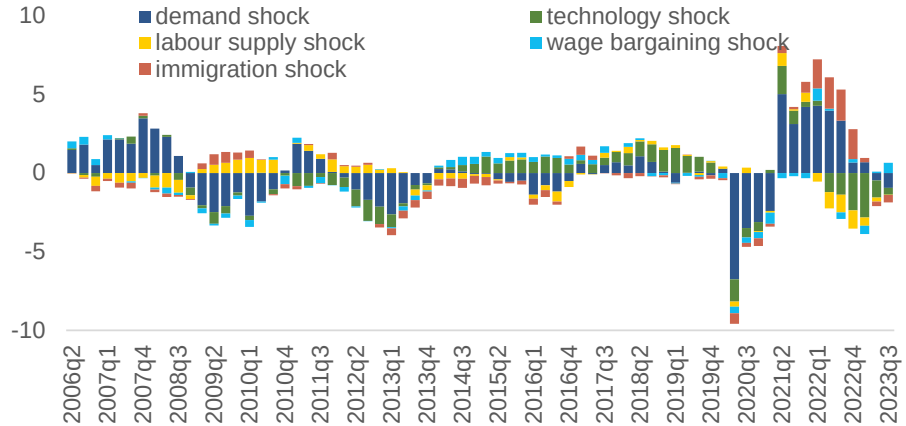
prices



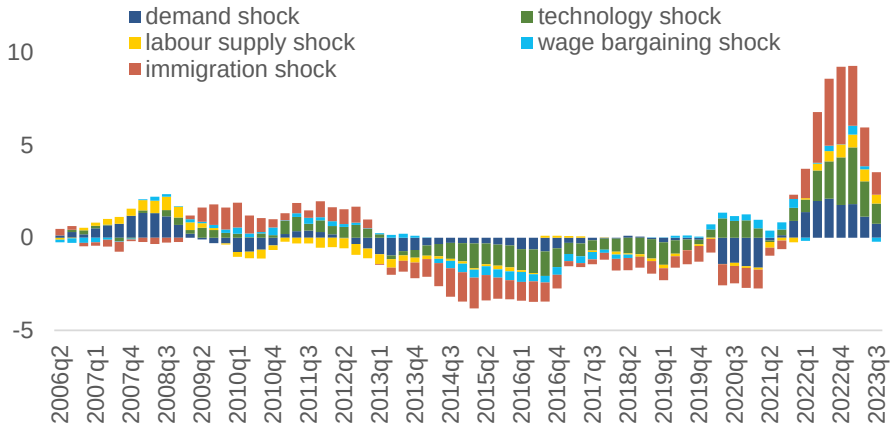
Model with total immigration

annual growth rate

output



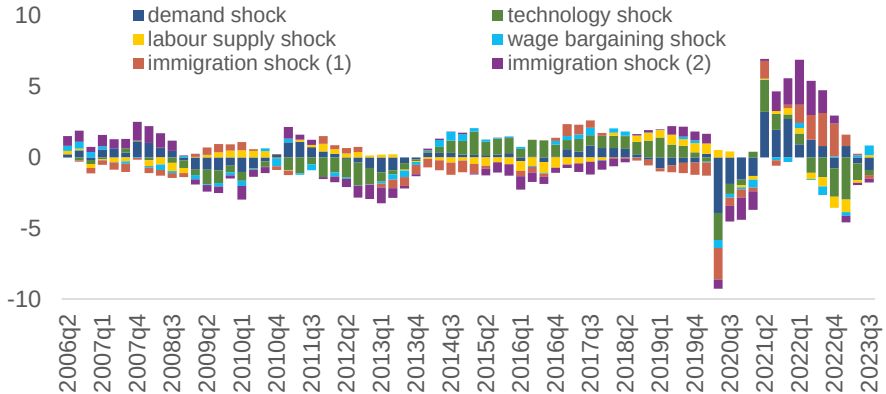
prices



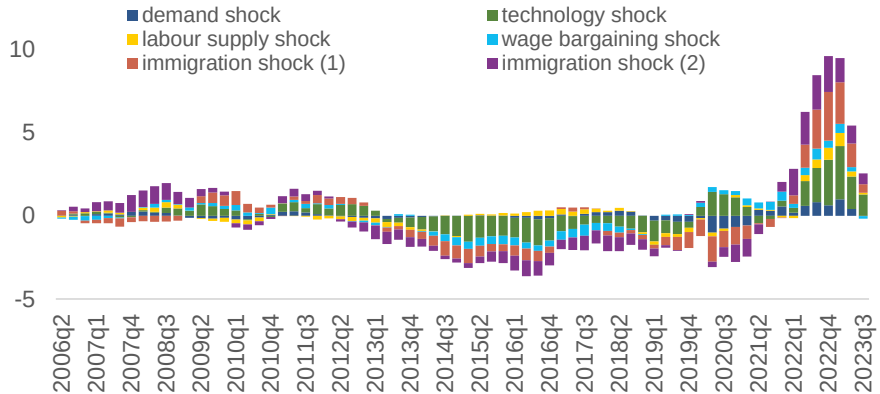
Model with two types of immigration

Annual growth rate

output



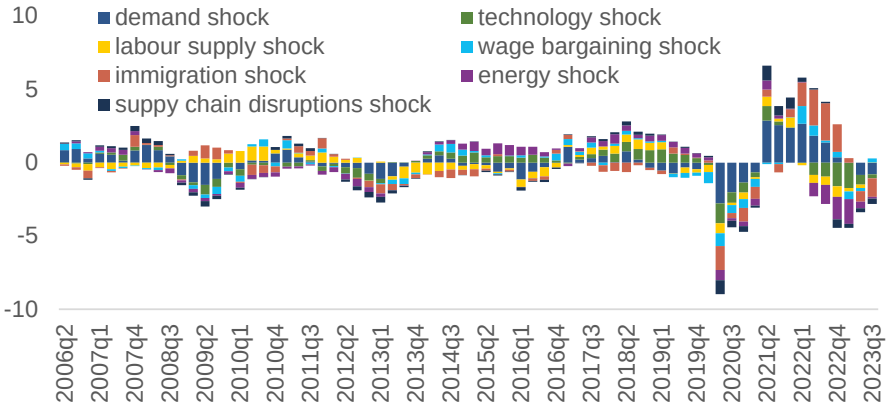
prices



Model with energy prices and supply chain disruptions

Annual growth rate

output



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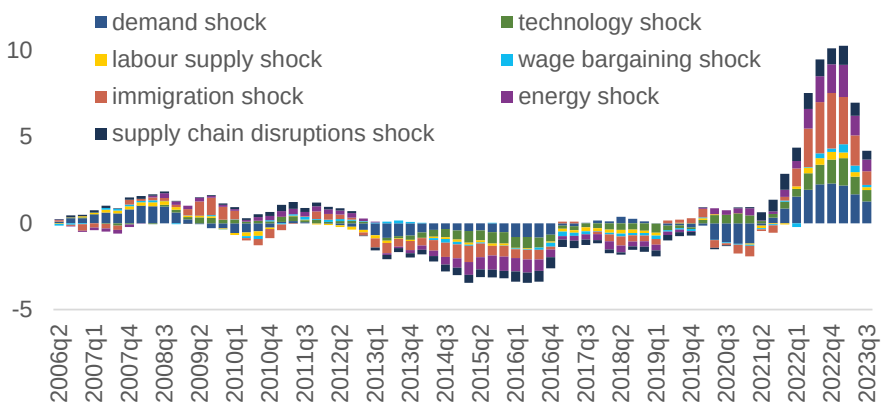

Appendix – posterior correlation matrix for structural shocks

Baseline model

	demand	technology	labour supply	wage bargaining
demand	1			
technology	-0.01	1		
labour supply	0.01	-0.01	1	
wage bargaining	-0.03	-0.01	-0.08	1

Model with total immigration

	demand	technology	labour supply	wage bargaining	immigration
demand	1				
technology	0.20	1			
labour supply	0.01	0.01	1		
wage bargaining	0.01	0.05	0.00	1	
immigration	0.15	-0.29	0.05	0.00	1

Model with two types of immigration

	demand	technology	labour supply	wage bargaining	immigration (1)	immigration (2)
demand	1					
technology	0.25	1				
labour supply	-0.10	0.03	1			
wage bargaining	0.09	0.10	0.07	1		
working immigrants	0.21	-0.11	0.08	-0.05	1	
other immigrants	0.29	-0.11	-0.03	-0.01	0.03	1

Model with energy prices and supply chain disruptions

	demand	technology	labour supply	wage bargaining	immigration	energy	supply chain disruptions
demand	1						
technology	0.17	1					
labour supply	-0.05	0.04	1				
wage bargaining	0.14	0.06	0.08	1			
immigration	0.30	-0.22	0.07	0.04	1		
energy	0.03	-0.82	0.01	-0.12	0.25	1	
supply chain disruptions	0.54	-0.43	0.12	-0.34	0.16	0.27	1


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