Inflation and how to deal with it in France. A policy perspective from an empirical stock-flow model

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Abstract

Since the 1980s, the French economy experienced vastly different periods of inflation, ranging from the high inflation in the early 1980s following the oil shocks, the disinflation of the mid-1980s, the great moderation of the 1990s achieved via inflation targeting, stable inflation at around 2% following the introduction of euro until the Global Financial Crisis in late 2000s, and finally the long period of low inflation rates until COVID-19 pandemic. Inflation has taken off sharply since the start of 2022 with the supply chain difficulties related to COVID-19 recovery and the onset of the armed conflict in Ukraine. Using an empirical stock-flow consistent (SFC) model for the French economy, we simulate an imported inflationary shock to emulate the current inflation situation and analyze the resulting macroeconomic impacts on the French economy. This shock appears as a net withdrawal in favor of the rest of the world which must be undergone by domestic agents. Two possible responses are considered: increased wage per capita so as to preserve workers' purchasing power, increased margins by firms in order to restore their profit share. Facing the risk of profit-price-wage spiral, alternative economic policy responses are evaluated. Traditional restrictive monetary policy with an increase in the interest rates does not seem well-suited to fight imported inflation as the cost is significant with limited and delayed results. Increased social transfers can help workers to support their loss of purchasing power. Reduced VAT can directly limit the inflation drift. These measures have a cost for public finances but are affordable as long as the inflation shock is temporary. However, their concrete implementation may raise difficulties.

Keywords: Inflation, monetary and wage policies, empirical SFC models

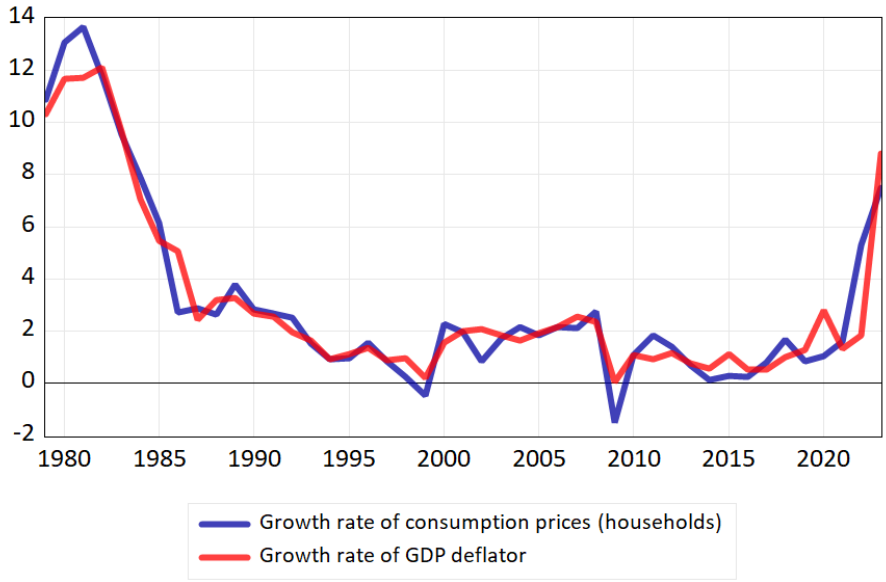
1. Introduction

Figure 1 shows the GDP and household consumption deflators in France from 1979-2023 (source: INSEE & authors' calculations up to 2021 and model's output for 2022-2023). It is clear that the French economy experienced vastly different inflation regimes, ranging from the high inflation in the early 1980s following the oil shocks, the great moderation of the 1990s achieved via inflation targeting, stable inflation at around 2% following the introduction of the

euro until the Global Financial Crisis late 2000s, and finally the long period of low inflation rates until COVID-19 pandemic. Inflation has taken off sharply since the start of 2022 with the supply chain difficulties related to COVID-19 recovery and the onset of the armed conflict in Ukraine.

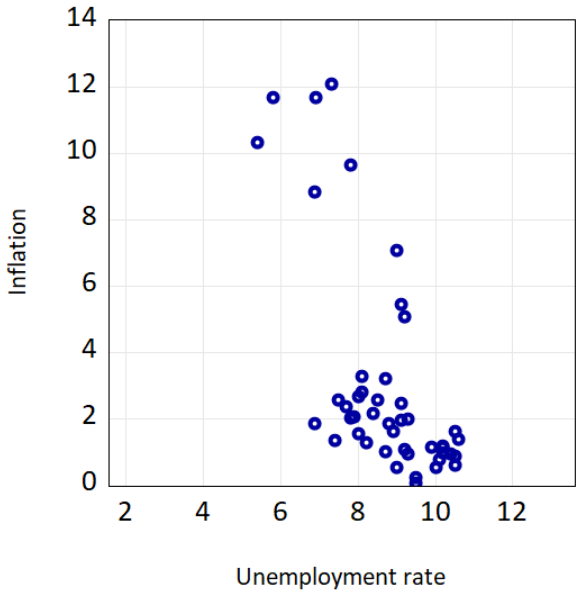
Figure 2 shows the components of the Phillips curve for France from 1979 to 2023. Note that the 8 data points in the top half of the plot are from the first part of the dataset, namely 1979-1986. The Phillips curve seems to have become flatter from 1987 onwards (bottom half of the plot), in line with Ball et al. (1988) who argue that the Phillips curve becomes steeper during periods of high and/or variable inflation due to reduced nominal price stickiness while the opposite is true when inflation is low.

Figure 1: Household consumer prices and GDP deflator in France (growth rates, %) 1979-2023



Source: INSEE & authors' calculations up to 2021 and model's output for 2022-2023

Figure 2: Phillips curve for France from 1979-2023.



Source: INSEE & authors' calculations up to 2021 and model's output for 2022-2023

In this paper, we take a closer look at the different periods of inflation and corresponding economic policies in France, focusing on the current situation. Using an empirical stock-flow consistent (SFC) model for the French economy, we analyze the macroeconomic impacts of the inflationary shock induced by a sharp rise in import prices. The shock is a net withdrawal in favor of the rest of the world which is undergone by domestic agents. Several possible policy responses are considered: increased wage per worker so that they preserve their purchasing power, increased margins by firms which try to restore their profit share. The risk of triggering a profit-price-wage spiral can encourage the authorities to implement some economic policy measures: traditional restrictive monetary policy, increased social transfers to help households to support their loss of purchasing power, reduced Value Added Tax (VAT) to limit directly the price increase. To our knowledge, the only work that analyzes inflation using a country-level SFC is that of Raza et al. (2023) for the Danish economy.

The rest of the paper is organized as follows. In Section 2, we look at inflation and economic policy in France, dating from the early 1980s. Section 3 provides an overview of the empirical SFC model of the French economy, highlighting the main equations related to inflation. This is followed by a discussion of the impact of the inflationary shock and of the different policy scenarios in Section 4. We then end with some conclusions in Section 5.

2. Inflation and economic policy in France

2.1 Inflation in France from the early 1980s to the late 1990s

2.1.1 High inflation following the 1979 oil shock and the Volcker shock

The 1980-1981 global recession was triggered by a spike in the price of oil following the Iranian revolution in 1979. As shown in Figure 1, the oil shock in 1979 had a more significant impact on inflation compared to those in latter periods (namely 1990-1991 and 2000-2001). Roubini & Setser (2004) suggested several reasons: some related to the oil shock itself (magnitude,

duration and speed in price changes), others related to the oil-importing countries (lack of strategic stockpiles, high dependence on oil, relatively high inflation level prior to the shock).

On October 6, 1979 the then newly elected chairman of the Federal Reserve Paul Volcker tightened monetary policy by sharply raising the federal funds rate (key overnight rate for banks). Over the next three years, the interest rate rose to almost 20%, resulting in what is now commonly called the Volcker Shock. In the U.S., the wage-cost markup model (using the relative growth rate between wages and labor productivity) was found to be better than other models of inflation such as the quantity theory of money, the Phillips curve and the Phelps-Friedman model, to explain inflation (Atesoglu, 1980). In a later paper, Atesoglu (1997) further concluded that there exists a long-run trade-off between unemployment and inflation (no vertical Phillips curve) such that an incomes policy on top of contractionary aggregate-demand policy would be necessary to avoid the significant rise in the unemployment rate following the interest rate hike.

The Volcker Shock had strong repercussions on the rest of the world as many other central banks followed suit soon after to counter domestic inflation and to avoid capital flight towards the U.S. partly driven by the enhanced integration of global financial markets.

2.1.2 Declining inflation with inflation targeting

In France, after the recovery policy of 1981-1982 following the election of François Mitterrand, the high inflation rates of the early 1980s were mainly brought down by a strong restrictive wage policy putting an end to the rising wage share observed since the mid-1970s. Fiscal and monetary policy became also restrictive with high interest rates. The sharp slowdown and rising unemployment further contributed to the downward pressure on wages. Conversely the devaluations of 1981-1983 were large but insufficient to compensate for the competitiveness loss and contributed to maintain imported inflation pressures. The *tournant de la rigueur* was a success concerning the fight against inflation with only a limited part played by monetary policy, but the cost has been high from a political point of view. The inflation rate dropped drastically from its near 14% peak in 1981 to less than 3% in 1987.

At the same time, the French financial markets were becoming more open and Banque de France began shifting its monetary policy approach from capital and exchange control towards the interest rate instrument (Quintyn, 1991). Finally, on 1 January 1987 (right before the Louvre Accord was signed), Banque de France underwent a major reform, moving from an administered interest rate policy to an open market system, i.e., from pegging to guiding the interest rates (Quintyn, 1991).

Banque de France's monetary policy operating regime underwent yet another major change in 1992, moving from the use of an interest rate corridor and reserve requirements towards open market fine-tuning operations (Pfister, 1997). This set the stage for the preparation of France for its entry into the euro area in late 1990s.

2.2 Inflation in France from the early 2000s to the late 2010s

2.2.1 Introduction of euro

The final stage of EMU (Economic and Monetary Union) starting on January 1st 1999 meant that the nominal exchange rates of the currencies of participating member states were henceforth fixed and there would be a single monetary policy directed by the European Central Bank (ECB). France, being among countries with below-average inflation rates, benefitted from

the temporary competitiveness gain with the induced real depreciation (ECB, 2003). When the euro changeover took place in 2002, it did not have a significant impact on the inflation rate which remained stable at around 2% for the most part of the decade until the onset of the Global Financial Crisis. Nevertheless, consumers tended to associate the introduction of the euro with higher inflation although average inflation was lower in the 15 years prior to 2002 than the 15 years after. This is due to the widened gap between actual and perceived inflation as prices were adjusted more significantly with the introduction of new psychological price in euros (Leclair, 2017).

2.2.2 Global Financial Crisis and Euro-zone debt crisis

Starting as a subprime mortgage crisis in the U.S. in 2007, the situation deteriorated and eventually culminated in the collapse of Lehman Brothers in September 2008 – the biggest bankruptcy in U.S. history. This caused shockwaves globally and resulted in the Global Financial Crisis (GFC) of 2008/2009 which caused France to suffer a deep recession despite having favorable conditions: no housing bubble, moderate banking exposure to U.S. speculative markets, stable exchange rates with major partners, benefiting from a fall in oil prices (Le Heron, 2011). Using the state of confidence of private agents, Le Heron showed that confidence was the main transmission channel by which the U.S. 2007 financial crisis led to a real economic crisis in France. The financial crisis caused a generalized increase in liquidity preference and reduction in firms' investment, household consumption and bank lending. This in turn made effective a demand drop and household incomes declined. Nevertheless, the French economy did relatively well compared to southern-European economies. Inflation did not drop as much as expected, possibly explained by the flattened Phillips curve after the long periods of low inflation prior to the crisis (Ball et al., 1988).

The financial crisis had another face in Europe due to the contradictions of the euro zone which led to the European sovereign debt crisis of 2010-2012. Since the launch of the euro, large imbalances emerged between Germany, engaged in a strong adjustment policy, and southern European countries, benefiting from large capital inflows coming from the eurozone core nations like Germany. Inflation and wages became divergent and large intra-European exchange rate misalignments appeared. In 2008 the euro was strongly overvalued for southern European countries while it was largely undervalued for Germany and other northern European countries (Mazier, 2020). With significant accumulation of public and private debt in southern-European countries, their governments met difficulties to service their debt. Their national central banks did not serve as lenders of last resort due to their membership in the Eurozone, leading to further worsening the crisis in the periphery. Emergency reforms were undertaken in order to avoid a split of the euro zone.

2.2.3 Recovery from the twin crises

With the recovery from the global financial crisis, inflation remained persistently low in the euro area, well below the target rate of 2%. In France, the post-crisis average inflation rate was approximately 1 percentage point within the average levels seen prior to the twin crises (Figure 1). Diev et al. (2021) found that this was mainly due to economic slack (e.g. a high unemployment rate) and the fall in commodity prices (driven largely by oil prices) although the impact had been partly mitigated through monetary policies such as asset purchases and negative interest rates. Ciccarelli & Osbat (2017) suggest that structural changes, such as aging

population and technological changes (e.g. further development of e-commerce) could have also contributed to moderate inflation.

2.3 Inflation in France from 2020s onwards

The COVID-19 pandemic and the rapid recovery in 2021 resulted in bottlenecks in manufacturing supply chains coupled with a shift away from consumption of services to consumption of durable goods arising from multiple episodes of pandemic lock-down. The rapid increase in the demand for durable goods, together with the global nature of the pandemic, has highlighted vulnerabilities in the production structure of these goods with its over-reliance on the global value chain. More than 50% of producers in the euro area had to constrain their output due to shortages of intermediate inputs (Celasun et al., 2022).

The onset of the war in Ukraine in February 2022 has further aggravated the issue via its impact on agricultural prices; Ukraine being one of the main global food producers and, more importantly, energy prices. Europe was particularly affected by the new geopolitical situation as it was highly dependent on Russian oil and gas which accounted for 35% and 40% of total European imports prior to Ukraine war (source: Statista).

Against this backdrop, the average inflation (Harmonised Index of Consumer Prices, Eurostat) in France rose to 5.9% on average in 2022, up from 2.1% in 2021 and 0.5% in 2020. Nevertheless, it is still 2.5 percentage points below euro area inflation thanks to counter-inflationary policy measures such as the "tariff shield" on gas and electricity prices and rebate on fuel prices which are estimated to reduce inflation by 2.1 percentage points in 2022 (Plane & Vermersch, 2022).

In response to high inflation in the euro area, the European Central Bank (ECB) began raising interest rates in July 2022, with the main refinancing operations rate reaching 4.25% (up from 0%) after the ninth consecutive rate hike in July 2023. However, inflation has remained persistently high due to three main reasons according to Gopinath (2023): stock of households' savings and residual pent-up demand; insufficiently tight financial conditions keep monetary policy transmission from causing real rates to remain relatively low; and lowered potential output and productivity due to the COVID pandemic continued to put upward pressure on inflation.

Through the decomposition of the consumption deflator to include the impact of import prices, Hansen et al. (2023) found that euro area inflation in 2022 was caused by domestic profits (45%), import prices (40%) and labor costs (25%) while taxes and labor productivity losses had a small deflationary impact. This is in line with the growing consensus that inflation has been largely profit-led while the change in nominal wages has been limited, resulting in increased profit share in national income (Nikiforos & Grothe, 2023).

The authors also found that despite the increase in profits and profit shares, there was no sign of a significant increase in profitability. Similarly, Plane & Vermersch (2022) found that the profit margins of French firms have remained relatively stable since end 2021. The strong rise in imported prices since the onset of the war in Ukraine has resulted in an initial cost-push, forcing firms to raise prices to protect their margins despite price rigidity. As described in Melmiès (2010), cost-push is one of the main reasons for firms to increase prices as firms seek to protect their profit margins and also that increasing prices due to a rise in costs is perceived by the customers as fair (Okun, 1981).

As argued by Lavoie (2023), the gain in the profit share can happen even without the firms increasing their mark-up. For a given level of output and a constant markup rate, unit material costs (affected by a considerable increase in import prices) will rise faster than unit labor costs. Profit being a mark-up over the total costs will hence increase faster than wages, resulting in an increase in the profit share. This is further enhanced when the output increases due to the presence of overhead labor costs.

Nevertheless, while there is no significant broad-base increase in mark-up, the situation can differ greatly across sectors depending on the competitiveness of the sectors. Using fine-grained firm-level data in France, Lafrogne-Joussier et al. (2023) showed that the pass-through rate was only 30% for intermediate inputs but around 100% for energy. Arquié & Thie (2023) further showed that the pass-through rates for energy were highest for sectors with higher markups (namely food industry), reaching as high as 10% excess pass-through, confirming that profit-seeking by firms has also contributed to inflation in France.

Hence, the current inflation situation is largely profit-led, with the profit margins of firms maintained in the face of a large increase in import prices, effectively shifting the impact to real wages. This is partly due to the higher wage rigidity as compared to prices, causing wages to react slowly against price increases. The French Labor Ministry statistics DARES showed that wages continued to lag prices by 1% year-on-year in the first quarter of 2023 although the gap has narrowed (Hananel, 2023). Indeed, the contribution of labor costs to inflation has been increasing since the end of 2022 (Hansen et al., 2023) and conflict inflation driven by wage catch-up could potentially cause a wage-price spiral, aggravating the inflation situation. Nevertheless, Banque de France considers that the average negotiated pay rise of 4.4% at individual firm level does not point to a wage-price spiral and inflation is expected to decline and return to Eurosystem's 2% target by end 2024 or end 2025 (Baudry et al., 2023).

3. A stock-flow consistent econometric model for France

To assess the main drivers of inflation and the efficiency of the various economic policies which can be implemented to fight it, a stock-flow consistent (SFC) econometric model for France is used. SFC models are macroeconomic models that coherently integrate all stocks and flows of an economy where one sector's expenditures correspond to another sector's income, and all financial assets in one sector correspond to financial liabilities in another sector (Godley & Lavoie, 2012). They are based on a double-entry system of accounting where the flow of funds (income and expenditure) between sectors and resulting changes to the stocks of outstanding debt and financial assets are often represented in a transaction-flow matrix (alternatively in a uses-resources setup, as in Table 2). These models also describe prices of goods and services, interest rates, asset prices and revaluation effects. These elements facilitate a complete analysis of the redistributive effects of prices, both on incomes and on assets and liabilities.

While the initial SFC models were theoretical (parameter values are not found from econometric estimation using actual economic data), there is a growing number of country-specific empirical SFC models (Bryalsen and al., 2022). Indeed, the interest of such models was boosted in the aftermath of the 2008 crisis as these accounting-based models were able to analyze the financial crisis while the mainstream "equilibrium" models used by national and international organizations like IMF failed to do so (Bezemer, 2010).

3.1 Model structure

The model presented here is an updated version of Mazier and Reyes (2022a; 2022b; forthcoming). Its structure is analogous to that of already existing national-level SFC models. The economy is divided into five domestic agents: firms, households, banks, the central bank, the government, all of which interact with the rest of the world. The monetary and financial operations from the European Central Bank are included with the rest of the world.

The model is aggregate with a single product. Production in volume is determined by domestic and foreign demand (exports net of imports). The consumption price depends on a mark-up pricing rule and is a function of unit labor costs and of import prices with an effect from demand pressures. Value added is split among the different agents depending on simple structural parameters. Its distribution between wages, profits and taxes is based on a wage-price-unemployment loop and on institutional relations in order to arrive at the balance of the agents' accounts, that also takes into account their expenditures.

Exports and imports are analyzed at the level of all goods and services determined by demand and relative prices. Financing methods via bank credit, bond and equity issuing, as well as financial investment behavior, are described for each agent. Changes in assets and liabilities, as well as investment and changes in inventories, combined with the revaluation accounts for capital gains or losses, allow for the transition of the accumulation accounts from one year to the next in an SFC manner.

With respect to non-financial assets (NFA), a distinction is made between produced capital (productive capital and housing), outstanding stocks and non-produced capital (mainly land). Among the financial assets, a split is made traditionally between F1 monetary gold and SDRs, F2 cash and deposits, F3 securities, F4 loans, F5 equity and investment fund shares, F6 insurance and pension funds, F7 financial derivatives and F8 other accounts receivable. The balance sheet structure of the domestic and foreign agents (Table 1) and the uses-resources table combined with the flow of funds (Table 2) provide the definition of the main variables of the model. The closures for each sector and instrument are also indicated in the tables.

Table 1: Symbolic balance sheet structure of economic agents

		Non-Fin. Corporations		**Financial institutions**				**Government**		**Households**		**Rest of the world**	
				Banks		**Banque de France**							
		Asset	**Liab.**	**Asset**	**Liab.**	**Asset**	**Liab.**	**Asset**	**Liab.**	**Asset**	**Liab.**	**Asset**	**Liab.**
NFA_1	*Produced non-financial assets*	$p^F_{K_1}K^F_1$		$p^B_{K_1}K^B_1$				$p^G_{K_1}K^G_1$		$p^H_{K_1}K^H_1$			
$NFA_{12/13}$	*Inventories (12) + valuables (13)*	$p^F_{K_{12}}K^F_{12}$						$p^G_{K_{12}}K^G_{12}$		$p^H_{K_{12}}K^H_{12}$ $p^F_{K_{13}}K^F_{13}$			
NFA_2	*Non-produced non-financial assets*	$p^F_{K_2}K^F_2$		$p^B_{K_2}K^B_2$				$p^G_{K_2}K^G_2$		$p^H_{K_2}K^H_2$			
F_1	*Monetary gold and SDRs*					$p^{CB}_G G^{CB}$							$p^{CB}_G G^{CB}$
F_2	*Bills and coins*	H^F		H^B			H^{CB}			H^H		H^R	
	Digital currency	EH^F		EH^B			EH	EH^G		EH^H			
	Refinancing between financial institutions				RF^B	RF^{CB}							RF^R
	Bank reserves			RES			RES						
	Govt. account at CB						$D^{CB_G}_L$	$D^{G_{CB}}_A$					
	Target 2					$TRGT2$							$TRGT2$
	Deposits	D^F_A		D^B_A	D^B_L	D^{CB}_A	D^{CB}_L	D^G_A	D^G_L	D^H_A		D^R_A	D^R_L
F_3	*Public securities*	$p^{F_G}_{B_A}B^{F_G}_A$		$p^{B_G}_{B_A}B^{B_G}_A$		$p^{CB_G}_{B_A}B^{CB_G}_A$			$p^G_{B_L}B^G_L$			$p^{R_G}_{B_A}B^{R_G}_A$	
	Foreign securities	$p^{F_R}_{B_A}B^{F_R}_A$		$p^{B_R}_{B_A}B^{B_R}_A$		$p^{CB_R}_{B_A}B^{CB_R}_A$		$p^{G_R}_{B_A}B^{G_R}_A$		$p^{H_R}_{B_A}B^{H_R}_A$			$p^R_{B_L}B^R_L$
	Other securities		$p^F_{B_L}B^F_L$	$p^B_{B_A}B^B_A$	$p^B_{B_L}B^B_L$	$p^{CB}_{B_A}B^{CB}_A$		$p^G_{B_A}B^G_A$		$p^H_{B_A}B^H_A$		$p^R_{B_A}B^R_A$	
F_4	*Loans*	L^F_A	L^F_L	L^B_A		L^{CB}_A			L^G_L		L^H_L	L^R_A	L^R_L

F_5	*[Domestic] Equity and inv. fund shares*	$p_{E_A}^{F_D} E_A^{F_D}$	$p_{E_L}^{F_D} E_L^{F_D}$	$p_{E_A}^{B_D} E_A^{B_D}$	$p_{E_L}^{B_D} E_L^{B_D}$	$p_{E_A}^{CB_D} E_A^{CB_D}$	$p_{E_L}^{CB_D} E_L^{CB_D}$	$p_{E_A}^{G_D} E_A^{G_D}$		$p_{E_A}^{H_D} E_A^{H_D}$		$p_{E_A}^{R} E_A^{R}$	
	[Foreign] Equity and inv. fund shares issued by RoW	$p_{E_A}^{F_R} E_A^{F_R}$		$p_{E_A}^{B_R} E_A^{B_R}$		$p_{E_A}^{CB_R} E_A^{CB_R}$		$p_{E_A}^{G_R} E_A^{G_R}$		$p_{E_A}^{H_R} E_A^{H_R}$			$p_{E_L}^{R} E_L^{R}$
F_6	*Insurance. pension funds and s.g.s.*	A_A^F			A_L^B			A_A^G		A_A^H		A_A^R	
F_7	*Fin. derivatives and employee stock options*	X_A^F			X_L^B			X_A^G		X_A^H			X_L^R
F_8	*Other accounts receivable/payable*	Z_A^F		Z_A^B		Z_A^{CB}		Z_A^G		Z_A^H		Z_A^R	
F	***Financial wealth***		FW^F		FW^B		FW^{CB}		FW^G		FW^H		FW^R
B90	***Net worth***		$WLTH^F$		$WLTH^B$		$WLTH^{CB}$		$WLTH^G$		$WLTH^H$		$WLTH^R$

Closes the column (sector) in flow

Closes the row (instrument) in flow

Table 2: Symbolic uses-resources table + flow of funds

		Firms		***Financial inst excl BdF***		***Banque de France***		***Government***		***Households***		***Rest of the world***		***Total (uses -res.)***
Code	***Item***	***paid***	***received***	***paid***	***received***	***paid***	***received***	***paid***	***received***	***paid***	***received***	***paid***	***received***	
P6	Exports											$p_X X$		$p_X X$
P7	Imports												$p_{IM} IM$	$p_{IM} IM$
B11	*Trade balance*												$-TB$	TB
P1	Production		$p_Q Q^F$		$p_Q Q^B$				$p_Q Q^G$		$p_Q Q^H$			$p_Q Q$
P2	Intermediate consumption	$p_{IC} IC^F$		$p_{IC} IC^B$				$p_{IC} IC^G$		$p_{IC} IC^H$				$p_{IC} IC$
B1	*Value added*		VA^F		VA^B				VA^G		VA^H			VA
D11	Wages and salaries	W_p^F		W_p^B				W_p^G		W_p^H	W_r^H	W_p^R	W_r^R	0
D12	Labor contributions	LC_p^F		LC_p^B				LC_p^G		LC_p^H	LC_r^H	LC_p^R	LC_r^R	0
D29	Taxes on payroll and miscellaneous taxes on production	T_L^F		T_L^B				T_L^G	T_L	T_L^H			T_L^R	0
D319	Subsidies on production							Sub				Sub^R		Sub'
D39	Other subsidies on production		Sub_r^F		Sub_r^B			Sub_p^G	Sub_r^G		Sub_r^H	Sub_p^R		0
B2	*Gross operating surplus*		Π^F		Π^B		$[\Pi^{CB}]$		$[\Pi^G]$		$[\Pi^H]$			Π
D21	Net taxes on production								T_P				T_P^R	T_P^T
D41	Interest	Int_p^F	Int_r^F	Int_p^B	Int_r^B	Int_p^{CB}	Int_r^{CB}	Int_p^G	Int_r^G	Int_p^H	Int_r^H	Int_p^R	Int_r^R	0
D42	Distributed income of corporations	Div_p^F	Div_r^F	Div_p^B	Div_r^B	Div_p^{CB}	Div_r^{CB}		Div_r^G		Div_r^H	Div_p^R	Div_r^R	0
D43	Reinvested earnings on direct foreign investment	$RFDI_p^F$	$RFDI_r^F$	$RFDI_p^B$	$RFDI_r^B$							$RFDI_p^R$	$RFDI_r^R$	0
D44	Property income attributed to insurance policy holders		INS_r^F	INS_p^B					INS_r^G		INS_r^H		INS_r^R	0
D45	Rents	$RENT_p^F$							$RENT_r^G$	$RENT_p^H$	$RENT_r^H$			0
D5	Taxes on income and wealth	T^F		T^B		T^{CB}			T	T^H		T^R		0
D61	Social contributions		SC_r^F		SC_r^B				SC_r^G	SC_p^H		SC_p^R	SC_r^R	0
D62	Social benefits	SB_p^F		SB_p^B				SB_p^G			SB_r^H	SB_p^R	SB_r^R	0
D7	Transfers	Tr_p^F		Tr_p^B	Tr_r^B			Tr_p^G			Tr_r^H		Tr_r^R	0
B6	*Gross disposable income*		Y_d^F		Y_d^B				Y_d^G		Y_d^H			Y_d
P3	Consumption							$p_C^G C^G$		$p_C^H C^H$				$p_C C$
B8	*Gross saving*		S^F		S^B				S^G		S^H			S
D9	Capital transfers		$Tr_{K_r}^F$		$Tr_{K_r}^B$			$Tr_{K_p}^G$		$Tr_{K_p}^H$		$Tr_{K_p}^R$	$Tr_{K_r}^R$	0
P51	Gross Fixed Capital Formation	$p_{I_1}^F I_1^F$		$p_{I_1}^B I_1^B$				$p_{I_1}^G I_1^G$		$p_{I_1}^H I_1^H$				$p_{I_1} I_1$
P52	Changes in inventories	$p_{I_{12}}^F I_{12}^F$						$p_{I_{12}}^G I_{12}^G$		$p_{I_{12}}^H I_{12}^H$				$p_{I_{12}} I_{12}$
P53	Acquisition less disposals of valuables									$p_{I_{13}}^H I_{13}^H$				$p_{I_{13}} I_{13}$

NP	Acquisitions less disposals of non-fin non-produced assets	NP_p^F		NP_p^B				NP_p^G		NP_p^H				0
B9NF	*Financing capacity*	FCN^F		FCN^B		*0*		FCN^G		FCN^H		FCN^R		*0*
Adj	***Adjustment B9F - B9NF***	Adj^F		Adj^B		Adj^{CB}		Adj^G		Adj^H		Adj^R		***0***
		Firms		***Financial inst excl BdF***		***Banque de France***		***Government***		***Households***		***Rest of the world***		
Flow	*Instrument*	*Asset*	*Liability*	*Asset*	*Liability*	*Asset*	*Liability*	*Asset*	*Liability*	*Asset*	*Liability*	*Asset*	*Liability*	
F1	Monetary gold and SDRs					$p_G^{CB}\Delta^*G^{CB}$							$p_G^{CB}\Delta^*G^{CB}$	0
F21	Bills and coins	Δ^*H^F		Δ^*H^B			Δ^*H^{CB}			Δ^*H^H		Δ^*H^R		0
F295	Refinancing between FI				Δ^*RF^B	Δ^*RF^{CB}							Δ^*RF^R	0
res	Bank reserves			Δ^*RES			Δ^*RES							0
gcb	Govt acc at the CB						$\Delta^*D_L^{CB_G}$	$\Delta^*D_A^{G_{CB}}$						0
tgt2	Target2					Δ^*TRGT2							Δ^*TRGT2	0
F2	Deposits	$\Delta^*D_A^F$		$\Delta^*D_A^B$	$\Delta^*D_L^B$	$\Delta^*D_A^{CB}$	$\Delta^*D_L^{CB}$	$\Delta^*D_A^G$	$\Delta^*D_L^G$	$\Delta^*D_A^H$		$\Delta^*D_A^R$	$\Delta^*D_L^R$	0
F3e	Public securities	$p_{B_A}^{F_G}\Delta^*B_A^{F_G}$		$p_{B_A}^{B_G}\Delta^*B_A^{B_G}$		$p_{B_A}^{CB_G}\Delta^*B_A^{CB_G}$			$p_{B_L}^G\Delta^*B_L^G$			$p_{B_A}^{R_G}\Delta^*B_A^{R_G}$		0
F3d	Foreign securities	$p_{B_A}^{F_R}\Delta^*B_A^{F_R}$		$p_{B_A}^{B_R}\Delta^*B_A^{B_R}$		$p_{B_A}^{CB_R}\Delta^*B_A^{CB_R}$		$p_{B_A}^{G_R}\Delta^*B_A^{G_R}$		$p_{B_A}^{H_R}\Delta^*B_A^{H_R}$			$p_{B_L}^R\Delta^*B_L^R$	0
F3g	Other securities		$p_{B_L}^F\Delta^*B_L^F$	$p_{B_A}^B\Delta^*B_A^B$	$p_{B_L}^B\Delta^*B_L^B$	$p_{B_A}^{CB}\Delta^*B_A^{CB}$		$p_{B_A}^G\Delta^*B_A^G$		$p_{B_A}^H\Delta^*B_A^H$		$p_{B_A}^R\Delta^*B_A^R$		0
F4	Loans	$\Delta^*L_A^F$	$\Delta^*L_L^F$	$\Delta^*L_A^B$		$\Delta^*L_A^{CB}$			$\Delta^*L_L^G$		$\Delta^*L_L^H$	$\Delta^*L_A^R$	$\Delta^*L_L^R$	0
F5e	Domestic equity and investment fund shares	$p_{E_A}^{F_{FR}}\Delta^*E_A^{F_{FR}}$	$p_{E_L}^F\Delta^*E_L^F$	$p_{E_A}^{B_{FR}}\Delta^*E_A^{B_{FR}}$	$p_{E_L}^B\Delta^*E_L^B$	$p_{E_A}^{CB_{FR}}\Delta^*E_A^{CB_{FR}}$	$p_{E_L}^{CB}\Delta^*E_L^{CB}$	$p_{E_A}^{G_{FR}}\Delta^*E_A^{G_{FR}}$		$p_{E_A}^{H_{FR}}\Delta^*E_A^{H_{FR}}$		$p_{E_A}^R\Delta^*E_A^R$		0
F5d	Foreign equity and investment fund shares	$p_{E_A}^{F_R}\Delta^*E_A^{F_R}$		$p_{E_A}^{B_R}\Delta^*E_A^{B_R}$		$p_{E_A}^{CB_R}\Delta^*E_A^{CB_R}$		$p_{E_A}^{G_R}\Delta^*E_A^{G_R}$		$p_{E_A}^{H_R}\Delta^*E_A^{H_R}$			$p_{E_L}^R\Delta^*E_L^R$	0
F6	Insurance, pension funds and s.g.s.	$\Delta^*A_A^F$			$\Delta^*A_L^B$			$\Delta^*A_A^G$		$\Delta^*A_A^H$		$\Delta^*A_A^R$		0
F7	Fin. derivatives and employee stock options	$\Delta^*X_A^F$			$\Delta^*X_L^B$			$\Delta^*X_A^G$		$\Delta^*X_A^H$			$\Delta^*X_L^R$	0
F8	Other accounts receivable/payable	$\Delta^*Z_A^F$		$\Delta^*Z_A^B$		$\Delta^*Z_A^{CB}$		$\Delta^*Z_A^G$		$\Delta^*Z_A^H$		$\Delta^*Z_A^R$		0
	Net acquisition of financial assets		$NAFA^F$		$NAFA^B$		$NAFA^{CB}$		$NAFA^G$		$NAFA^H$		$NAFA^R$	***0***

Cells in blue represent the closing items of the corresponding line

3.2 Main equations

3.2.1 Production and price levels

The production in volume (excluding inventories and valuables) is first determined by domestic and foreign demand (exports net of imports). The general price level is found by taking the ratio between the production in value and in volume. Total production in value is then obtained by adding inventories and valuables to the product of the first two variables. The price of household consumption (see *Figure 3*) is based in the medium term on mark-up from unit labor cost with the effect of import prices. In the short term the inflation rate (i.e. the growth rate of the household consumption deflator $\Delta \ln(p_C^H)$) is determined by the growth rate of unit labor costs ($\Delta \ln(ULC)$) with a short-term effect on demand pressure, measured by the value-added-to-non-financial-assets $\left(\frac{va^M}{K_1^M}\right)$. The growth rate of import prices ($\Delta \ln(p_{IM})$) has also been added in the short- and medium-term. Last, a lagged effect of the net value added taxes in percentage of GDP $\left(\frac{T_{P-1}-Sub_{-1}}{\boldsymbol{p_{Y-1}Y_{-1}}}\right)$ has been introduced in the short term, net of the subsidies received. vc_{-1} refers to a simplified vector of cointegration in the form $\ln(p_{C-1}^H) - 0.3 - 0.9\ln(ULC_{-1}^M) - 0.1\ln(p_{IM-1})$, so that the associated parameter -0.1 is the speed of adjustment.

GDP volume, excludes inventories and valuables (noΔs)

$$Y_{no\Delta s} = \underbrace{C^H + C^G}_{Consumption} + \overbrace{I_1^F + I_1^B + I_1^G + I_1^H}^{Gross\ Fixed\ Capital\ Formation} + \underbrace{X - IM}_{Trade\ balance}$$

GDP deflator, excludes inventories and valuables (no∆s)

$$p_{Y_{no\Delta s}} = \left(\frac{\boldsymbol{p_C^H C^H + p_C^G C^G + p_{I_1}^F I_1^F + p_{I_1}^B I_1^B + p_{I_1}^G I_1^G + p_{I_1}^H I_1^H + p_X X - p_{IM} IM}}{C^H + C^G + I_1^F + I_1^B + I_1^G + I_1^H + X - IM}\right)$$

GDP value

$$\boldsymbol{p_Y Y = p_{Y_{no\Delta s}} Y_{no\Delta s} + p_{I_{12}}^F I_{12}^F + p_{I_{12}}^G I_{12}^G + p_{I_{12}}^H I_{12}^H + p_{I_{13}}^H I_{13}^H}$$

Household consumption deflator

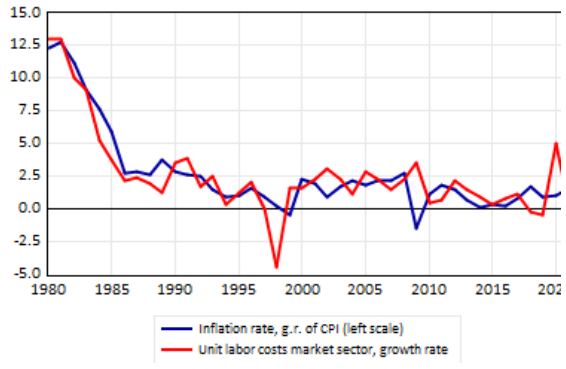
$$\ln(p_C^H) = 0.3 + 0.9\ln(ULC^M) + 0.1\ln(p_{IM})$$

t-stats (39.3) (54.8) (3.9)

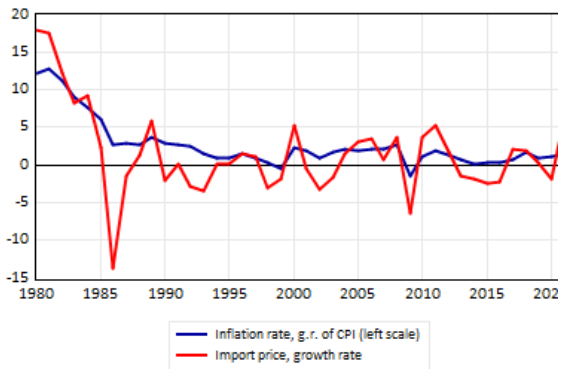
$$\Delta\ln(p_C^H) = -0.1 + 0.4\Delta\ln(p_{C-1}^H) + 0.1\Delta\ln(ULC^M) + 0.2\Delta\ln(ULC_{-1}^M) + 0.1\Delta\ln(p_{IM}) + 0.2\left(\frac{va^M}{K_1^M}\right) + 0.3\left(\frac{T_{P-1} - Sub_{-1}}{p_{Y-1}Y_{-1}}\right) - 0.1vc_{-1}$$

t-stats (-2.8) (7.2) (2.8) (2.9) (7.2) (2.4) (1.8) (-2.6)

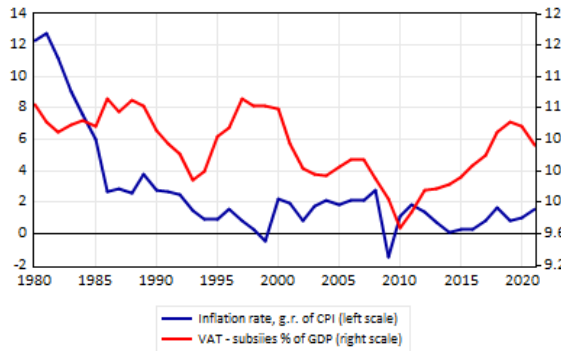
Figure 3 Household consumption deflator as a proxy for Consumer Price Index (blue line) and its determinants (red line), levels and growth rates (1980-2021)



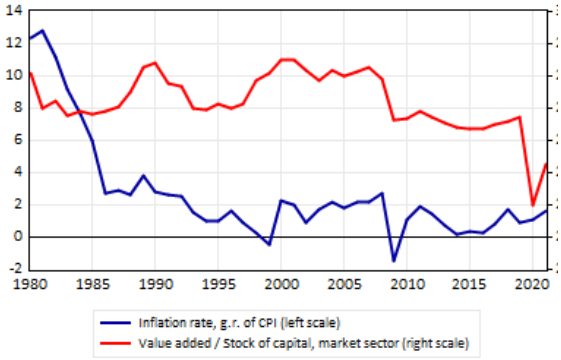
(a) Unit labor costs, growth rate



(b) Import prices, growth rate



(c) (VAT-subsidies)/GDP



(d) Value added (Y)/ Capital stock (K)

3.2.2 Wages and employment

Wage per worker in the market sector (w^M) results from a wage-price-unemployment relation with an indexation slightly less than unity and a medium-term labor productivity $\left(\frac{va^M}{N^M}\right)$ effect. This wage per worker in the market sector serves as a reference for the evolution of that of the other sectors.

Wage per worker (market sector)

$$\ln(w^M) = -1.5 + 0.7\ln(p_C^H) + 1.1\ln\left(\frac{va^M}{N^M}\right)$$

$$\Delta\ln(w^M) = -0.09 + 0.9\Delta\ln(p_C^H) + 0.5\Delta\ln\left(\frac{va^M}{N^M}\right) - 0.04\ln(u) - 0.2vc_{-1}$$

Employment in the market sector (N^M) adjusts with respect to medium-term employment resulting from a simple trend of labor productivity. The wage bill for the market sector (W^M) is given by the product of employment and wage per worker.

Employment, market sector

$$\Delta\ln(N^M) = 0.01 + 0.6\Delta\ln(N_{-1}^M) + 0.3\Delta\ln(va^M) - 0.2\Delta\ln(va_{-1}^M) - 0.3vc_{-1}^*$$

$$vc^* = \ln(N^M) - [\ln(va^M) - 3.1 - 0.02t + 0.01t_{1992-2021} + 0.008t_{2008-2021}]$$

Unit labor costs of the market sector is one of the main factors determining consumer prices and is given by the sum of the total wage bill, labor contributions and labor tax paid by the employers as well as the labor contributions paid by the workers; divided by the total value added of the market sector in volume.

Unit labor costs, market sector

$$ULC^M = \left(\frac{W^M + LC^M + LCW_p^{H_M} + T_{L_p}^M}{va^M}\right)$$

Public employment (N^G) is exogenous and total employment (N) is the sum of employment in the market sector and in the public sector. Active population (AP) i.e. labor force results from a flexion of the activity rate $\left(\frac{AP}{TAP}\right)$ as a function of job creation, *TAP* being the working age population. Finally, the unemployment rate (u) is given by the ratio of the number of unemployed (U, given by $AP - N$) to the active population.

Active population

$$\Delta\ln(AP) = 0.5\Delta\ln(N) + 0.5\Delta\ln(TAP) - 0.3vc_{-1}$$

$$vc = \ln(AP) - 0.5\ln(N) - 0.4\ln(TAP) - 0.002t$$

Unemployment rate

$$u = \left(\frac{U}{AP}\right)$$

3.2.3 Foreign trade

Exports (X) and imports (IM) depend respectively on foreign (Y^f) and domestic demand (Y) as measured by GDP in volume. Since the analyses are conducted for all goods and services, it is more difficult to obtain satisfactory econometric results on price competitiveness. For imports the relative price effects could not be identified and only import prices (p_{IM}) could be isolated. Export prices are determined in standard fashion with a price-maker arbitrage, whereas import prices are exogenous. In the current inflationary situation, import price is one of the main factors driving up the consumer price index.

Exports, volume

$$\ln(X) = -8.5 + 1.3\ln\left(Y^f\right) - 0.7\ln\left(\frac{p_X}{p_{X*}}\right)$$

$$\Delta\ln(X) = -0.06 + 0.3\Delta\ln(X_{-1}) + 3\Delta\ln(Y^f) - 0.4\Delta\ln\left(\frac{p_X}{p_{X*}}\right) - 0.2vc_{-1}$$

Price of exports

$$\ln(p_X) = 0.06 + 0.6\ln(p_{X*}) + 0.2\ln(p_C^H)$$

$$\Delta\ln(p_X) = -0.01 + 0.3\Delta\ln(p_{X*}) + 0.6\Delta\ln(p_C^H) - 0.4vc_{-1}$$

Imports, volume

$$\ln(IM) = -9 + 1.9\ln(Y) - 0.2\ln(p_{IM}) + 0.01t$$

$$\Delta\ln(IM) = 2\Delta\ln(Y) - 0.5vc_{-1}$$

3.2.4 Capital accumulation and financialization of firms

Firms have a non-financial accumulation rate of productive capital [$\Delta\ln(K_1^F)$] that depends on four variables, following a Kaleckian logic: the profit share of value added $\left(\frac{\Pi^F}{VA^F}\right)$; the output-to-capital ratio $\left(\frac{VA^F}{K_1^F}\right)$; the real interest rate[1] ($r_L^F - \pi_Y$) and financial profitability ($r_{E_L}^F - \pi_Y$, with π_Y being the inflation rate). Financial profitability of equities issued/held is the sum of revaluation and dividends received/paid divided by the stock of equities of the previous period $r_{E_A}^F = \left(\frac{E_{A-1}^F \Delta p_{E_A}^F + Div_r^F}{p_{E_{A-1}}^F E_{A-1}^F}\right)$ / $r_{E_L}^F = \left(\frac{E_{L-1}^F \Delta p_{E_L}^F + Div_p^F}{p_{E_{L-1}}^F E_{L-1}^F}\right)$ and in both cases these are mainly driven by the growth rate of equity price. Financial profitability has a negative impact on the accumulation rate as it favors financial accumulation at the detriment of productive capital.

Firms' non-financial rate of accumulation

$$\Delta\ln(K_1^F) = -0.16 + 0.3\left(\frac{VA^F}{K_1^F}\right) + 0.1\left(\frac{\Pi^F}{VA^F}\right) - 0.2(r_L^F - \pi_Y) - 0.01\left(r_{E_L}^F - \pi_Y\right)$$

[1] r_L^F is the apparent (or implicit) interest rate, calculated as the ratio of interests paid by firms and the stock of indebtedness from the previous year.

In financialized capitalism, firms tend to favor financial accumulation $\left(\frac{\Delta^* E_A^F}{E_{A-1}^F}\right)$ at the expense of productive accumulation. This translates into a financial accumulation rate that is an increasing function of the profit rate $\left(\frac{\Pi^F}{p_{K_1}^F K_{1-1}^F + p_{K_{12}}^F K_{12-1}^F + p_{K_2}^F K_{2-1}^F}\right)$ and of financial profitability of equities held $\left(r_{E_{A-1}}^F - \pi_{Y-1}\right)$, where lagged indebtedness as a ratio of capital $\left(\frac{L_{L-1}^F}{p_{K_{1-1}}^F K_{1-1}^F}\right)$ plays a supporting role.

Firms' financial rate of accumulation

$$\left(\frac{\Delta^* E_A^F}{E_{A-1}^F}\right) = -0.03 + 0.5\left(\frac{\Pi^F}{p_{K_1}^F K_{1-1}^F + p_{K_{12}}^F K_{12-1}^F + p_{K_2}^F K_{2-1}^F}\right) + 0.03\left(r_{E_{A-1}}^F - \pi_{Y-1}\right) + 0.01\left(\frac{L_L^F}{p_{E_L}^F E_L^F + WLTH^F}\right)$$

Firms have an indebtedness behavior. In the medium-term their debt structure, as a ratio of total non-financial capital $\left(\frac{p_{BL_L}^F BL_L^F}{p_{K_1}^F K_1^F + p_{K_{12}}^F K_{12}^F + p_{K_2}^F K_2^F}\right)$, depends positively on the profit rate and negatively on the real interest rate $\left(i_{10years} - \pi_Y\right)$. More than a debt behavior, it is an indebtedness norm, which reflects a given institutional relation between firms and banks. A split between bank debt (L_L^F) and bonds $(p_{B_L}^F B_L^F)$ is also made. The flow of equities issued $(p_E^F \Delta^* E_L^F)$ closes the firms' account.

Firms' indebtedness

$$\left(\frac{p_{BL_L}^F BL_L^F}{p_{K_1}^F K_1^F + p_{K_{12}}^F K_{12}^F + p_{K_2}^F K_2^F}\right) = 7.8\left(\frac{\Pi^F}{p_{K_1}^F K_{1-1}^F + p_{K_{12}}^F K_{12-1}^F + p_{K_2}^F K_{2-1}^F}\right) - 3.6\left(i_{10years} - \pi_Y\right) - 0.1 d_{1995-2003}$$

$$\Delta\left(\frac{p_{BL_L}^F BL_L^F}{p_{K_1}^F K_1^F + p_{K_{12}}^F K_{12}^F + p_{K_2}^F K_2^F}\right) = 0.2\Delta\left(\frac{p_{BL_{L-1}}^F BL_{L-1}^F}{p_{K_{1-1}}^F K_{1-1}^F + p_{K_{12-1}}^F K_{12-1}^F + p_{K_{2-1}}^F K_{2-1}^F}\right) + 1.8\Delta\left(\frac{\Pi^F}{p_{K_1}^F K_{1-1}^F + p_{K_{12}}^F K_{12-1}^F + p_{K_2}^F K_{2-1}^F}\right) - 0.13 vc_{-1} + 0.07 d_{2014}$$

3.2.5 Banks, interest rates and public debt

Banks are accommodating in the current version of the model. They grant all loans requested $(\Delta^* L_A^B)$, buy all public bonds available $(p_{B_A}^{B_G} \Delta^* B_A^{B_G})$ and balance the market of domestic private bonds $(p_{B_L}^B \Delta^* B_L^B)$ as well as domestic equities $(p_E^{FR} \Delta^* E_L^B)$. The flow of foreign securities $(\Delta^* B_A^{B_R})$ is expressed as a percentage of GDP. The demand for private domestic securities $(p_{B_A}^B \Delta^* B_A^B)$ depends on its lagged value and its apparent interest rate (r_A^B) while the bank financial accumulation rate $\left(\frac{\Delta^* E_A^B}{E_{A-1}^B}\right)$ depends on the financial profitability lagged one period $\left(r_{E_{A-1}}^B - \pi_{Y-1}\right)$. There is a split between foreign and domestic equities $\left(\frac{p_{E_A}^{B_R} E_A^{B_R}}{p_{E_A}^B E_A^B}\right)$ depending on the exchange rate variation. Banks collect the net deposits (D_L^B), insurance policies (A_L^B) and financial derivatives (X_L^B). Lastly, there are two alternative closures. Before 2007 and the settlement of the quantitative easing regime, banks' reserves are a percentage of the deposits and the refinancing $(\Delta^* RF)$ closes the banks' account as it is provided without restriction by the central bank. Since 2007, the banks' account is closed by the banks' reserves $(\Delta^* RES)$ which have been sharply increasing with the quantitative easing.

Interest rates are treated exogenously with the ECB key interest rate $(r_€)$ and the 10-year interest rate on public bonds (i_{10yrs}) playing a leading role. Apparent interest rates are calculated for

the various securities. They are related to the apparent interest rate of the previous year and to the 10-year bonds interest rate for the interest paid or to the ECB interest rate for the interest received. The short-term interest rate on deposits (r_D) and long-term interest rate on credit ($i^{LT_{cr}}$) are determined as a function of the ECB rate and the 10-year rate, respectively. The interest rate paid by the rest of the world is exogenous.

Apparent interest rate paid by the government

$$r_L^G = \left[\frac{Int_{p-1}^G}{D_{L-2}^G + \boldsymbol{p_{B_L-2}^G B_{L-2}^G} + L_{L-2}^G}\right](1 - 0.11) + 0.11 i_{10yrs}$$

Interest rate on deposits

$$r_D = 1.4 + 0.5 r_{€}$$

Interest rates on credit

$$i^{LT_{cr}} = 1.3 + 0.9 i_{10yrs}$$

The price of public bonds $\left(p_{B_L}^G\right)$ varies inversely with respect to the rate of interest paid by the government $\left(r_L^G\right)$. It plays a leading role in the determination of other prices of bonds such as bonds issued by firms $\left(p_{B_L}^F\right)$, public bonds held by firms $\left(p_{B_A}^{F_G}\right)$, private bonds held by households $\left(p_{B_A}^H\right)$ or private bonds held by banks $\left(p_{B_A}^B\right)$.

Price of public bonds, issued by the government

$$\ln\left(p_{B_L}^G\right) = -0.4 + 0.1 \ln\left(\frac{1}{r_L^G}\right)$$

Government is described in a traditional way with taxes related to economic activity and incomes, public value added (VA^G) related to public wages. Public expenditures are exogenous. Total public indebtedness $\left(p_{BL_L}^G BL_L^G\right)$ closes the account of the government with a split between loans $\left(L_L^G\right)$ and public bonds $\left(p_{B_L}^G B_L^G\right)$.

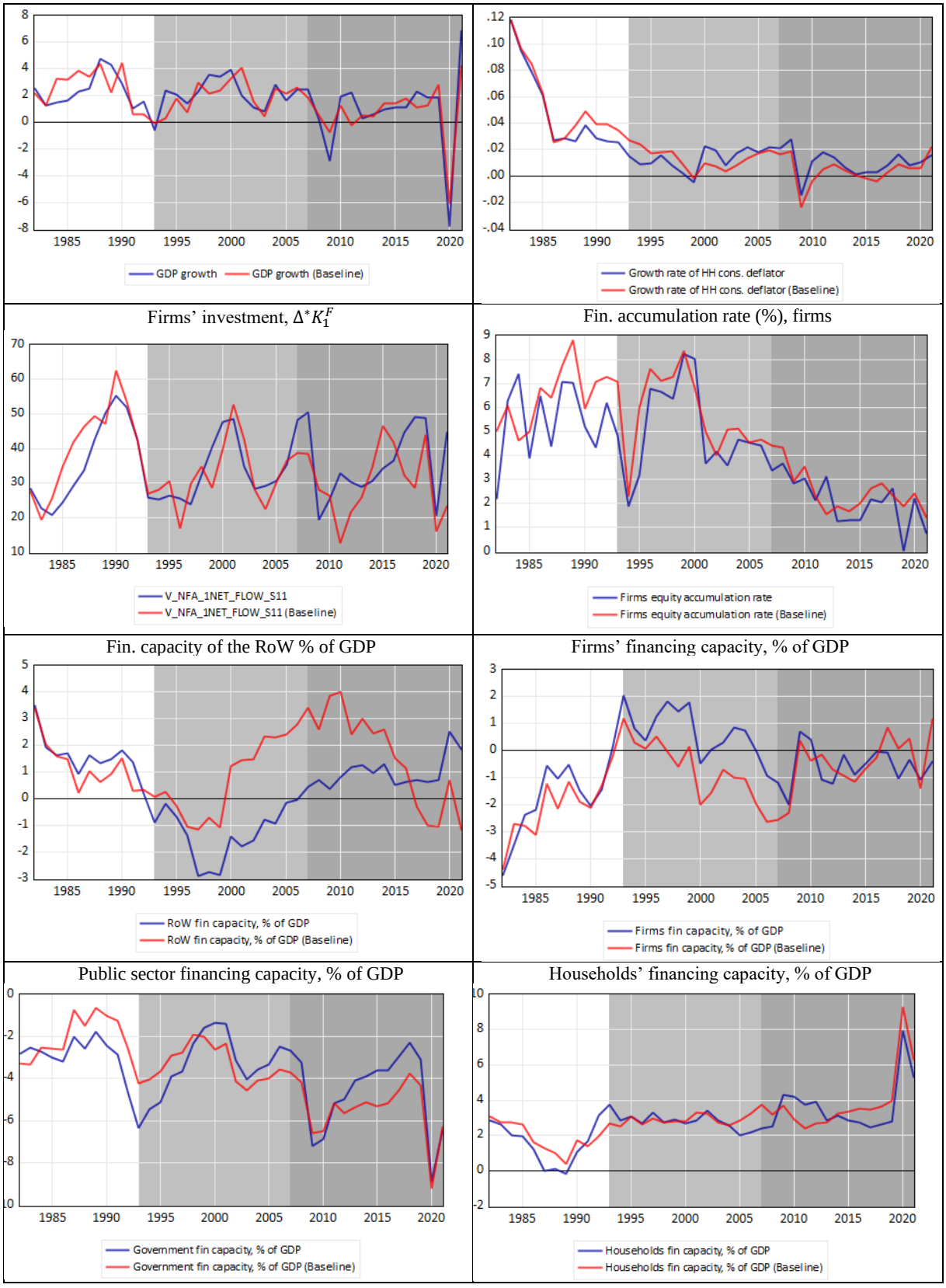
$$p_{BL_L}^G \Delta^* BL_L^G = \Delta^* D_A^{G_{CB}} + \Delta^* D_A^G + p_{B_A}^G \Delta^* B_{B_A}^G + p_{B_A}^{G_R} \Delta^* B_{B_A}^{G_R} + p_{E_A}^G \Delta^* E_A^G + \Delta^* A_A^G + \Delta^* X_A^G + \Delta^* Z^G$$
$$- \Delta^* D_L^G + p_{I_1}^G I_1^G + p_{I_{12}}^G I_{12}^G - S^G + Tr_{K_p}^G + NP^G - Adj^G$$

3.3 Simulations on the past

The graphs in Figure 4 display the observed series in blue and the simulated series in red. The model is run in dynamic simulation to reproduce the past starting in 1982. The results are overall acceptable. For observed and simulated data, we verify that the sum of financing capacities from the different agents equals 0 and that the central bank equilibrium is verified (rounded to the nearest decimal).

Figure 4: Simulations on the past

GDP growth rate	Inflation as given by growth rate of HH cons. deflator, $\frac{\Delta p_C^H}{p_{C-1}^H}$


GDP growth
GDP growth (Baseline)
Growth rate of HH cons. deflator
Growth rate of HH cons. deflator (Baseline)
Firms' investment, $\Delta^* K_1^F$
V_NFA_1NET_FLOW_S11
V_NFA_1NET_FLOW_S11 (Baseline)
Fin. accumulation rate (%), firms
Firms equity accumulation rate
Firms equity accumulation rate (Baseline)
Fin. capacity of the RoW % of GDP
RoW fin capacity, % of GDP
RoW fin capacity, % of GDP (Baseline)
Firms' financing capacity, % of GDP
Firms fin capacity, % of GDP
Firms fin capacity, % of GDP (Baseline)
Public sector financing capacity, % of GDP
Government fin capacity, % of GDP
Government fin capacity, % of GDP (Baseline)
Households' financing capacity, % of GDP
Households fin capacity, % of GDP
Households fin capacity, % of GDP (Baseline)

4. Inflationary shocks and possible responses

In this part we study the impact of inflationary shocks imported from the rest of the world, as they have been observed since 2021, and the different economic policy responses which may be considered; restrictive monetary policy to fight higher inflation in a traditional way, increased social transfers to support households' income, increase of the wage rate to try to preserve the purchasing power of the wage earners, decrease in value added tax (VAT) to try to compensate the initial inflationary shock.

To do this a baseline scenario has to be built with the model over the period 2022-2040. Two alternative scenarios are possible. The first one describes the trend path given by the model after the shock of the COVID crisis. The second one, more realistic but that does not pretend to be a forecast, includes an increase of the import prices and of the foreign prices for the years 2023-2025, a slowdown of the world economy and an increase of the rates of interest reflecting the restrictive monetary policy implemented since 2022. The features of these long-term scenarios will not be discussed in too much detail since our focus is on the consequences of the inflationary shocks. Indeed, these shocks have been introduced with respect to the two scenarios. The results, compared to the two different baselines, are very similar and independent of the baselines used. This simplifies the presentation and the discussion of the main results.

4.1 Inflationary shocks

In this hypothetical scenario, import prices, but also world export prices, increase by 5% only in 2023 if we consider a temporary shock, during three years (from 2023 to 2025) if we have a more persistent shock without being permanent (see Figure 5). In case of a temporary shock in 2023, a 5% increase in world import prices induces imported inflation (0.8 % in the short term) which lowers the purchasing power of workers but does not last. Economic activity slows down. Imports in volume are reduced but imports in current prices increase with the increase in import prices, leading to an initial 0.8% of GDP trade deficit. With the economic slowdown the public balance as a share of GDP initially worsens moderately (-0.2% of GDP in the short term).

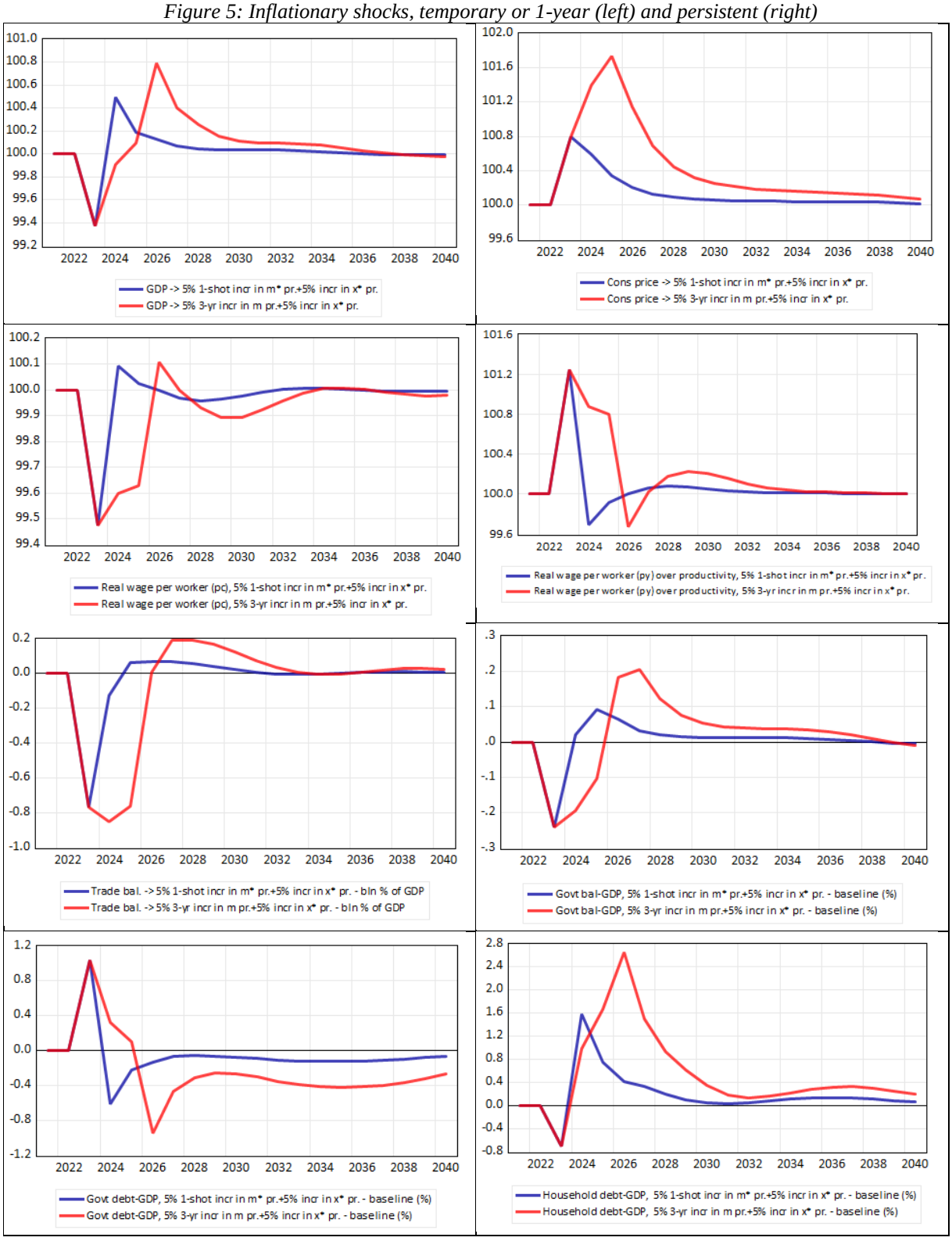
After the initial inflationary shock, a reversal takes place and inflation falls. The trade balance reverses its course and remains almost balanced. The public balance as a share of GDP also improves. Government debt mirrors this evolution, rising by 1% in 2023 and then falling to almost 0% the following years. All in all, after the initial drain linked to the rise in import prices, economic activity rebounds and GDP returns to the baseline scenario. This reflects an endogenous adjustment mechanism.

The increasing import prices corresponds to a levy from the rest of the world on the national economy which cannot be erased. According to the model this levy is supported both by the workers (the real wages drops by -0.5%) and by the firms (the share of profit decreases which is represented in the figure by the rise of the ratio real wage/labor productivity, the wage being deflated by the GDP price). It can be noted that the wage share is rising in spite of the declining real wage because labor productivity is reduced even more due to the inertia in the employment adjustment. This balanced mechanism and the end of the import prices shock allow a progressive adjustment. The inflation decreases, the real wage and the profit share recover.

With a more sustained shock on import prices the evolutions are similar, but more marked. The inflation drift is more important (1.7% after three years), the trade deficit more durable, the real wage rate declines but the decrease is contained due to the partial indexation of wages on prices (0.9 in the short term, 0.7 in the long term). The share of wages increases less. The public deficit

remains limited and the public debt even declines moderately after three years. As in the previous case, with the end of the import prices shock, a reversal appears.

Figure 5: Inflationary shocks, temporary or 1-year (left) and persistent (right)

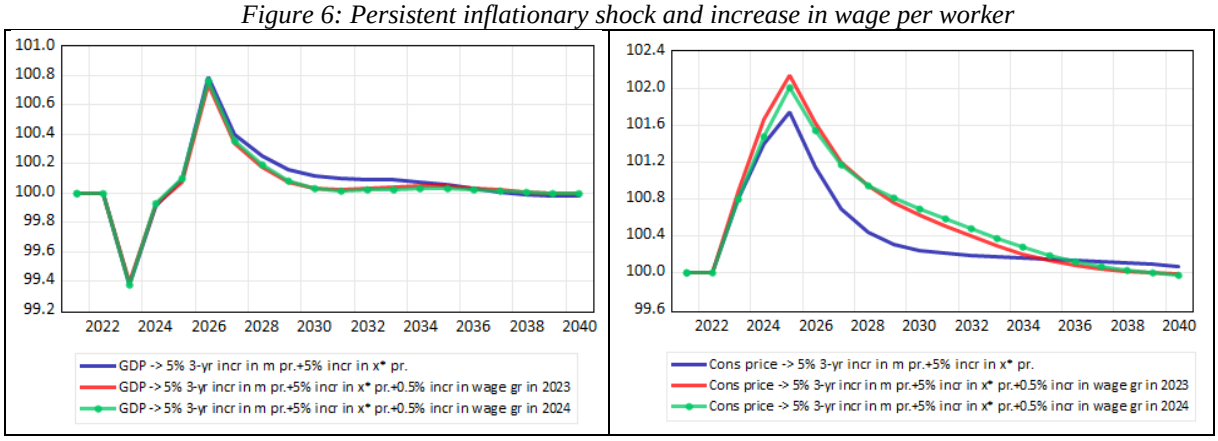


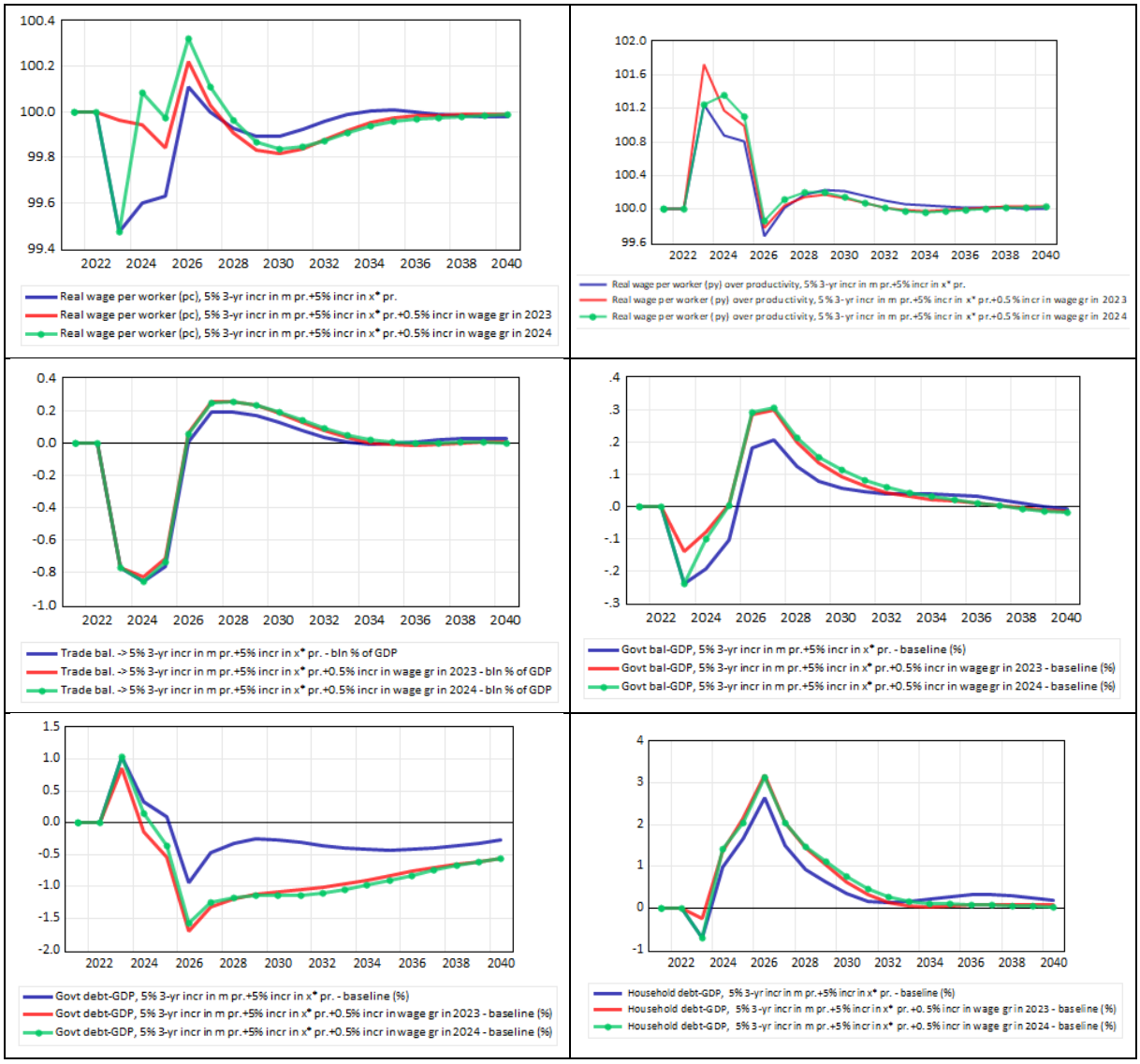
The reality is more complex since there are conflicts and inappropriate answers. Although the import price shock is a net levy in favor of the rest of the world, domestic agents may attempt to defend their shares. Employees demand salary increases to preserve their purchasing power. Firms can increase their margins to restore their profit share. The central bank can try to fight imported inflation via a restrictive monetary policy. Alternatively, the government can reduce social tensions by taking responsibility for part of the external shock. This is illustrated in the following scenarios.

4.2 Wage-profit responses

First, workers could obtain wage increases in the hope of preserving their purchasing power. We analyze the consequences of doing so in 2023 (when the inflationary shock takes place) or the year after with an increase of 0.5% of the wage rate (Figure 6). The results are not fundamentally different in either case, except for the lag in the response of the series. Prices rise significantly and a wage-price spiral begins. Disinflation is slowed in the medium term. The real wage rate is preserved in the short term but declines in the medium term. Unsurprisingly, the profit share is more strongly affected in the short term. All in all, GDP follows an evolution close to that where the inflationary shock was left with no policy response. The surplus of consumption is compensated by less investment. Despite the inflation drift, the trade balance is only slightly affected. The main positive point of this scenario is the improvement of the public finance induced by the inflationary drift. The public balance increases by 0.3% of GDP and the stock of government debt falls by 1.5% of GDP by 2028. Fighting an imported inflationary shock by increasing wages to try to preserve the purchasing power seems to be rather inefficient, but the acceptance of an inflationary drift may prove useful for public finances.

Figure 6: Persistent inflationary shock and increase in wage per worker



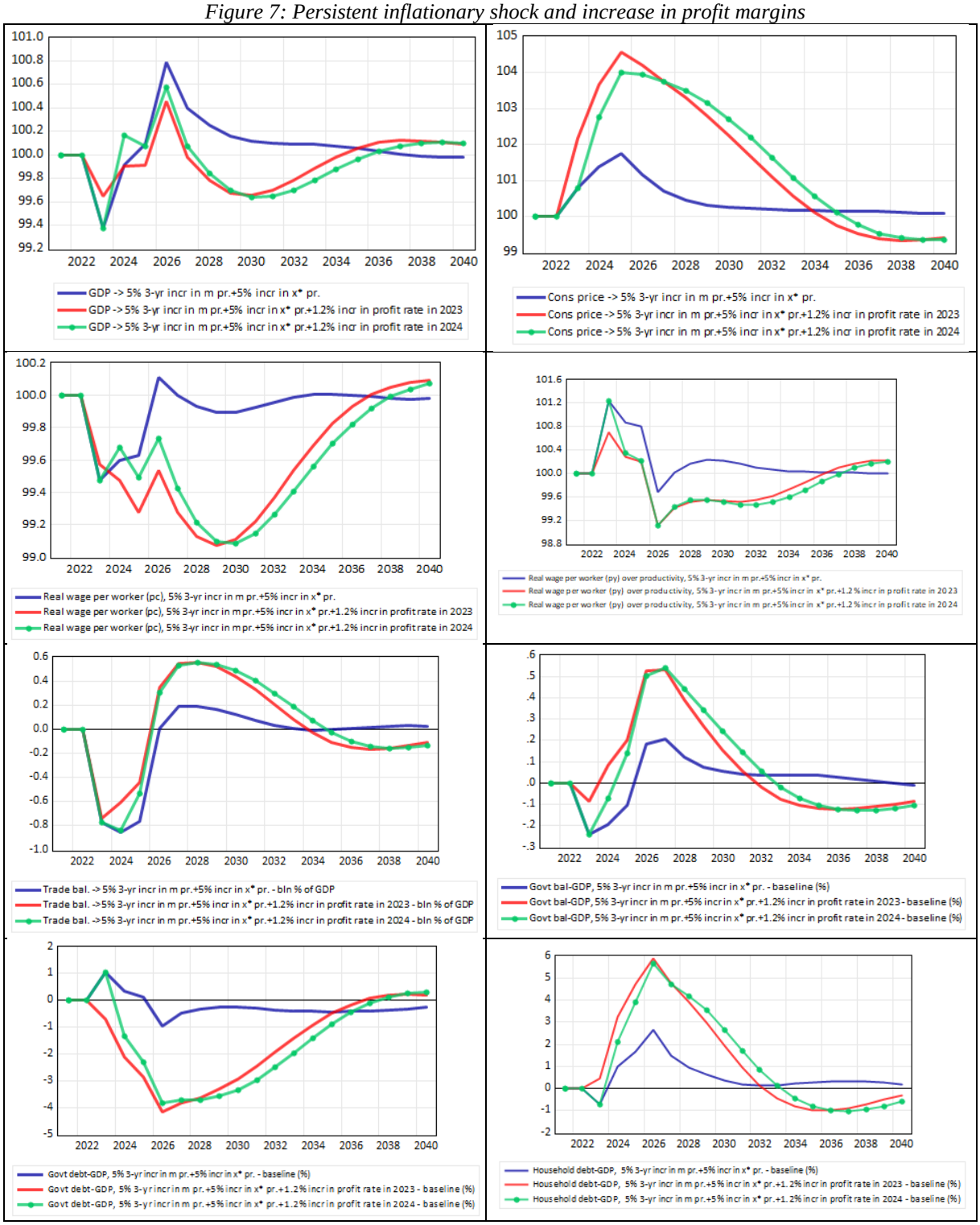


Second, firms could increase their margins to restore their profit share, negatively affected by the external inflationary shock. This is described simply in the model by an additional increase of prices of 1.2% in 2023 or in 2024 (Figure 7). The impact is important. The inflation drift is largely amplified (more than 4% in 2025). The profit share is restored in the short term and even more in the medium term, while the real wage rate is affected persistently. The recessionist effect of the inflationary shock is partly mitigated thanks to the improvement of the financial situation of the firms and to the preservation of investment. But the decrease in real wages is important and long-lasting, which weighs more and more on consumption. In the medium term the effect is clearly negative on GDP. The trade balance improves especially in the medium term due to declining economic growth, despite the inflationary drift. Conversely, regarding the public balance, the opposite effect can be observed. The price effects is more important and generates increasing taxes, that improves the public balance and allows a reduction of the public debt (-4% of GDP in 2028).

This profit-led inflation has been observed after the energy prices shock in the euro area and in France, more particularly, as it has been argued in the first section. The risk is that the workers react against the reduction of their purchasing power. A combination of the two previous shocks

could be considered and would lead to a large profit-price-wage spiral. To avoid such evolution, various policy responses may be considered.

Figure 7: Persistent inflationary shock and increase in profit margins



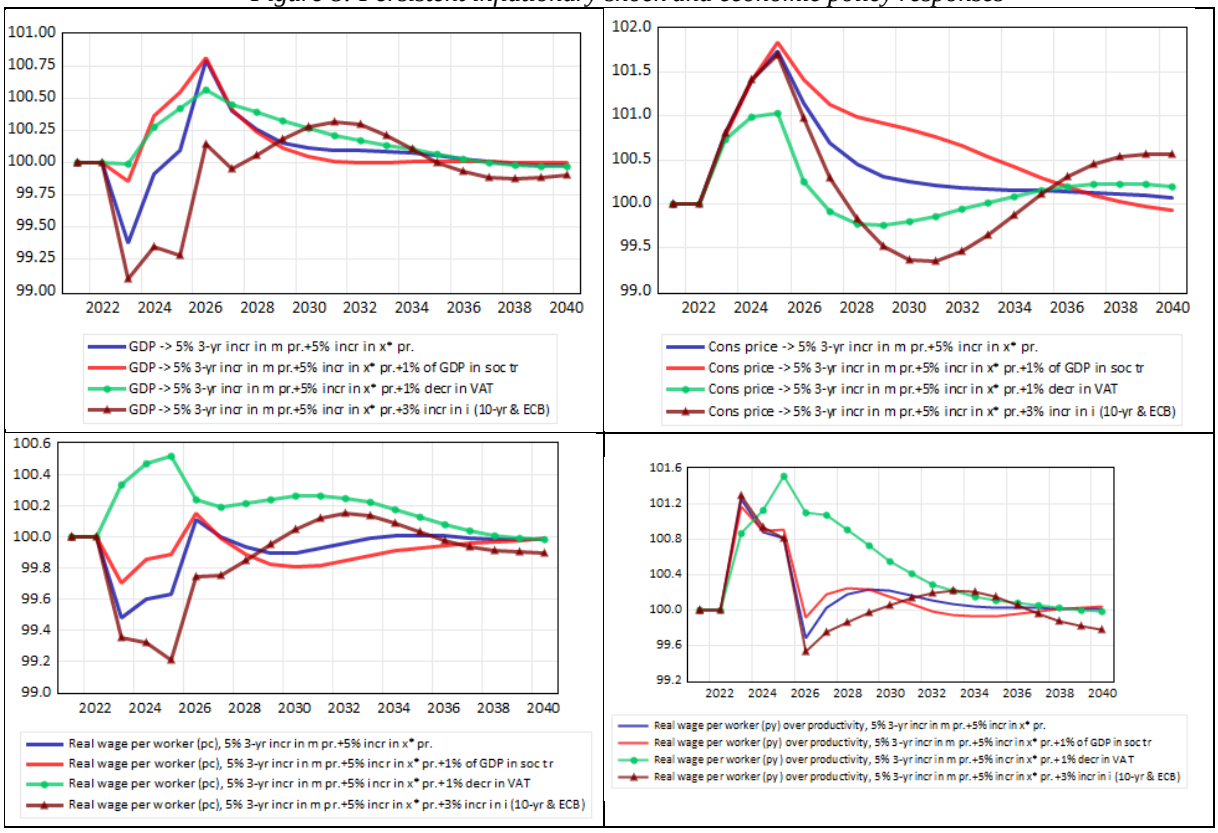
4.3 Economic policy responses

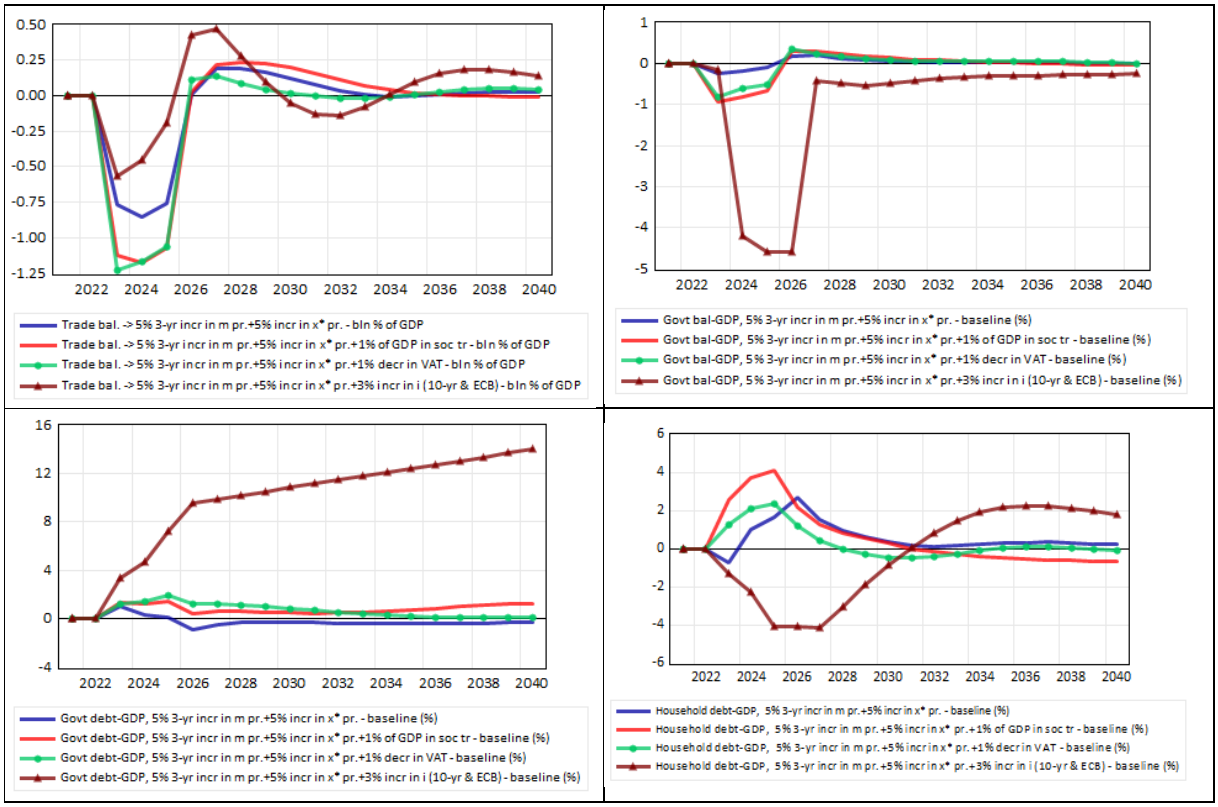
Facing the inflationary shock, the authorities could decide (and has actually decided in practice) to preserve the credibility of the central bank by using traditional monetary policy tools, i.e.

increase the interest rates and progressively reduce quantitative easing (QE). The decision was not evident since a restrictive monetary policy is a priori well suited to fight inflation due to an excess demand, or to a lesser extent, due to cost pressures. It was the case in 2021-2022 in the US where the recovery from the COVID crisis was supported by a prompt activist fiscal policy, inducing strong demand pressures. Furthermore, the cost drift was amplified by the disorganization of the international supply chains at the world level generated by the COVID crisis. The situation was different in the euro area where the fiscal policy has been less supportive and demand pressures have remained limited. However, other instruments to reduce the inflation tensions (incomes policies especially) were either absent or difficult to implement at the EU level, as they depended on national decisions and raised problems of coordination. The ECB was obliged to follow the FED and to embark in restrictive policy.

As an illustration, a 3% increase in the interest rate (ECB rate of interest and ten years interest rate on public bonds) is introduced in the model for three years (2023-2025). The cost of this restrictive policy is high for a rather modest and delayed effect on prices (Figure 8). The rise in domestic prices is only contained in the medium term, via the contraction in aggregate demand which is persistent. In 2028 the loss of production observed between 2023 and 2028 is not compensated. The public balance worsens due to the slowdown, the decrease of public resources and the rising cost of debt services (-4.5% of GDP in 2026). Furthermore, public debt as a share of GDP is higher (9% of GDP in 2026) and remained higher in the medium term, due to the reduced activity and the more moderate price increases which limit nominal GDP. The simulation clearly illustrates that this traditional contractionary monetary policy with the increase in the interest rate is ill-suited to fight imported inflation, which is not caused by excessive demand pressure. Its cost is significant in terms of growth and public debt for a limited and delayed result.

Figure 8: Persistent inflationary shock and economic policy responses





Alternatively, the government could increase social transfers by 1% of GDP (25€ bn, reference year 2022) in order to support households and limit the worsening of their purchasing power (Figure 8). This has indeed the desired lessening effect on the output drop, although at the cost of (slightly) raising demand-pull inflation, worsening public finance and the trade balance in the short term. But this degradation remains rather limited. The increase of the ratio public debt to GDP is contained around 1%. The more unfavorable point of this scenario is the long-term stagnation of real wage (-0.2%) due to a more persistent inflation. Fighting an imported inflationary shock via social transfers seems like a good option under three conditions: the imported inflationary shock must not continue; a slower decrease of the rate of inflation is accepted; a wage-price spiral must be avoided which is not evident with the stagnation of the real wage rate and the possibility of wage demands.

Last, the government could reduce temporarily the rate of indirect taxes by 1% of GDP to compensate firms for the initial inflationary shock (Figure 8). The results are close to those obtained with an increase of social transfers, but globally more favorable. The negative shock on GDP in the short term is limited while the inflation decrease is more important. On the other hand, the worsening of the public balance is of the same magnitude whereas the public debt ratio increases slightly more due to a more pronounced stabilization of the prices. The real wage rate is increased significantly and persistently which can be considered as positive. The counterpart is a large and persistent decline in the medium term of the profit share which may not last long, even if in the long term it recovers. This point joins a practical difficulty encountered during VAT reduction experiments. In many cases the VAT reduction has not been fully transferred in price reduction and has been partly kept by firms or retailers. This is a practical difficulty which cannot be ignored.

While the above imported inflation scenario is targeted to emulate the current inflationary situation, it can also reflect a likely scenario from the green transition as a more widespread

adoption of a carbon tax and other related regulations have significant impacts on energy and industrial inputs prices (Dees et al., 2023), which in turn would increase the prices of both import and export prices. As noted by Braga & Ernst (2023), macroeconomic policies may contribute to facilitate the green transition through mobilization of additional resources and ensure that the transition is socially just.

5. Conclusion

The different periods of inflation in France since the 1980s have been analyzed, ranging from the high inflation in the early 1980s following the oil shocks, the disinflation of the mid-1980s, the great moderation of the 1990s achieved via inflation targeting, the stable inflation at around 2% following the introduction of euro until the Global Financial Crisis in late 2000s, and finally the long period of low inflation rates until COVID-19 pandemic. Inflation has taken off sharply since the start of 2022 with the supply chain difficulties related to COVID-19 recovery and the onset of the armed conflict in Ukraine. We have used an empirical stock-flow consistent (SFC) model for the French economy to simulate the current inflation situation and the alternative responses.

Based on the national accounts of INSEE and the financial accounts of Banque de France, we presented part of a medium-scale (400+ equations) econometric SFC model for France. It is an aggregate model with a single product distinguishing five domestic agents (firms, households, banks, central bank, government) and the rest of the world with a complete representation of economic and financial accounts in flows and stocks. The structure of the model is close to that of existing SFC models with demand-led dynamics, an accumulation behavior of a Kaleckian type and an indebtedness norm. The dynamic simulations on the past over the period 1982-2021 provided acceptable results. The effect of an external inflationary shock was examined with a discussion of alternative policy responses. This shock appears as a net withdrawal in favor of the rest of the world which is upheld by domestic agents. Two possible responses are considered: increased wage per capita as workers so as to preserve their purchasing power, increased margins by firms which try to restore their profit share. Facing the risk of profit-price-wage spiral, alternative economic policy responses have been evaluated. Traditional restrictive monetary policy with an increase in the interest rates does not seem well-suited to fight imported inflation as the cost is significant with limited and delayed results. Increased social transfers can help workers to support their loss of purchasing power. Reduced VAT can directly limit the inflationary drift. These measures have a cost for public finance but are affordable as long as the inflationary shock is temporary. However, their concrete implementation can raise difficulties.

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