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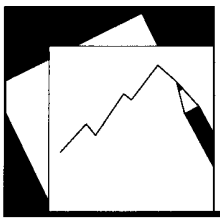

IMF Working Paper

Challenges to Monetary Policy in the Czech Republic—An Integrated Monetary and Fiscal Analysis

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Challenges to Monetary Policy in the Czech Republic—An Integrated Monetary and Fiscal Analysis

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Abstract

This paper uses the Global Integrated Monetary and Fiscal Model (GIMF), a New Keynesian open-economy general equilibrium model suitable for an integrated evaluation of monetary and fiscal policies, to analyze monetary policy challenges facing the Czech Republic. In the context of the recent rising inflation pressures, we analyze how the authorities' fiscal reform package and the planned reduction in the inflation target in 2010 would weigh on the conduct of monetary policy.

JEL Classification Numbers: C68, E52, E58, E63

Keywords: Inflation targeting, Macroeconomic model, Fiscal Policy, Policy coordination

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I. INTRODUCTION

In recent years, researchers in policymaking institutions have developed macroeconomic forecasting and simulation models with increasingly rigorous microfoundations to analyze monetary policy. The IMF's Global Economy Model (GEM) and the Federal Reserve Board's SIGMA model have been used to address many issues regarding the monetary business cycle. The GEM, for instance, has been applied to the Czech Republic to assess the effectiveness of Taylor rules and inflation-forecast-based rules in stabilizing variability in output and inflation (Laxton and Pesenti, 2003) and the monetary policy implications of capital account volatility (Karam, Laxton, and Tamirisa, 2005).

The economic environment for the conduct of monetary policy in the Czech Republic has changed significantly over the past year. Until recently, demand-driven inflation had remained subdued despite acceleration in economic growth, and increases in regulated prices had been the main drivers of headline inflation. Moreover, continued robust productivity gains, wage moderation, a strong koruna, and an increasingly competitive retail environment were helping to keep underlying inflation at a low level. However, more recently, sources of growth have shifted toward domestic demand, fuelled by rising employment and real wages, rapid credit creation, and a temporary cessation of the koruna appreciation during the first half of 2007.

The aim of this paper is to analyze the monetary policy challenges ahead on the backdrop of the changing context of rising inflation pressures, the recently-announced fiscal reform package and the planned reduction in the inflation target from 2010 onwards from 3 percent to 2 percent.

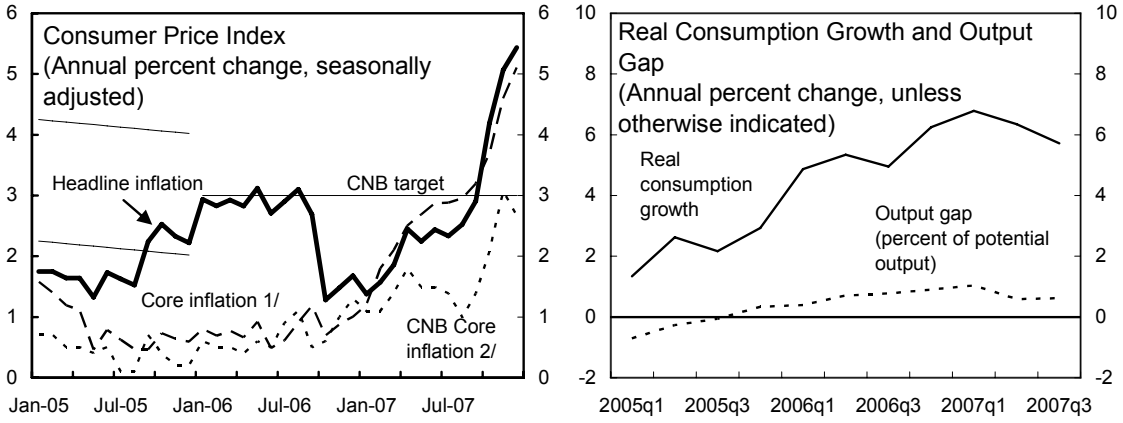
An integrated evaluation of monetary and fiscal policies is needed to assess properly the policy stance and mix. Nevertheless, given their Ricardian features, the models mentioned above are not useful to evaluate dynamic short-run effects of fiscal policy nor medium- and long-run fiscal issues. The joint evaluation of monetary and fiscal policies requires models with microfoundations (as rigorous as those of open economy monetary business cycle models), yet equipped for fiscal policy analysis that maintains the nominal and real rigidities of existing models. Consequently, this paper uses the new IMF's Global Integrated Monetary and Fiscal Model (GIMF) by Kumhof and Laxton (2007a,b) to analyze monetary policy challenges for the Czech Republic. The GIMF reproduces the features of GEM but adds to it a full-fledged fiscal policy. To the best of our knowledge, this study constitutes the first application of GIMF to the Czech Republic.

The paper is structured as follows. Section II reviews the current environment facing the Czech National Bank (CNB) in the formulation and conduct of monetary policy. Section III provides a brief description of the GIMF model. Section IV attempts to assess the monetary implications of the fiscal reform package, while section V examines the monetary effects of the remaining current macroeconomic challenges. Section VI explores the implications of the reduction of the inflation target from 2010 onwards. Section VII concludes.

II. CHALLENGES FOR MONETARY POLICYMAKING

Rising domestic demand pressures are increasingly reflected in core inflation. Although increases in regulated prices and indirect taxes led to an increase in headline inflation in 2006, core inflation remained subdued most of the year, at around 1 percent. Since late 2006 however, core inflation has risen steadily, supported by strong domestic demand, particularly private consumption, and reached over 5 percent at end-2007. The output gap is estimated to have turned positive in 2006 and to have increased steadily during 2007.

Figure 1. Domestic Demand and Inflation

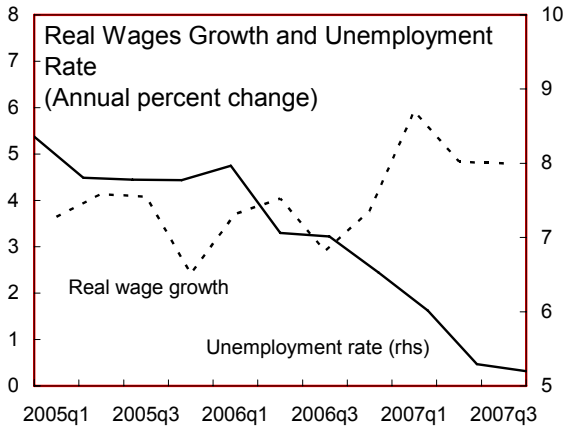


Source: Sources: Czech Statistical Office; Eurostat; and IMF staff estimates.
1/ Harmonized CPI excluding energy and seasonal food.
2/ Headline inflation excluding indirect tax changes, regulated prices, food and fuels.

Source: Sources: Czech Statistical Office; and IMF staff estimates.

Pressures on wages are emerging in the wake of declining unemployment. Productivity gains exceeding nominal wage growth helped moderate inflation over the last few years. However, nominal and real wage growth picked up sharply, the latter reaching 6 percent in the first quarter of 2007. The acceleration reflected a tighter labor market, with the rate of unemployment reaching a record low level below 6 percent.

Figure 2. Wages and Unemployment

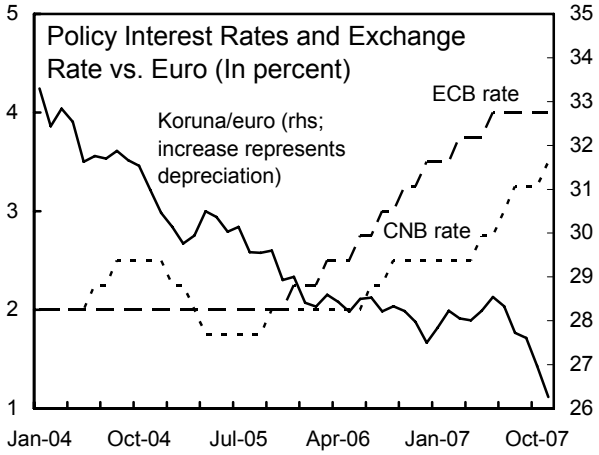


Source: Sources: Czech Statistical Office; and IMF staff estimates.

Despite increasing immigration, labor shortages seem to be on the rise. On the one hand, the number of foreign workers has been increasing since the beginning of 2005, mainly driven by strong demand of labor and GDP growth. Most of them are Slovaks (47 percent), Ukrainians (25 percent), and Poles (10 percent). Indeed, immigration of low-skill workers has soared.[2] But on the other hand, labor shortages are emerging in more skilled jobs in the IT and automotive sectors, reflecting growing skill mismatches. Shortages also exist in the construction sector. These scarcities are exacerbated by the fact that younger generations exhibit lower labor participation rates and unemployment in neighboring countries has also been declining.

The trend of koruna appreciation abated in the first half of the year. The appreciation trend exhibited by the koruna over 2004-06 reversed in 2007, as the currency depreciated by 4 percent against the euro in the first half of the year. The use of the koruna as funding currency for carry trade operations explained most of this turnaround: as the European Central Bank (ECB) started tightening monetary policy from 2006 onwards, relatively low interest rates in the Czech Republic led investors to borrow in koruna to finance the purchase of debt instruments in higher-yielding currencies. The subsequent tightening by the CNB and the financial turmoil, arising from concerns over the US sub-prime mortgage market, resulted in the unwinding of the koruna carry trade by mid-August and the reversal of the depreciation. Toward the end of the year, the koruna was on the stronger side, appreciating by about 5 percent against the euro in about two months and posing a significant source of uncertainty for monetary policy.

Figure 3. Interest Rates and Exchange Rate



Sources: Czech National Bank; and European Central Bank.

The fiscal reform package approved by Parliament last August includes measures that will have direct impact on inflation. The package includes the introduction of a 15 percent flat tax

[2] This is particularly apparent for Ukrainian nationals while Slovaks can also get employment in skilled jobs, presumably due to the lack of a language barrier. See Šnobl (2007) for details.

rate on personal income (PIT),[3] an increase of the lower value added tax (VAT) rate from 5 to 9 percent in 2008, a phased reduction in the corporate income tax (CIT) rate from 24 to 19 percent by 2010, and a cut in social spending by about 0.7 percent of GDP in 2008-10, as well as an increase in excises. The direct pass-through of VAT hikes to inflation could be compounded by second round effects in the current environment of rising demand-side inflation pressures. Conversely, the decline in both PIT and CIT rates could moderate price pressures.

The CNB announced in March 2007 that it would lower its annual CPI inflation target from 3 to 2 percent effective January 2010. Moreover, it announced that it would allow inflation to descend gradually to the new inflation target far enough in advance so that inflation is close to the new target by the date that the new target takes effect. However, at this stage, it has not provided a benchmark path envisaged to achieve the new target.

Monetary policy will face additional challenges in the transition into the euro area. The earlier target date of 2010 for euro adoption has been pushed back. Under the Convergence Program Update published in March and the updated Euro-area Accession Strategy adopted in August, the earliest date feasible would now be 2012, which implies that the Czech Republic would have to join ERM II in 2010. Given the tradeoff between exchange rate and price stability during the transition period in ERM II, major indirect tax hikes would complicate the CNB's task. Moreover, in the context of looming long-term spending pressures from population aging, delays in achieving substantial fiscal consolidation could also pose a threat to the fulfillment of the price stability criterion by generating additional demand pressures.

III. Brief Description of the Model

This paper attempts to exploit the features of GIMF, a multi-country non-Ricardian model, to evaluate jointly the impact of monetary and fiscal policies in the Czech Republic. GIMF is a large scale version of the new open-economy macroeconomic models, with microeconomic foundations based on optimizing consumers and producers under sticky prices, real and nominal rigidities as well as monopolistic competition.[4] Agents are forward-looking but non-Ricardian. Fiscal policy is countercyclical and the monetary policy reaction reflects the inflation targeting regime in place in the Czech Republic. These features allow for the analysis of both monetary business cycles and the medium and long term effects of fiscal policies on inflation (Kumhof and Laxton, 2007b). We used here a two-country version of the model, where the "home" country is the Czech Republic, and the "rest of the world" is represented by the euro area. Because we are particularly interested in assessing monetary policy reactions to shocks, we relied on a quarterly version of the model.

[3] It is envisaged that the flat rate will be reduced to 12.5 percent in 2009, but these plans—and their financing—are uncertain and hence not considered in the analysis.

[4] A full description of the theoretical underpinnings of the model can be found in Kumhof and Laxton (2007a).

The calibration is based on data averages for the past decade consistent with impulse responses of the model.[5] Because GIMF is a general equilibrium model, its steady state needs to be calibrated before any shock can be run to assess the impact of various policies. To that effect, the steady state GDP ratios and other macroeconomic variables are derived from the national accounts averaged over 1995-2005/6 (latest observation for the fiscal ratios); while structural parameters are largely adapted from the literature on Czech Republic (Laxton and Pesenti, 2003), and Western Europe or the United States (Bayoumi, Laxton, and Pesenti, 2004 and Everaert and Schule, 2006), or Chile (Kumhof and Laxton, 2007c), when no such parameters have yet been estimated for the Czech Republic.

The government's tax and expenditure decisions affect the country's public sector balance and debt. In the model, the government collects taxes on consumption, labor and capital as well as lump sum taxes, and spends on both public consumption and investment, as well as on transfers to households. During the period of study, the fiscal parameters—tax rates and the level of public expenditures—are set exogenously, therefore allowing for automatic stabilizers. Long term stability is ensured through a government-set budget balance target that stabilizes debt to GDP, a stability requirement for the model to converge. However, given our focus on the short to medium-run impact of the fiscal package, the period after which the sustainability criterion kicks in has been pushed to beyond the horizon of interest here.

The CNB credibly targets an inflation rate of 3 percent. The monetary policy reacts to any deviation to the 3 percent target by adjusting nominal interest rates. The sacrifice ratio—how much GDP is lost when inflation is lowered by 1 percentage point—hovers around 1.5, as opposed to 1.1 in earlier calibrations of the Czech Republic using GEM, but still below the level of the euro area at 2.1 (Laxton and Pesenti, 2003). This result should not be surprising: during the initial period of disinflation, inflation was transitorily decelerating without excessive output loss. Now that the disinflation process is more advanced, the sacrifice ratio has naturally risen closer to levels seen in Western Europe. The credibility of the CNB is assumed to guarantee that all economic agents incorporate this target in their forward-looking behavior.[6]

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[5] Appendix I lists the variables used for the calibration and their value.

[6] The monetary policy rule is set consistent with the Czech Quarterly Projection Model (Beneš and others, 2003). The interest rate smoothing coefficient value is set at $\mu_i = 0.75$, the response to the inflation forecast gap is $\mu_\pi = 1.4$, and the response to output growth features $\mu_{gdp} = 0.4$. (We use output growth instead of output gap in the Inflation-Forecast Based rule because the level of potential output is dependent on fiscal policy while the output gap in the GIMF model is derived from the steady state and therefore does not reflect tax rate changes). Regarding the Euro area we use the ECB parameters ($\mu_i = 0.5; \mu_\pi = 2; \mu_{gdp} = 0.5$).

IV. IMPACT OF THE FISCAL PACKAGE

This section analyses the effects of the fiscal package focusing on the changes in the PIT, VAT, CIT rates, and the announced decline in social spending.[7] We assume that the fiscal package would get implemented starting in the first quarter of 2008, but that, since it has already been announced, agents would begin adjusting their behavior and expectations as early as 2007. The increase in the lower VAT rate by 4 percentage points— from 5 to 9 percent—is assumed to raise the effective VAT tax rate by 1.1 percentage point, as these goods weigh 28 percent in the consumption basket; the introduction of the flat PIT would imply that the effective rate decreases by 1.1 percentage point while the gradual CIT reform would generate a decline in the tax rate by 1.2 percentage points in 2008 and by an additional 0.4 percentage point in 2009 and 2010.[8] Moreover, we retain the authorities' original assumption that social transfers to households would be cut by 0.6, 0.7, and 0.8 percentage point of pre-shock GDP in 2008, 2009, and 2010 respectively.[9]

The first round effects of the VAT hike could push headline inflation by about 1 percentage point.[10] Because we did not assume any special margin behavior from retailers, headline inflation would be impacted one-to-one by the increase in the lower VAT rate. However, the direct price effect could be spread over a more protracted period if retailers temporarily squeeze their margin to smooth the price increases, as has recently been witnessed in Germany where VAT rates were hiked in January 2007 (Carare and Danninger, 2007). The impact could even be minimized by the existence of low-cost, high-efficiency international retailers, the so-called "Wal-Mart Effect" (Igan and Suzuki, 2007).

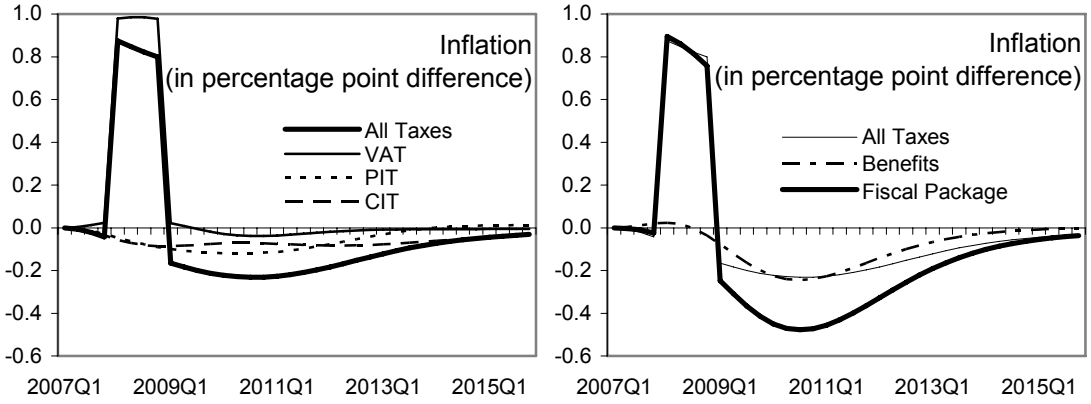
[7] The fiscal package also include increases in excises that are not considered in this analysis. See Dalsgaard (2008).

[8] Given that CIT payments made in the second half of the year and the first half of the following year depend upon the tax liability in the previous year(s) and the amount of over/under payment when the tax payment is settled in the middle of the year, the tax rebate effect would be mainly felt the following year.

[9] For the sake of the exercise, we assume that tax rates do not change after the reform and benefit cuts are permanent.

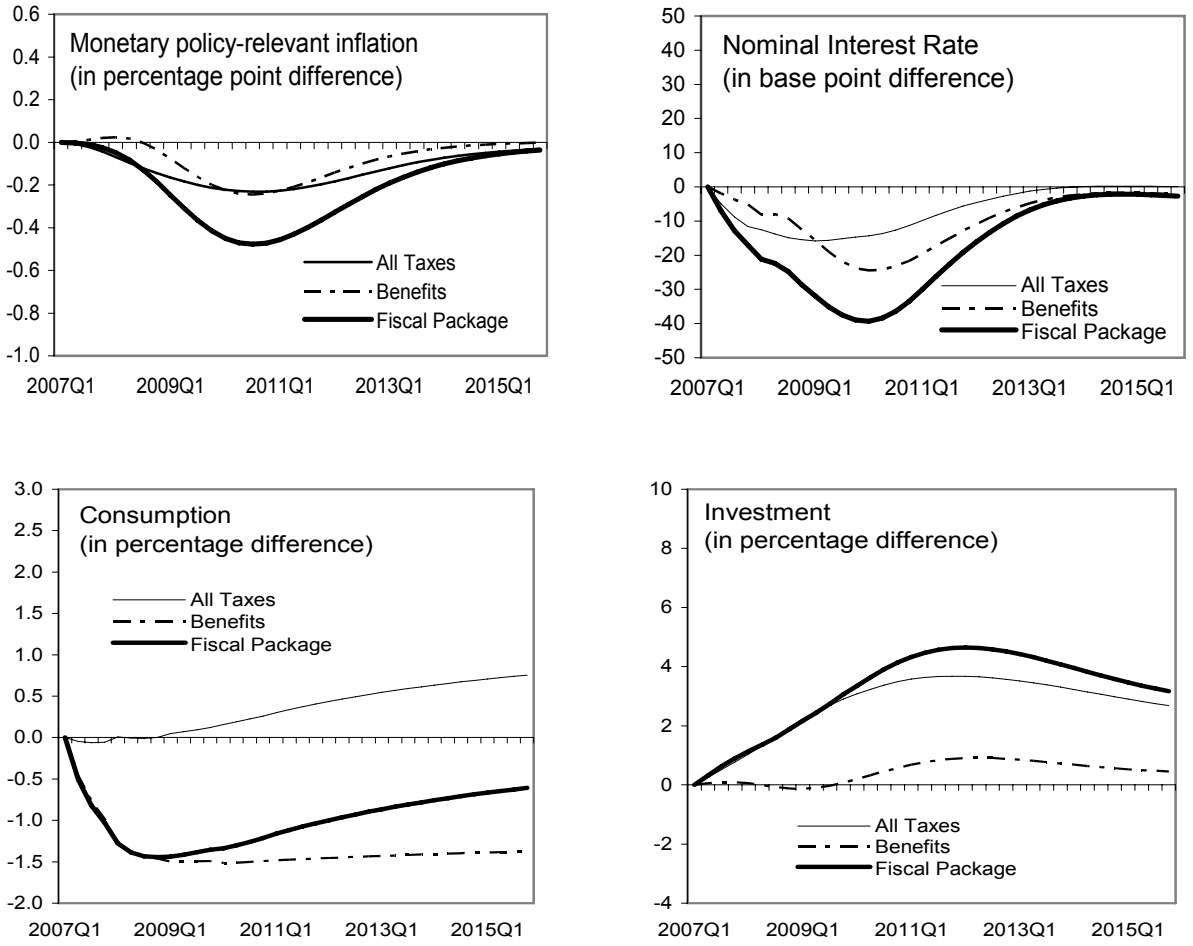
[10] First round effects are included in the headline inflation shown in the graphs. However, they are not included in the inflation indicator taken into account by monetary policy and therefore in the rest of the figures that follow.

Figure 4. Effect of the Fiscal Shock on Headline Inflation



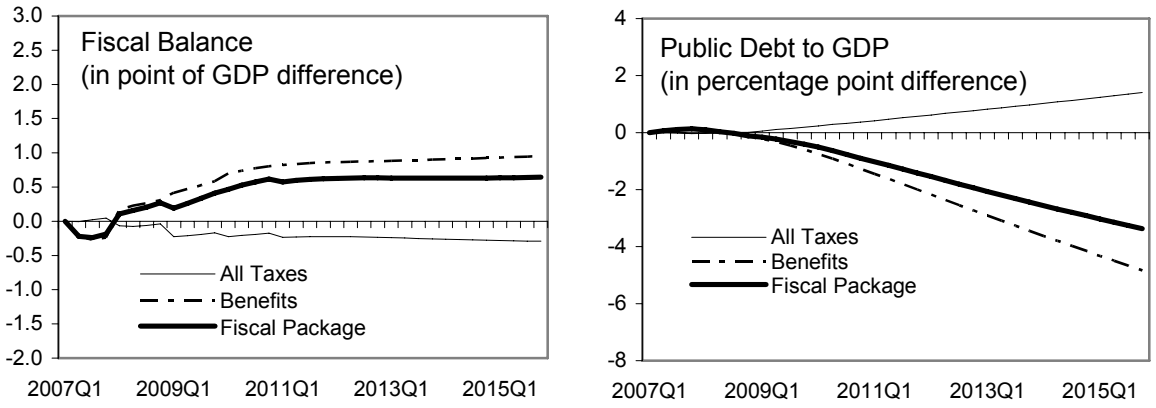
If the fiscal measures are implemented as originally announced, the model suggests that supply-side effects are likely to dominate demand-side effects, dampening inflationary pressures. Monetary policy-relevant inflation (inflation excluding the first-round effects of indirect taxes, to which monetary policy is not mandated to react) will decrease by about 0.5 percentage point over the next two to three years and will allow a fall in nominal interest rate, estimated at 40 basis points in GIMF. In fact, the tax cuts would boost supply, both through a lift in investment of up to 5 percent over the next three years (see Appendix Figure 1b) due to the CIT cut, and through an increase in labor supply coming from the PIT cut. Moreover, the PIT cuts, by increasing households' take-home pay will moderate wage increases since unions are more willing to accept less favorable gross wage raises. Household demand pressures triggered by the cut in PIT would be more than offset by the dampening effect of the VAT hike. The ensuing slowdown in consumption would be compounded by the decrease in social expenditures. One caveat to bear in mind is that households are expected in the model to refrain from demanding wage hikes following the hike in VAT, because they fully anticipate that real income gains cannot be derived as the central bank ensures that the inflation target is met. To the extent that this assumption does not hold, the risk is that second round effects could start to emerge. It also must be kept in mind that the model does not capture the distributional impact of tax cuts and hence their impact on the aggregate propensity to consume and the timing and strength of supply effects.

Figure 5. Macroeconomic Impact of the Fiscal Shock



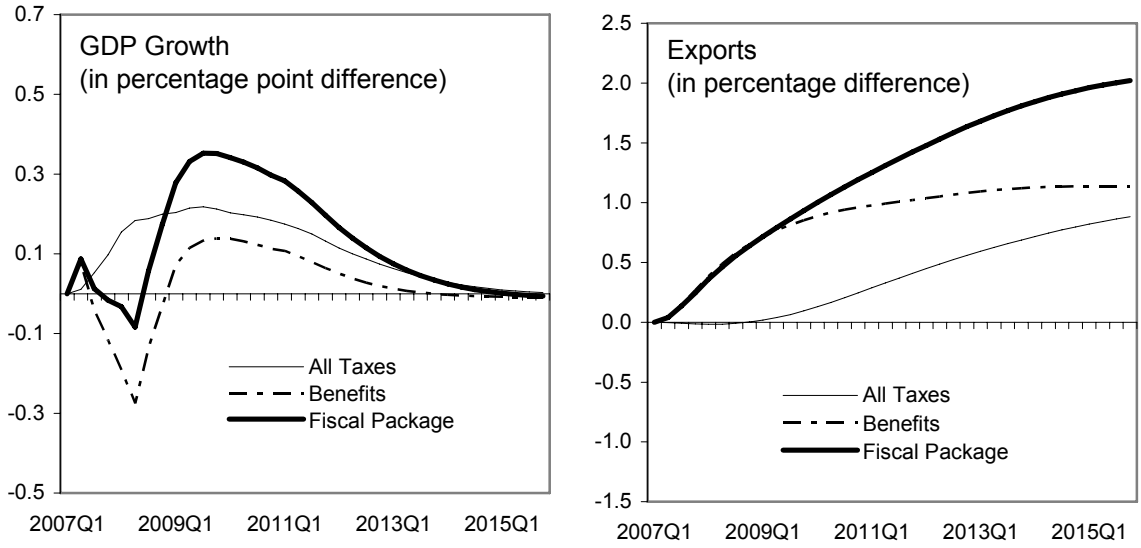
This exercise is consistent with the authorities' estimation that the fiscal package would be broadly neutral in its effects on the fiscal balance. The reduction in social expenditures would in fact more than compensate for the loss in tax revenues. The fiscal balance would improve by ½ percentage point of GDP over the whole period but would fall short of any significant fiscal consolidation.

Figure 6. Impact of the Fiscal Shock on Public Balances



The fiscal package would also be moderately expansionary. Annual growth could be spurred by over ¼ percentage point in 2009-10. Besides boosting investment through the cut in corporate income tax, the fiscal package would also spur labor participation as social transfers are curtailed and personal income taxes cut. In addition, the combination of a negative consumption demand shock and a positive supply shock would lead to a ½ percentage koruna depreciation, thereby boosting net exports. These effects would more than offset the dampening impact of the package on private consumption.

Figure 7. Impact of the Fiscal Shock on Growth and Exports



V. PROSPECTS FOR MONETARY POLICY IN THE PERIOD AHEAD

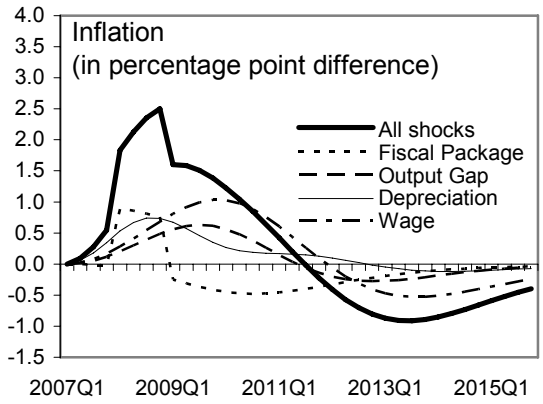
Apart from any impact of the fiscal package, formulation of monetary policy would need to also take account of the positive output gap, wage trends, and the course of the exchange rate. To that effect, we looked at the additional impact on the economy of a positive output gap of about ½ percent (triggered by a temporary boost in consumption) and of an increase in wages of about 1½ percentage points generated by the current labor shortages. Moreover, we simulated a depreciation of the koruna by 2 percent in 2008, a range that is consistent with carry trade movements observed in 2007, given the uncertainty in the behavior of the exchange rate.[11] These factors have been examined on top of the fiscal package shock to assess the full burden that could fall on monetary policy in the near future.

The various shocks add up to substantial inflation pressures. Overall inflation could be boosted by as much as 2½ percentage points above the target during 2008, out of which only

[11] Technically, the output gap shock is engineered through a temporary decrease in the households' discount factor: with a lower rate of time preference, households get more impatient and bring forward their consumption. The wage increase follows a temporary decline in the elasticity of substitution between the different type of labor provided: such a shock enhances the bargaining power of unions, who can then secure higher wages. The carry trade depreciation follows a hike in the foreign exchange risk premium of the Czech currency, which triggers de facto increase in the foreign nominal interest rate relative to the domestic one.

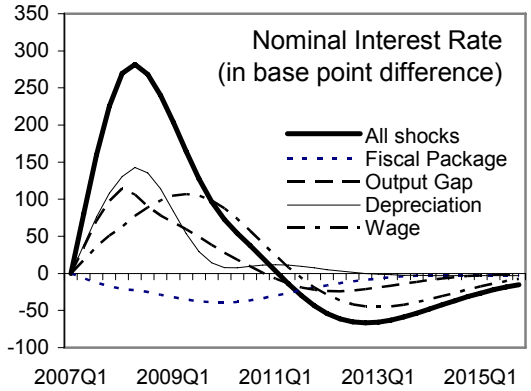
1 percentage point derives directly from the VAT hike. Koruna depreciation would generate close to ¾ percentage point additional inflation, as imports would become more expensive. An appreciation would have the opposite result. The positive output gap and wage increases impact inflation more gradually—through higher demand pressures and higher production costs, but each would still contribute ½ percentage point in 2008.

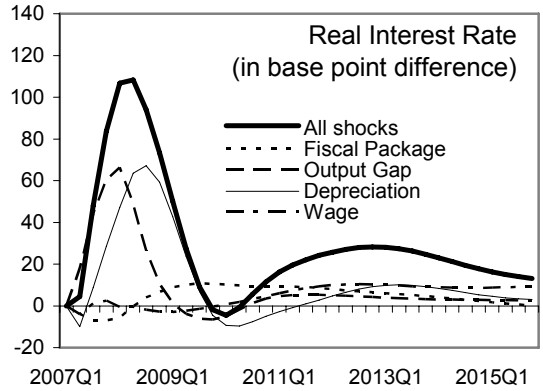
Figure 8. Impact of Fiscal, Output Gap, Wage, and Depreciation Shocks on Headline Inflation



To counteract the projected pick-up in inflation, monetary policy would need to be significantly tightened. While, as mentioned earlier, the reaction of monetary policy to the fiscal package would be muted because the monetary authorities would not react to the increase in indirect taxes, the reaction to each of the other shock would range from 100 to 150 basis points in 2008, with an overall hike of as much as 250 basis points. This sharp tightening would successfully curb inflation over 2009-10, with a return to target in 2011, but at the cost of a rise in real interest rate of close to 100 basis points at its pick.

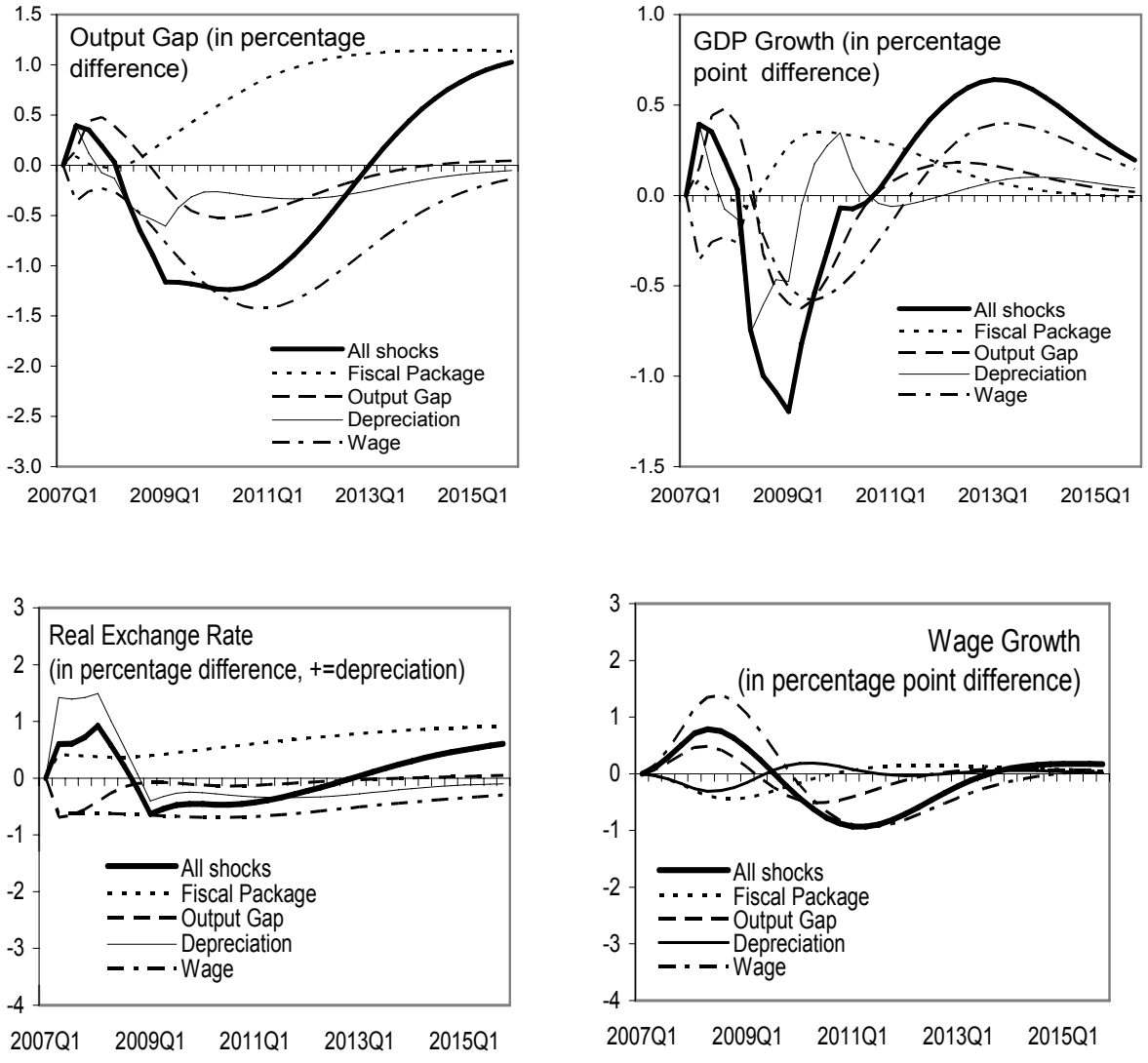
Figure 9. Response of the Interest Rates to the Fiscal, Output Gap, Wage and Depreciation Shocks





The monetary tightening would also trigger a sharp reversal in the cycle by the end of the decade. While the temporary boost in consumption and wages would abate, the delayed effects of the monetary tightening would be felt throughout 2010, sending the output gap into negative territory by the end of the decade. The wage shock would be particularly detrimental to activity, as it would reduce corporate profitability. The real appreciation of the exchange rate and ensuing loss in competitiveness would further dampen growth. Following the correction, wages would adjust downwards, further reducing consumption.

Figure 10. Impact of Fiscal, Output Gap, Wage and Depreciation Shocks on Growth, Exchange Rate and Wages

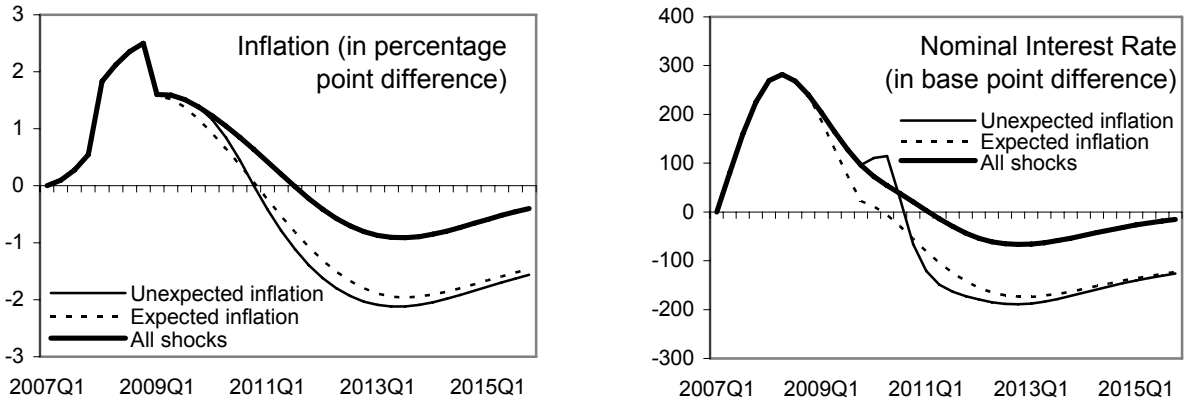


VI. Effects of Reducing the Target Rate of Inflation

The intention to lower its inflation target to 2 percent would also affect the conduct of monetary policy. The CNB has announced that the target would be lowered from 3 to 2 percent from January 2010 onwards. A lot will depend on how agents incorporate this news in their behavior. If they consider the CNB fully credible in that move, they would adjust their expectations automatically. Otherwise, the CNB may have to initially push inflation down sharply for economic agents to fully believe in the lower target. Whether the first or second scenario prevails would have a very different impact on the adjustment costs.

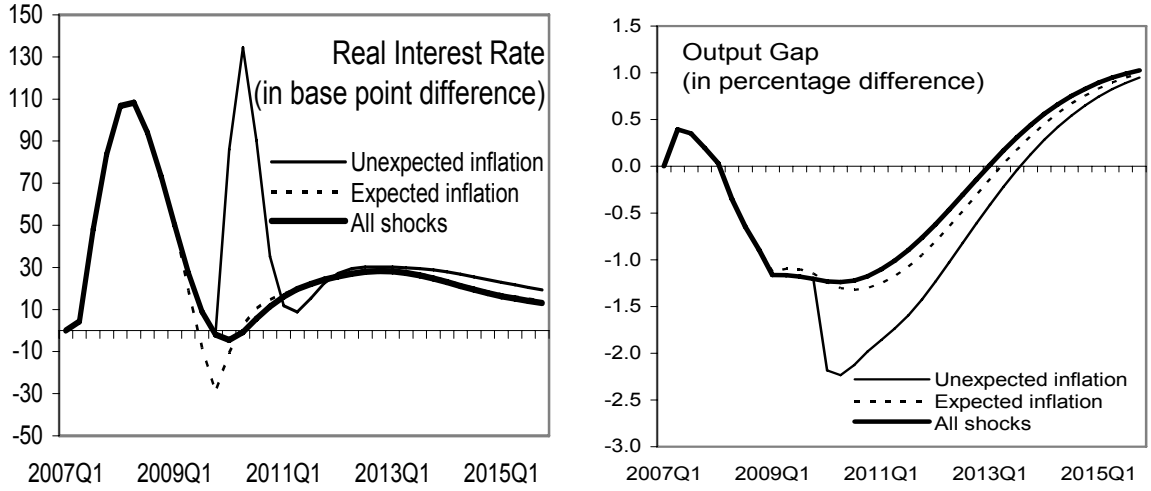
If not fully anticipated by households, the permanent reduction in the inflation target in 2010 could have significant adverse impact on the real economy. A scenario where households would only start to adjust their expectations at the time the new target is in place ("unexpected inflation" in the figures below), the model suggests that stickiness in the inflation adjustment might require an increase in the nominal interest rate of 75 basis points, on top of the earlier hikes discussed in the previous section. Furthermore, with inflation falling, real interest rates would skyrocket, resulting in a further deterioration of the output gap by some 1½ percentage points: Investment would be further hit, while the real exchange rate appreciation deriving from lower domestic inflation would weigh on exports.

Figure 11. Effects of Reducing the Inflation Target on Inflation and Interest Rates



However, if the public incorporates the reduction in the inflation target in their behavior fully in advance, the real effects will be negligible—highlighting the critical importance of communication from the CNB early on. That scenario, reflected under the heading "expected inflation" in the figures, would require no action from the monetary policy authorities, and in fact, inflation would start adjusting downwards as early as 2009. But such a scenario will require that the communication strategy of the CNB be fully successful.

Figure 12. Macroeconomic Effects of Reducing the Inflation Target



VII. CONCLUSIONS

An assessment based on the model suggests that the fiscal package by itself does not put pressure on inflation, excluding first-round tax effects, but it does not help monetary policy to cool down the other shocks affecting the economy. Although the fiscal package is relatively neutral on monetary policy-relevant inflation—that is, excluding the first-round effects of the VAT hike—, it still runs the risk of putting additional pressure on prices in the context of resource constraints, and a tightening labor market. A further reduction on the fiscal deficit will go a long way in easing the task of monetary policy of keeping inflation within target in an environment of demand-driven pressures.

Monetary policy may have to tighten again if the reduction in the inflation target in 2010 is not fully incorporated in the public behavior and inflation is above the target at that time. Strengthening the CNB's communication strategy will help avoid short-run negative effects on the real economy and quickly anchor expectations to the new target.

Fiscal policy will need to play a greater supportive role to monetary policy on the route to euro adoption. Inflation pressures in the medium term are likely to require monetary tightening. However, nominal convergence with the euro area will make it more difficult to ensure that the price stability criterion is fulfilled by means of monetary policy alone.

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Appendix I. Calibration Parameters

	Czech Republic	Euro Area
Ratios to GDP		
Labor Income Share		
In Total Economy	52.8	59.1
In Non Tradable Sector	55.6	63.9
Investment Share	28.0	18.8
Exports of Final Goods	22.4	-
Exports of Intermediate Goods	33.2	-
Imports of Final Goods	22.1	-
Non Tradable Production	61.6	71.1
Net Financial Asset Position	-15.9	-
Fiscal And Monetary Parameters		
	(in percent of GDP)	
Government Expenditures	25.9	22.2
Government Consumption	19.8	19.6
Government Investment	6.1	2.6
Government Social Transfers	20.9	25.1
Government Debt	30.4	70.6
	(in percent)	
Share In Total Revenue of ... 1/		
Consumption Tax	21.8	24.1
Capital Tax	10.5	7.0
Labor Tax	25.4	24.5
Lump-Sum Tax	42.3	44.4
Share of Cyclical Revenue Saved 2/	100.0	100.0
Inflation Target (annual)	3.0	2.0
	(in level)	
Coefficients In The Monetary Policy Reaction Function		
Lagged Nominal Interest Rate	0.75	0.5
Inflation	1.4	2.0
GDP Growth	0.4	0.5
Output-Gap	0.0	0.0
Exchange Rate	0.0	0.0

1/ These ratios were calibrated to yield average effective tax rates observed in the Czech Republic and the euro area.
2/ This corresponds to a fiscal rule that stabilizes the structural fiscal balance.

	Czech Republic	Euro Area
Households' parameters		
Share of Liquidity Constrained Consumers	0.5	0.35
Population Growth Rate (annual)	0.75	0.75
Population Ratio	1	30.8
Habit Persistence	0.7	0.7
Probability of Surviving (quarterly) 1/	0.989	0.989
Income Decline Rate (quarterly) 2/	0.98125	0.98125
Coefficient of Relative Risk Aversion	5	5
Rigidities And Competition Parameters		
Price Adjustment Costs (quarterly)	350	350
Unions	350	350
Distributors	350	350
Non Tradable Sector	350	350
Tradable Sector	350	350
Imported Final Goods	100	100
Imports Intermediary Goods	100	100
Quantity Adjustment Costs		
Retail Sector	2	2
Trade Flows of Final Goods	1	1
Trade Flows of Intermediary Goods	1	1
Capital Stock	0	0
Investment	10	10
Elasticities Of substitution Between Varieties 3/		
Non tadable Sector	11	11
Tradable Sector	11	11
Retail Sector	21	21
Distribution Sector	21	21
Unions	11	11
Importers of Final Goods	41	41
Importers of intermediary Goods	41	41

1/ Corresponds to a 50 percent probability of surviving 15 years

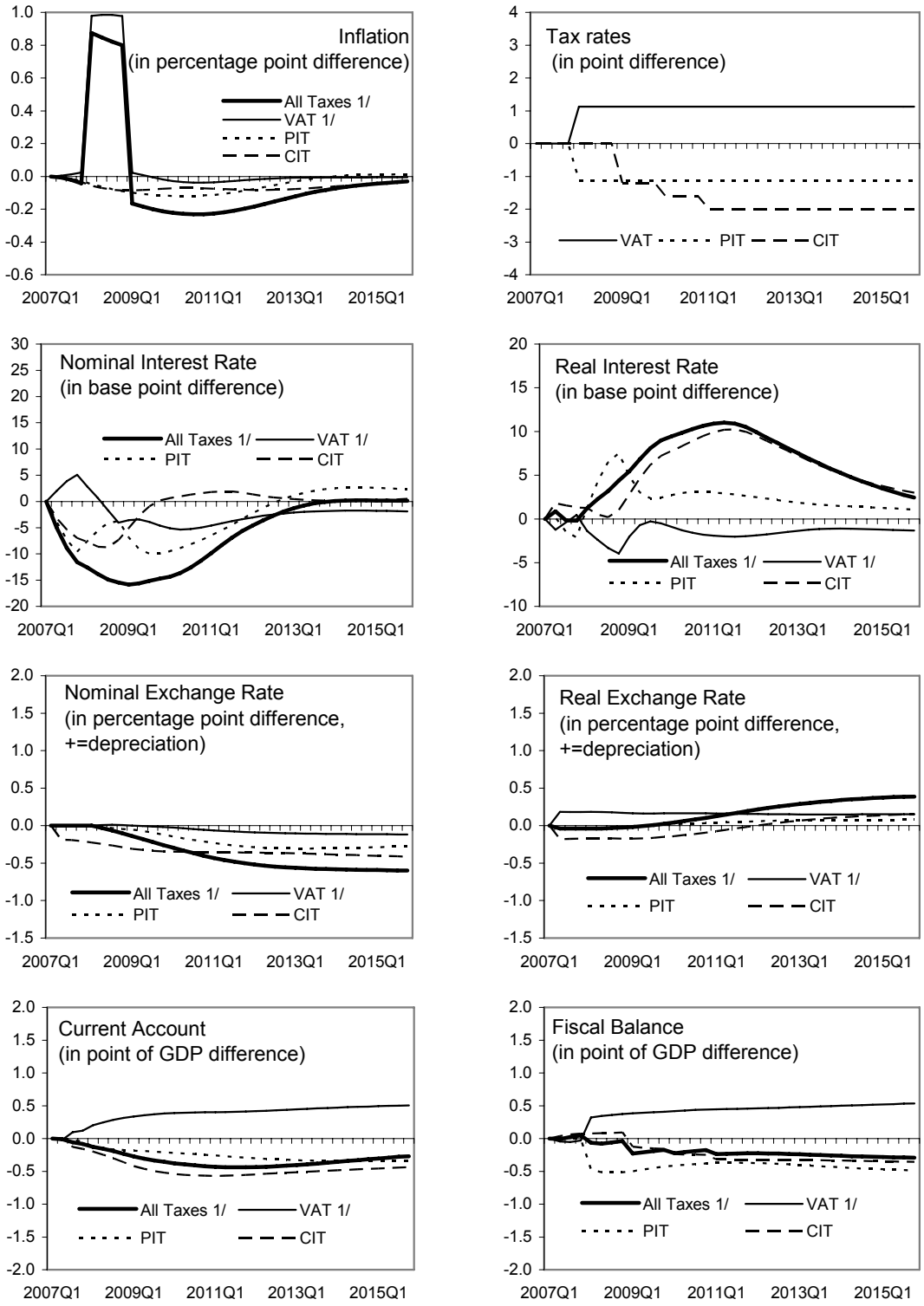
2/ This parameter captures the decline in revenue at the end of the life cycle

3/ The larger the elasticity (s) the smaller the market power of agents, and the lower the mark-of prices charged over marginal costs (s/(s-1)). An elasticity of 11 corresponds to a mark-up of 10 percent, an elasticity of 41 to a mark-up of 2.5 percent.

	Czech Republic	Euro Area
Production parameters		
	(in percent)	
Real Growth Rate (annual)	-	2.0
Real Interest Rate (annual)	-	2.2
Depreciation Rates of... (annual)		
Private Capital Stock	10	10
Public Capital Stock	4	4
Public Consumption Stock	4	4
	(in level)	
Elasticity of GDP to ...		
Public Capital Stock 1/	0.1	0.1
Public Consumption Stock 1/	0.01	0.01
Elasticity of Substitution Between ...		
Private Ouput and Public Capital	1.5	1.5
Domestic and Foreign Goods	1.5	1.5
Labor and Capital in the Tradable Sector	0.99	0.99
Labor and Capital in the Non Tradable Sector	0.99	0.99
Domestic Tradable and Non Tradable Goods	0.8	0.8
Foreign Intermediary Goods from Different Countries	0.75	0.75
Foreign Final Goods from Different Countries	0.75	0.75

1/ A 10 percent rise in public capital (resp. consumption) stock would increase GDP by 1 (resp. 0.1) percent.

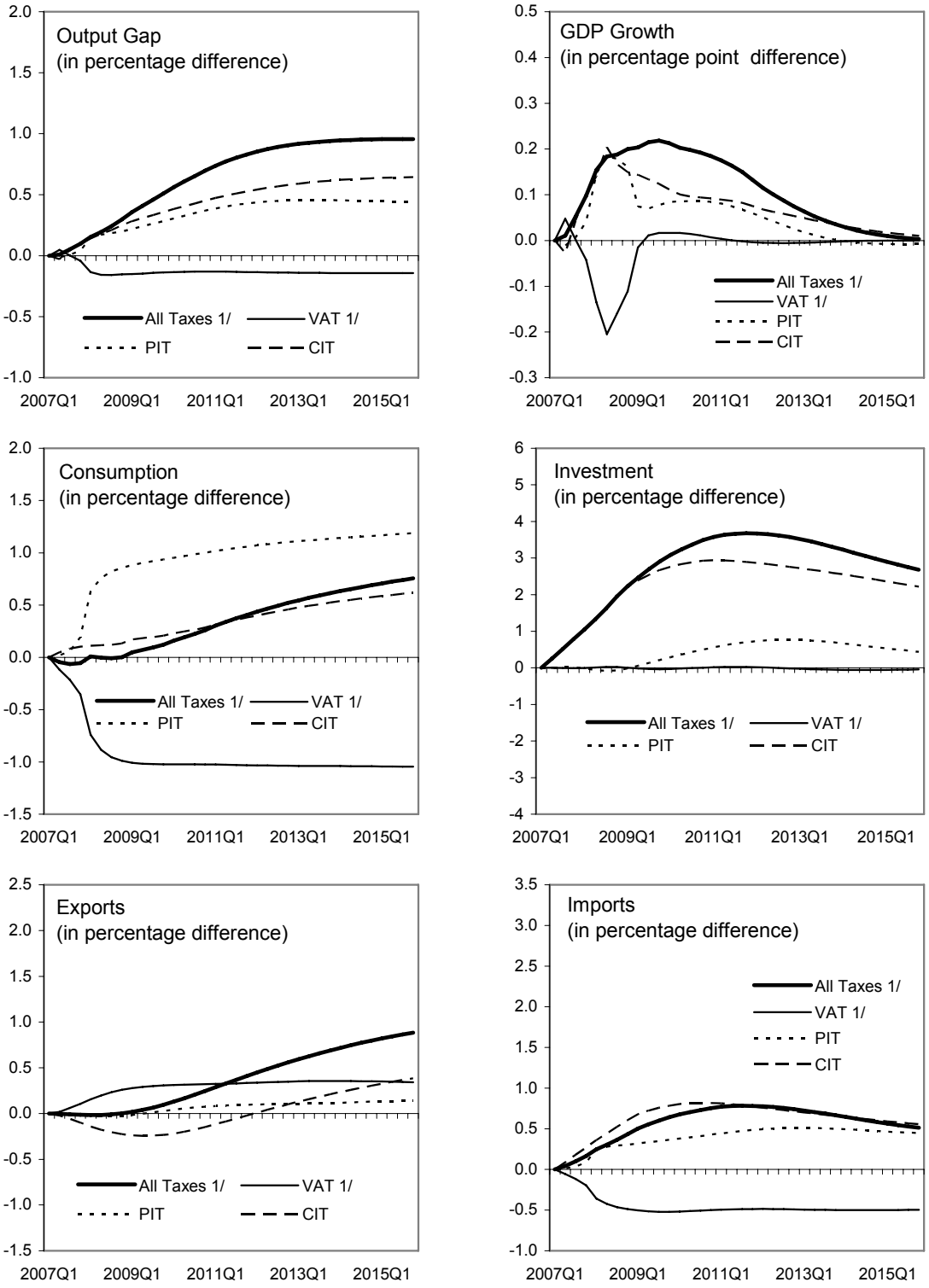
Appendix Figure 1a. Czech Republic: Tax shocks, 2007-15



Source: IMF staff estimates.

1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

Appendix Figure 1b . Czech Republic: Tax shocks, 2007-15



Source: IMF staff estimates.

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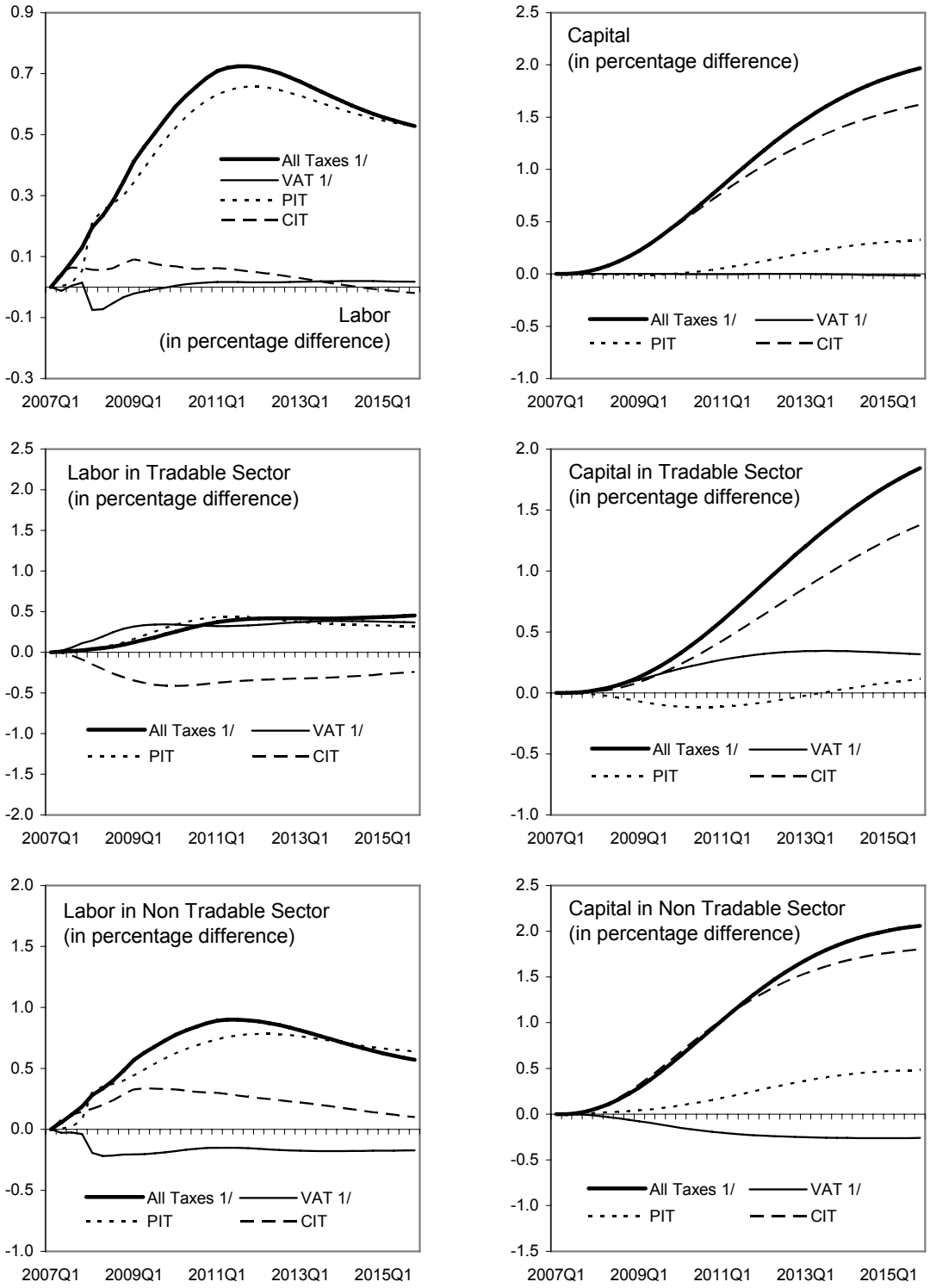
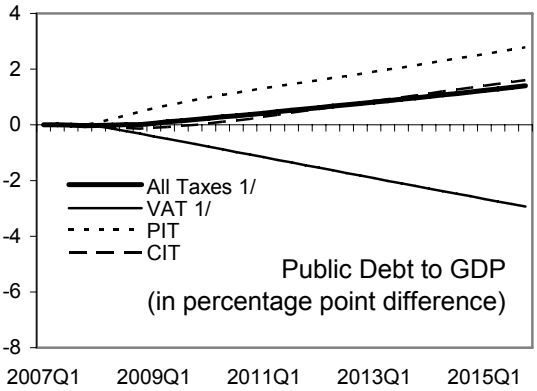
Appendix Figure 1c. Czech Republic: Tax shocks, 2007-15

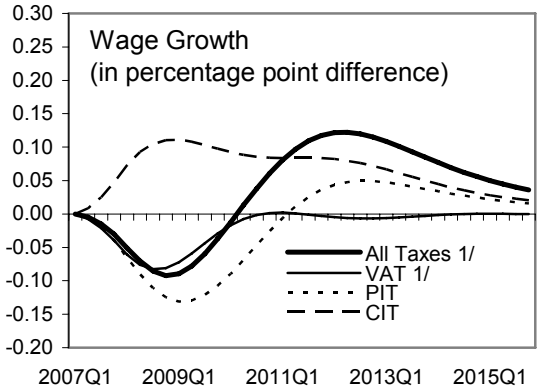


Source: IMF staff estimates.

1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

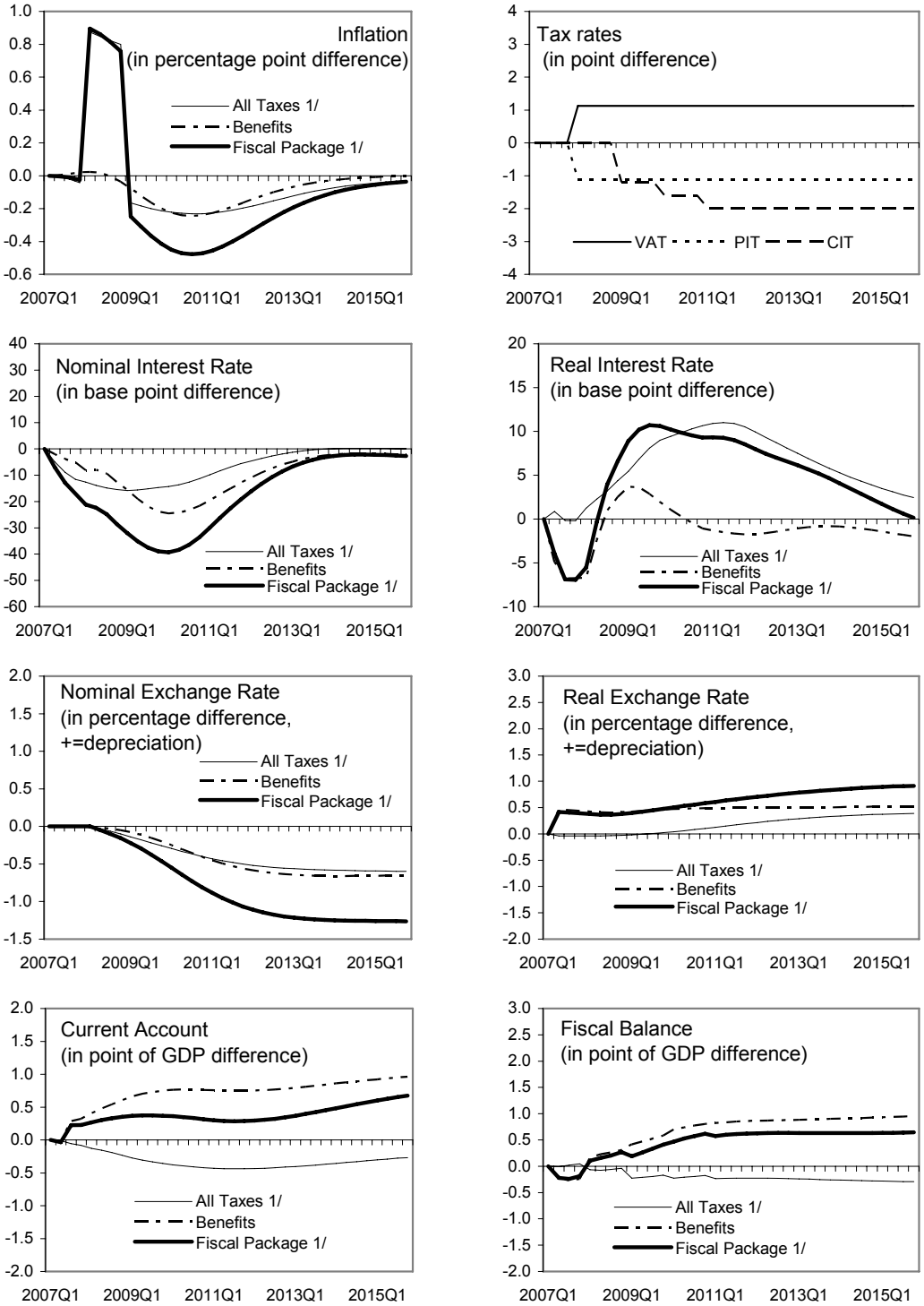
Appendix Figure 1d . Czech Republic: Tax shocks, 2007-15





Source: IMF staff estimates.
1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

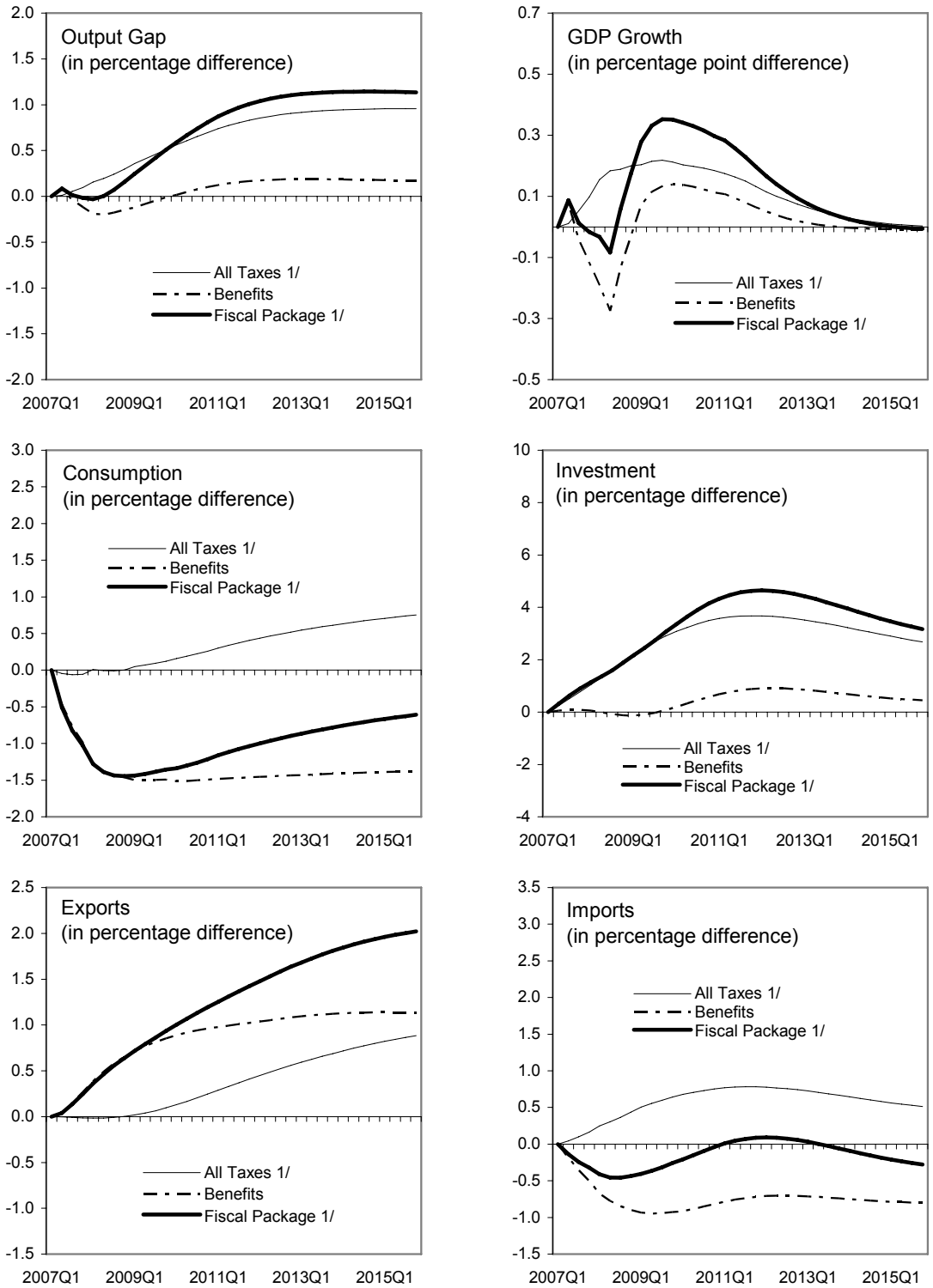
Appendix Figure 2a . Czech Republic: Fiscal shocks, 2007-15



Source: IMF staff estimates

1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

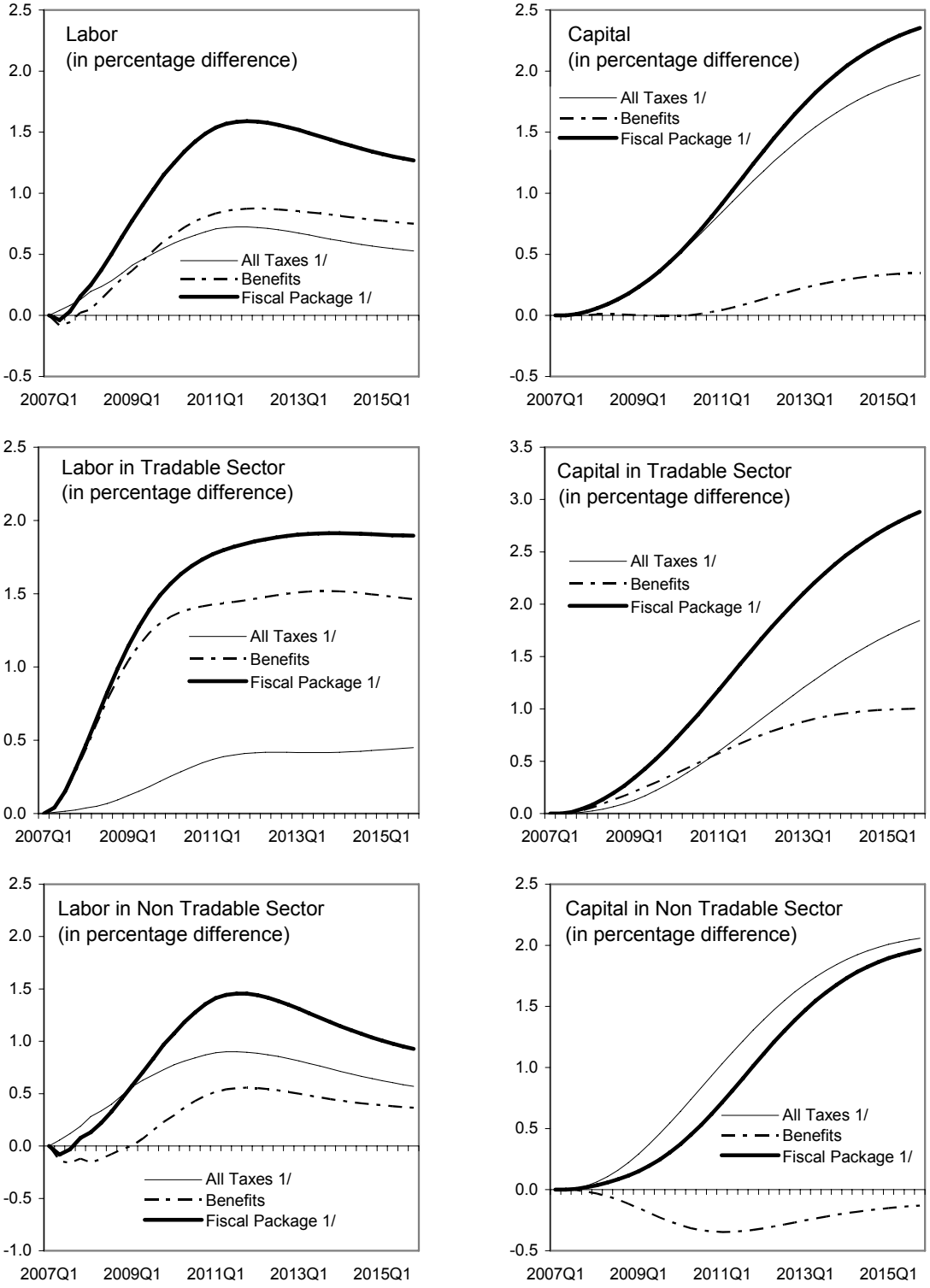
Appendix Figure 2b. Czech Republic: Fiscal shocks, 2007-15



Source: IMF staff estimates

1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

Appendix Figure 2c. Czech Republic: Fiscal shocks, 2007-15



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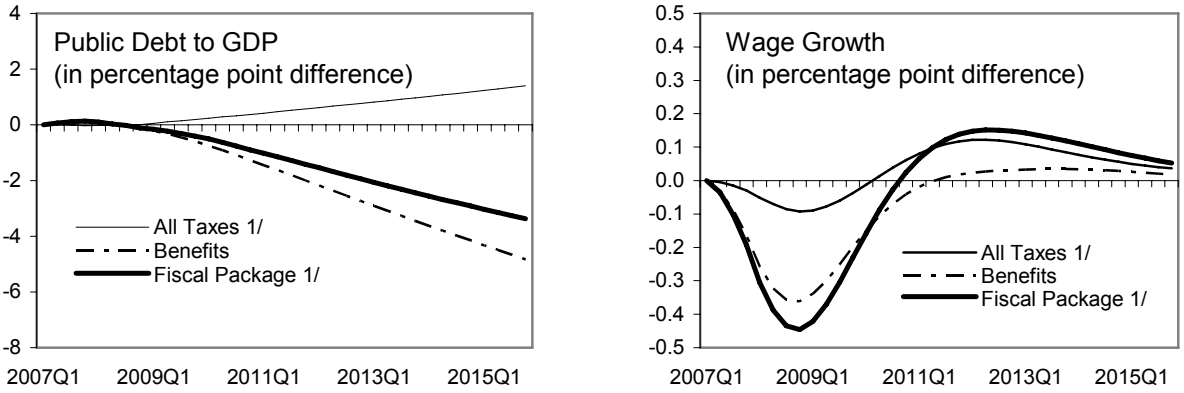
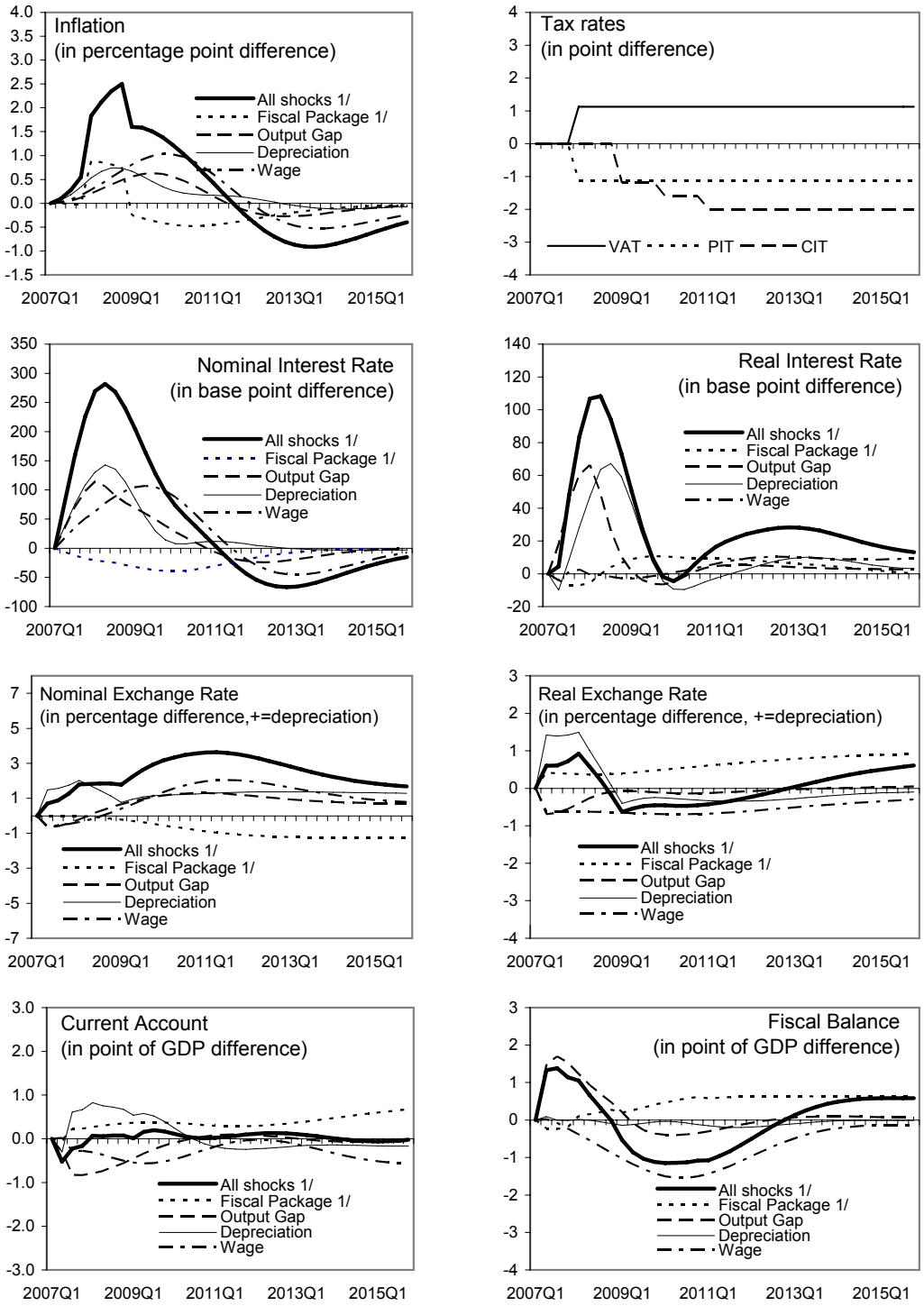
Appendix Figure 2d . Czech Republic: Fiscal shocks, 2007-15



Source: IMF staff estimates

1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

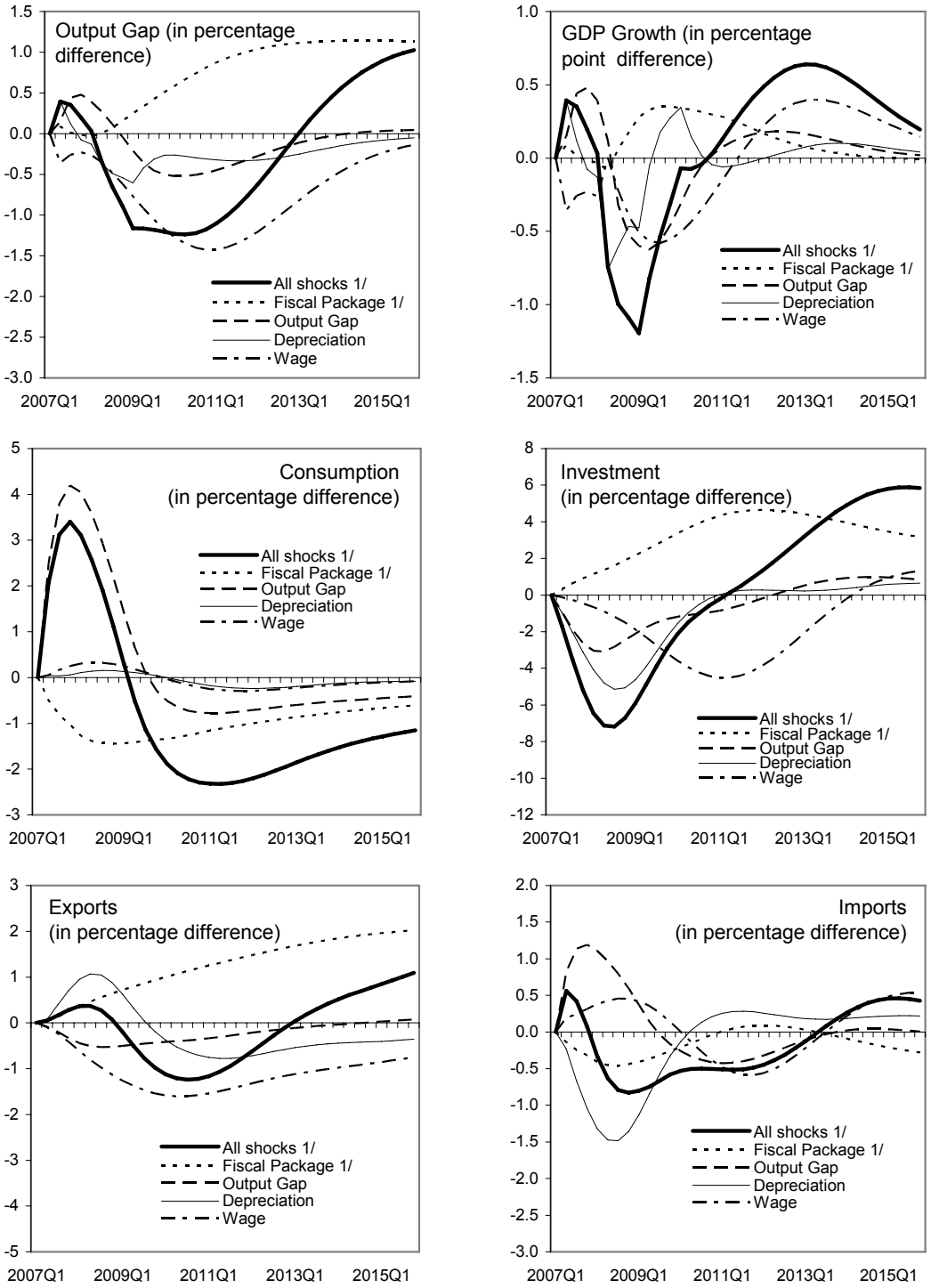
Appendix Figure 3a. Czech Republic: Fiscal, Output Gap, Wage and Depreciation shocks, 2007-15



Source: IMF staff estimates

1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

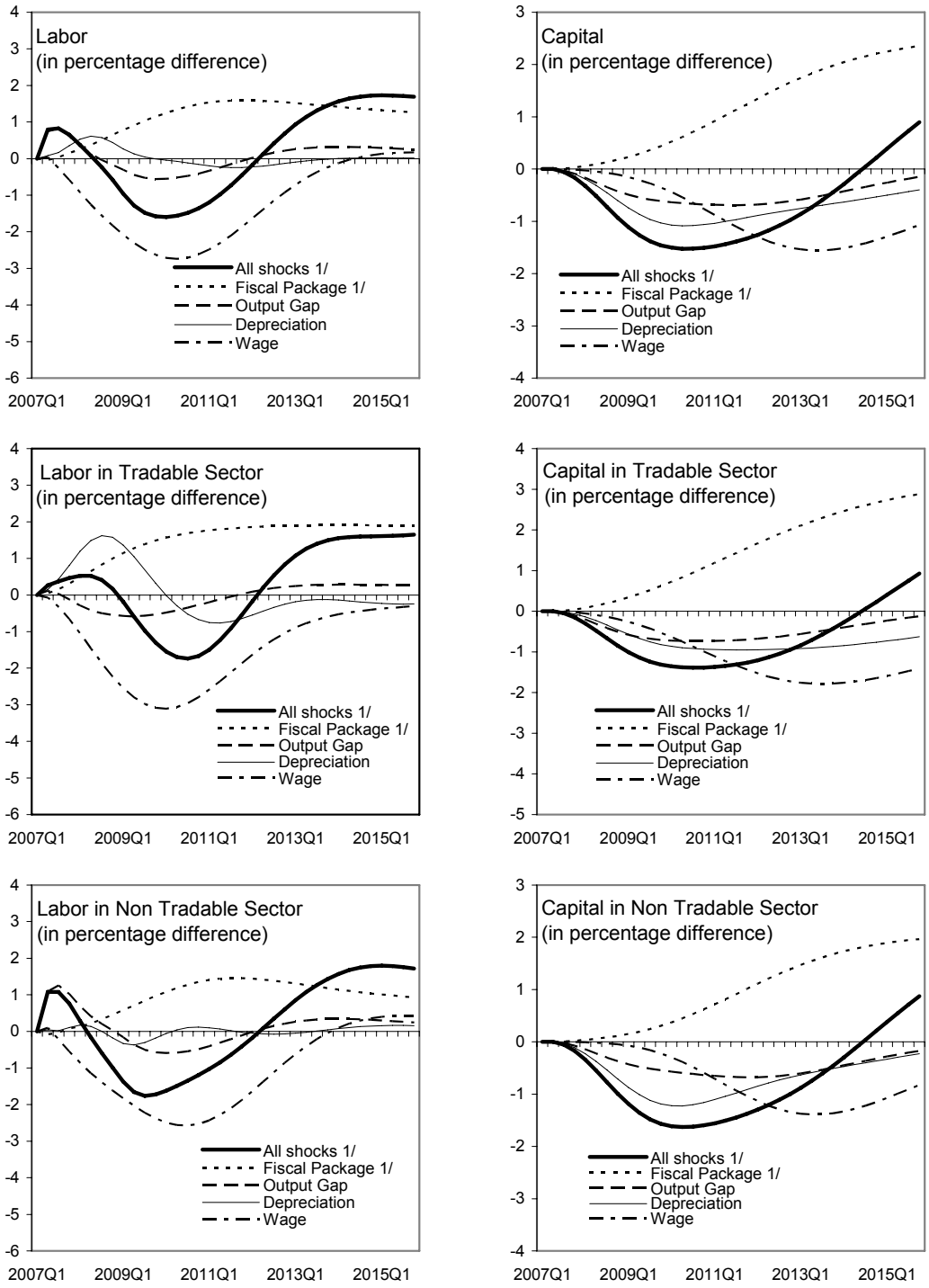
Appendix Figure 3b. Czech Republic: Fiscal, Output Gap, Wage and Depreciation shocks, 2007-15



Source: IMF staff estimates

1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

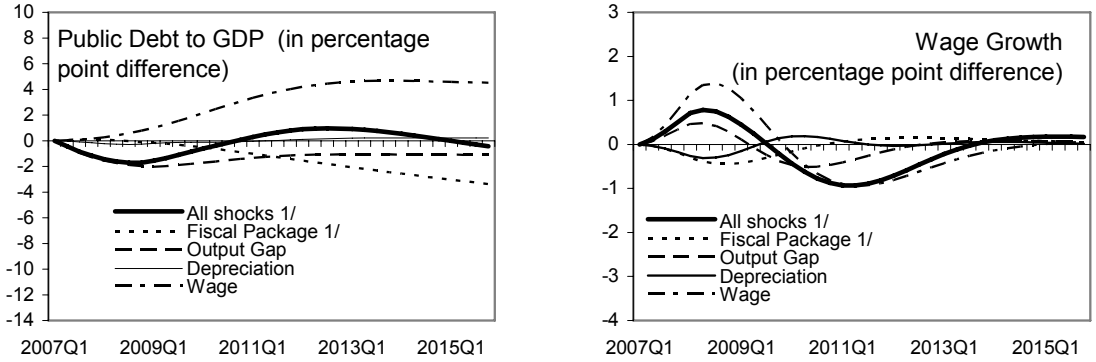
Appendix Figure 3c. Czech Republic: Fiscal, Output Gap, Wage and Depreciation shocks, 2007-15



Source: IMF staff estimates

1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

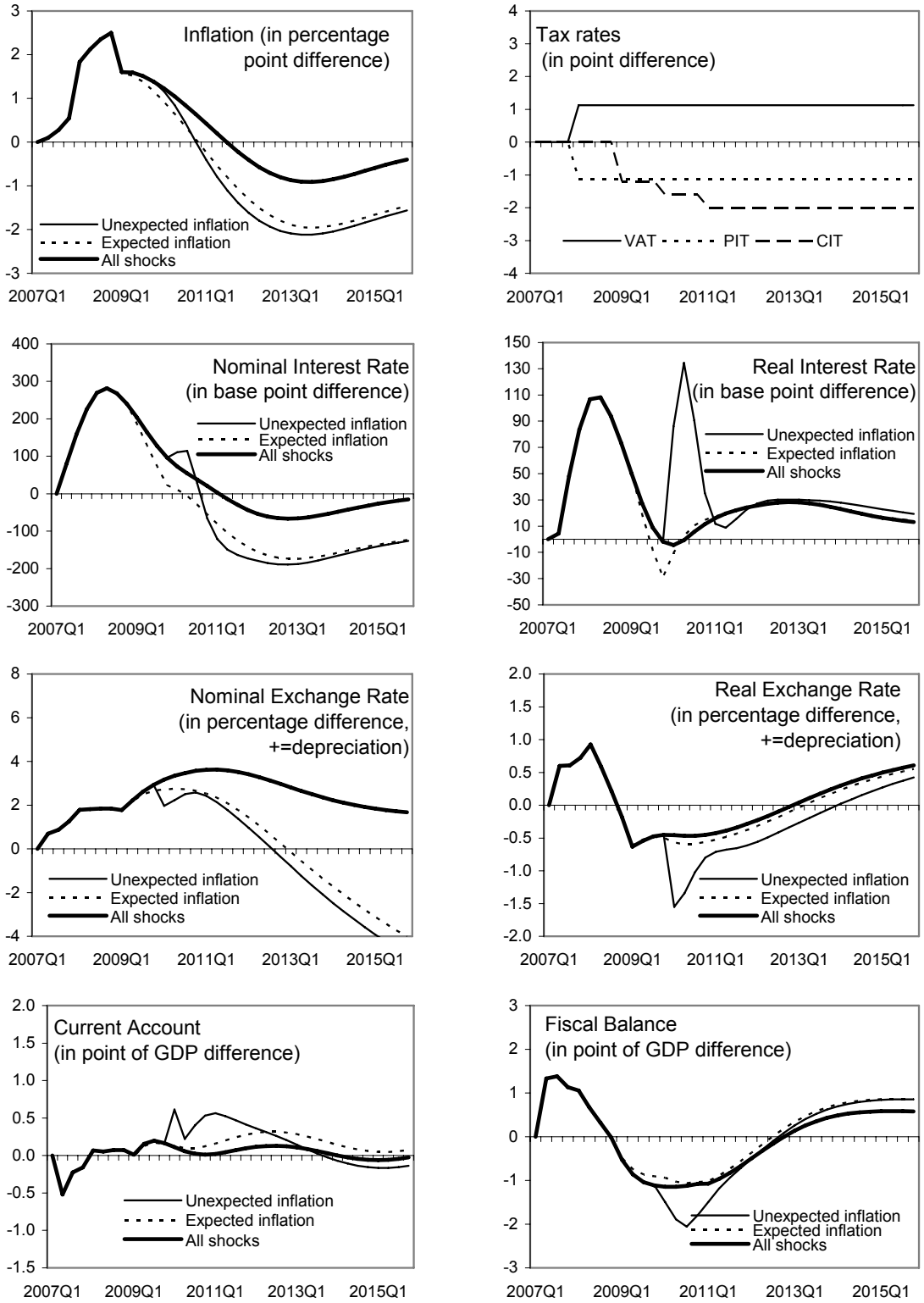
Appendix Figure 3d. Czech Republic: Fiscal, Output Gap, Wage, and Depreciation shocks, 2007-15



Source: IMF staff estimates

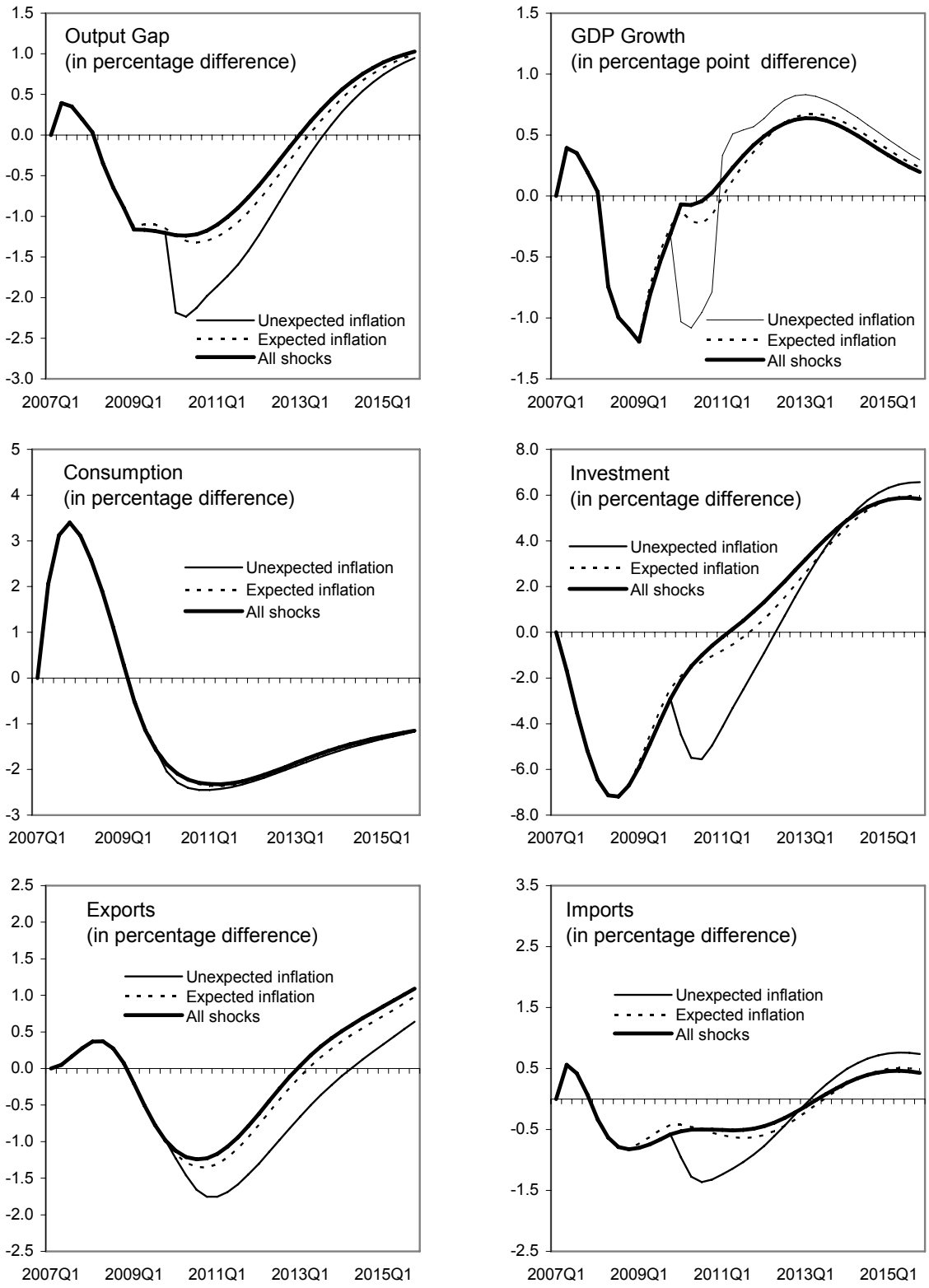
1/ First round effects are included in the headline inflation. However, they are not in the inflation indicator taken into account by monetary policy.

Appendix Figure 4a. Czech Republic: All Shocks and Reduction in Inflation Target, 2007-15



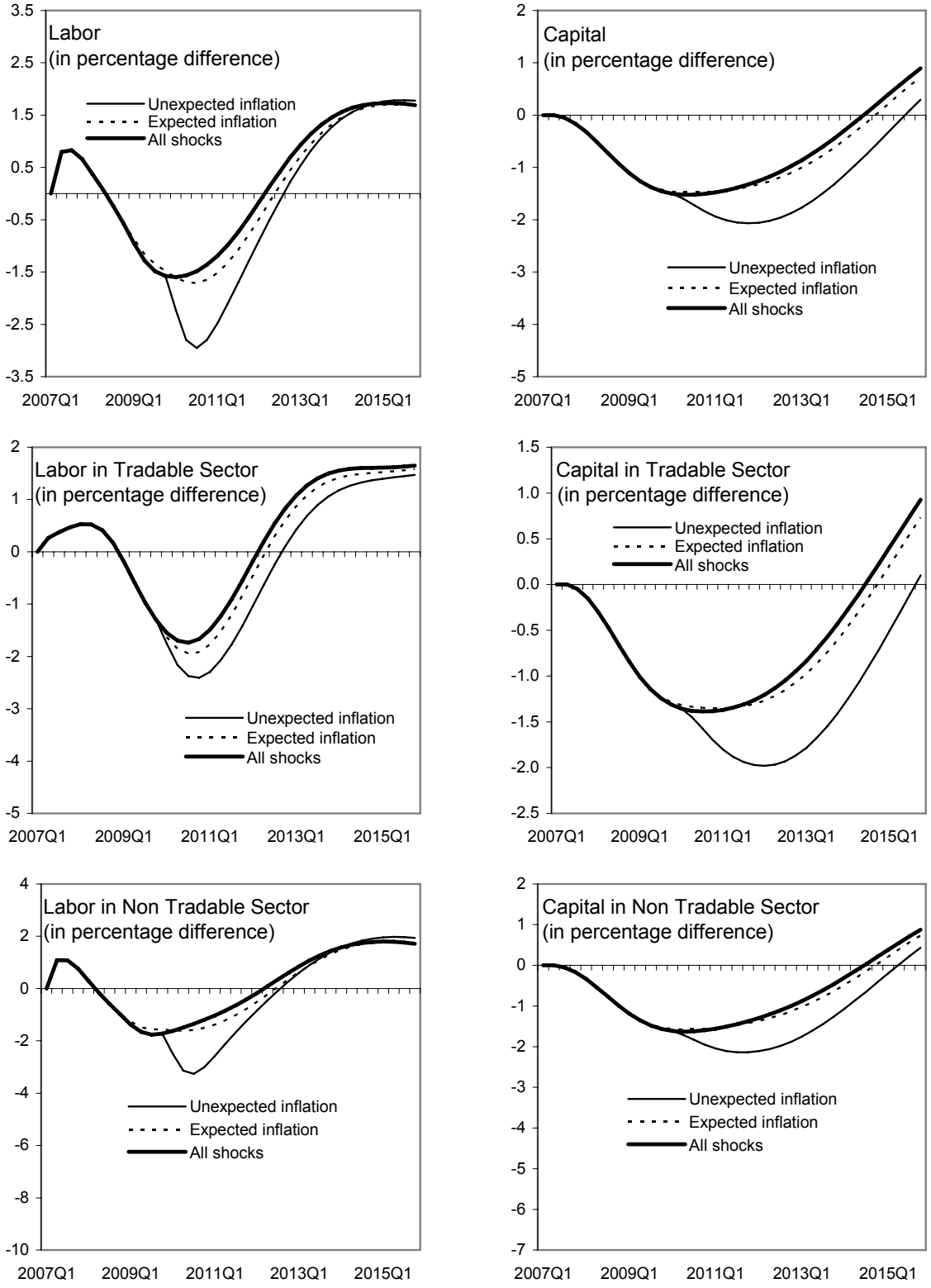
Source: IMF staff estimates.

Appendix Figure 4b . Czech Republic: All Shocks and Reduction in Inflation Target, 2007-15



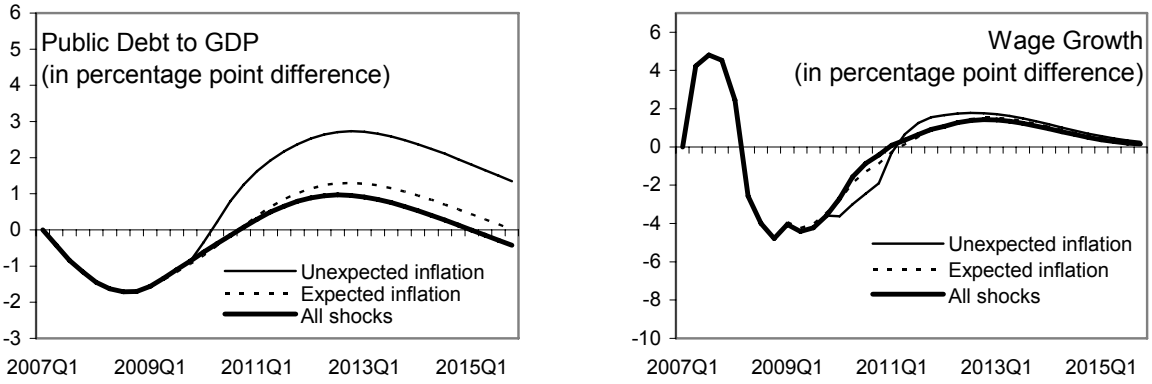
Source: IMF staff estimates.

Appendix Figure 4c. Czech Republic: All Shocks and Reduction in Inflation Target, 2007-15



Source: IMF staff estimates.

Appendix Figure 4d. Czech Republic: All Shocks and Reduction in Inflation Target, 2007-15



Source: IMF staff estimates.