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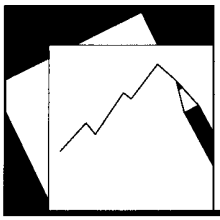

IMF Working Paper

The Composition of Fiscal Consolidation Matters:

Policy Simulations for Hungary

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The Composition of Fiscal Consolidation Matters: Policy Simulations for Hungary

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Abstract

This paper evaluates policy alternatives to achieve permanent fiscal consolidation in Hungary, based on a general equilibrium calibration. The main finding is that the composition of the consolidation, as determined by the mix of revenue and expenditure measures, has important implications for growth, employment, investment, and other key macroeconomic variables. A reduction in current expenditures yields the smallest GDP contraction in the short term and can increase output in the long term by stimulating labor participation and private investment. On the other end of the spectrum, a consolidation of government investment and corporate taxes are the most costly, as disincentives for private investment result in protracted declines in GDP that compound over time to GDP losses that are multiple times the initial size of the consolidation.

JEL Classification Numbers:E27, E62, H21, H30, H39, H50, H63

Keywords: fiscal consolidation, Hungary, DSGE models, overlapping generations households, liquidity constrained households, financial accelerator, macro-financial linkages

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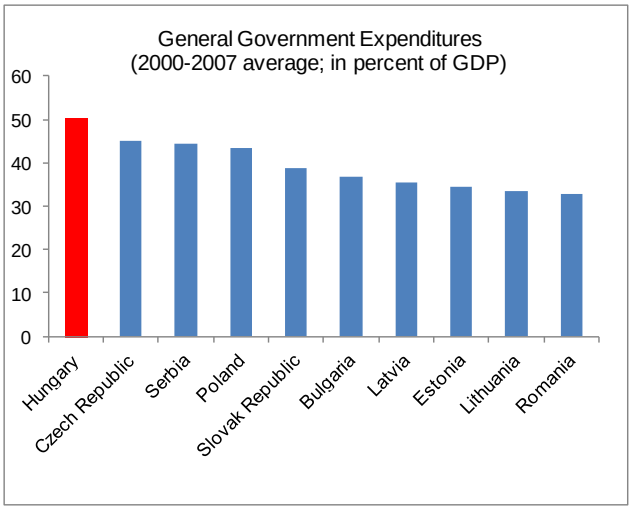
I. INTRODUCTION

This paper evaluates the impact of alternative fiscal consolidation options for Hungary. Fiscal consolidation is necessary for various reasons. First, in order to reduce risks to fiscal sustainability, particularly as public debt stands at near 80 percent of GDP at end 2012, with gross financing needs of around 20 percent of GDP annually, and with a sovereign spread that is high relative to regional peers. Second, to meet public debt and deficit targets with the EU and as committed in the Hungarian Constitution[1]. Third, in order to improve conditions conducive to growth. As the results in this paper indicate, the composition of a fiscal consolidation across tax and expenditure categories can have a deep impact on growth, both in the short and long terms, as these have a distinctive effect on investment, employment, wages, competitiveness and other critical macroeconomic indicators. Choosing the right consolidation composition is particularly critical in the case of Hungary given its large government size, at about 50 percent of GDP (text chart). Financing this level of expenditures requires a high level of tax pressure, resulting in significant allocation inefficiencies, discouraging investment and labor participation, and eroding competitiveness.



To this end, a general equilibrium model suitable for fiscal policy analysis is calibrated to the Hungarian economy. The policy simulation exercise considers seven broad instruments that can be used for fiscal consolidation. On the revenue side, the instruments include consumption taxes, corporate taxes, and labor income taxes. On the expenditure side, a reduction in government consumption, government investment, general transfers (lump-sum), and targeted transfers to liquidity-constrained consumers (lump-sum). The analysis develops in four sections. Section II provides a broad background of recent fiscal developments that provide context to the analysis. Section III presents a general description of the model used. Section IV presents the calibration of the model parameters and main ratios. Section V presents the fiscal policy simulations. Section VI concludes.

II. FISCAL POLICY CONTEXT

Fiscal consolidation in Hungary in recent years has been significant. After a period of large budget deficits and accumulation of public debt that lasted over a decade, the authorities begun a process of improving the sustainability of its fiscal accounts. At the early stages of the 2008 global financial crisis and the collapse of Lehman Brothers investment bank, and under pressure

[1] The Hungarian Constitution specifies a public debt upper threshold at 50 percent of GDP.

from a reversal in capital flows, currency depreciation, and a collapse in economic growth, Hungary was the first European nation to enter a Fund-supported program. The program included a sequence of fiscal consolidation efforts in a broad set of areas, ranging from tax policy to public employment, pensions, and in several expenditure areas. However, these efforts were never sufficient to pull Hungary out of the Excessive Deficit Procedure, a commitment with the EU to reduce fiscal deficits of the general government to below 3 percent of GDP.

Since 2010, there were recurrent efforts and a strong commitment to achieve fiscal consolidation. The starting point, however, was a reduction in the personal income tax effective in 2010, to a flat-rate system at 16 percent[2], which had an increase in labor participation as main objective. This initiative came at a significant fiscal cost, and set public finances on an unsustainable path. To compensate the revenue loss the government introduced sector-specific levies on bank, energy, and retail sectors, which are largely foreign owned. These levies were introduced as transitory, and were still insufficient to meet deficit commitments.

The impact of these measures on the fiscal accounts in 2011, however, was masked by the nationalization of the pension system, which allowed one-off revenues of 9½ percent of GDP. In that year the government launched the Szell-Kalman Plan, a reform program that focused on fiscal consolidation and structural reform. It included some ambitious fiscal reforms to be implemented during 2012 and 2013, of which around ¾ were expenditure-based. The reforms spread across a broad set of areas including on health, education, social transfers, pensions, local administrations, and transport. During 2011-2012, there were savings in the expenditure areas of goods and services, public wages, and transfers to households totaling 2¼ percent of GDP.

The Convergence Programs of 2011 and 2012 included declining fiscal deficits and public debt projections. During 2011-2012, however, deteriorating external conditions in the context of the European crisis slowed revenue performance. In response, the authorities recurrently relied on largely revenue-based fiscal consolidation packages (two in 2011 and four in 2012). These packages included an increase in the VAT rate (to become the highest in Europe at 27 percent), the introduction of multiple small taxes, increase in excises and levies, increase in social security contributions, and the introduction of simplified business and personal income tax schemes for small businesses and individuals. In 2013 the budget includes a new tax on financial transactions, and additional sector-specific taxes on insurance, utilities and telecoms. In addition the bank levy mentioned above was made permanent. On the expenditure side, the additional policies since 2011 included across-the-board expenditure restraint by way of cancelation of budgetary reserves and wage freezes.

III. MODEL OVERVIEW

The results are based on a three-region GIMF (Global Integrated Monetary and Fiscal) general equilibrium model developed in Kumhof, Laxton, Muir, and Mursula (2010) (KLMM). The

[2] Effectively, the Hungarian personal income tax is a two-rate system given that income is taxed in gross terms (including social security contributions) above a certain threshold.

three regions modeled are Hungary (HN), euro area (EU), and Rest of the World (RW). Below is descriptive presentation of GIMF key features and sectors. More details on the specific equations and a formal presentation can be found in KLMM.

A. Key Model Features

This section highlights some key model features that are useful to interpret the results.

Non-Ricardian features. The model includes several non-Ricardian features that make revenue and expenditure fiscal measures non-neutral, both in the short and long terms. In order of quantitative importance, these features include (i) overlapping generations (OLG) agents with finite lifetimes and therefore with high subjective discount rates; (ii) life-cycle income profiles that make wealth less dependent on future labor income; (iii) liquidity-constrained agents; and (iv) distortionary taxes on labor income, capital income, consumption, and imports.

Nominal and real rigidities. GIMF includes multiple nominal and real rigidities in labor markets and also in intermediate and final goods markets that result in a cascade of price rigidities as goods are traded along the production chain from primary producers to final retailers. Real rigidities include habit persistence in consumption; quantity adjustment costs in the retail sector; investment adjustment costs and variable capital utilization; and imports' adjustment costs and productivity spillovers. Nominal rigidities are included as price adjustment costs by firms, and nominal wage rigidities.

Growth. Steady-state growth is exogenous with the world economy growing at a constant rate. Population also grows at a constant rate.

Asset markets. Asset markets are assumed to be incomplete. There is complete home bias in government debt, so that all debt is held by domestic investors in the form of nominal, one-period bonds denominated in domestic currency. The only internationally traded assets are nominal one-period bonds denominated in foreign currency. Firms are also owned domestically, and households receive lump-sum dividend payments from their shareholding in domestic firms. The commodity sector is owned by both domestic and foreign households.

Risk premium. Risk premium takes the form of a foreign exchange risk premium and a sovereign risk premium. The foreign exchange risk premium is a non-linear function of current account to GDP ratio, so that the risk premium becomes higher—and at an increasing rate—as the current account deficit becomes bigger. The sovereign risk premium is set to be exogenously, and therefore it is independent from fundamentals.

Monetary policy. The monetary authority responds to economic developments and seeks to achieve an inflation target. The policy interest rate responds to inflation (concurrent and one-period-ahead forecast), the size of the inflation gap, and to lagged interest rates.

B. Economy Sectors

In broad terms, the GIMF structure includes the following framework, replicated for all three regions:

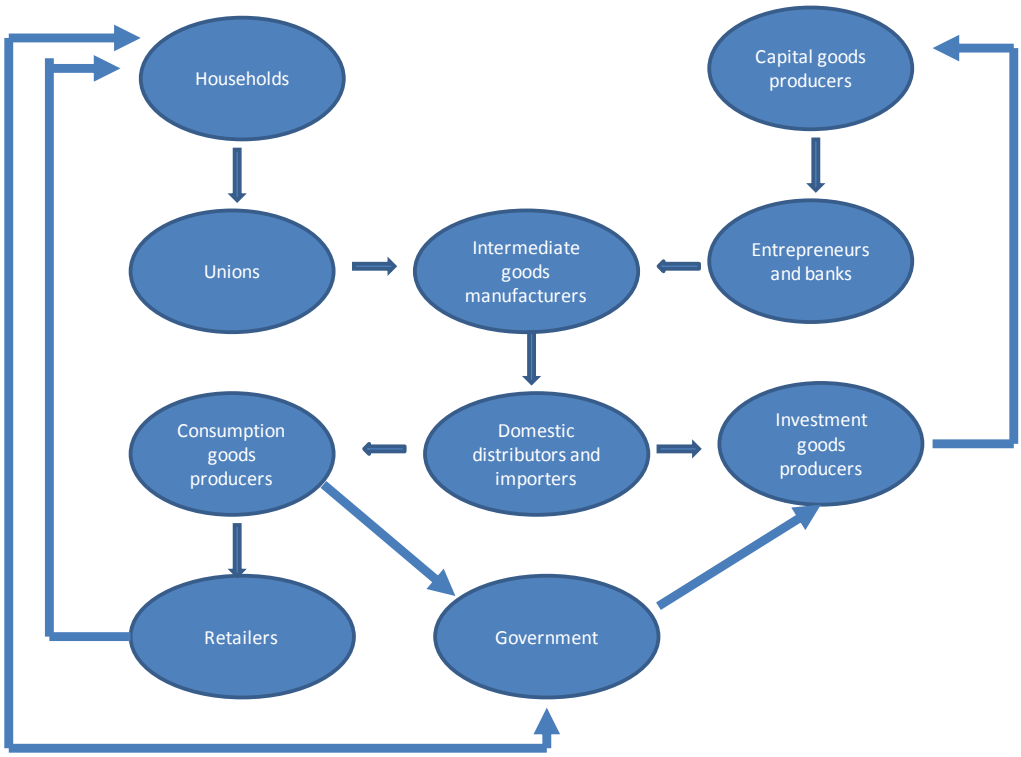
Households. There are two types of households: overlapping generations' (OLG) households with finite planning horizons (Blanchard, 1985), and liquidity constrained households (LIQ). Households consume final retailed output and supply labor to unions. Both types of households are subject to uniform labor income, consumption, and lump-sum taxes. Their income also derives from financial assets (domestic government and corporate bonds in domestic currency), international private bonds in foreign currency, and ownership of domestic firms. Households supply labor to unions. OLG households have several investment options: finance entrepreneurs through bond purchase; make bank deposits (non-contingent return), and own firm shares that yield dividends.

Firms. The production structure of the economy includes several stages, which range from primary producers to retail distributors. Each stage includes a combination of frictions in price setting and acquisition of inputs that results in a parsimonious response to shocks and also to changes in economic policy. Primary production is carried by manufacturers producing tradable and non-tradable goods. For inputs, manufacturers buy capital services from entrepreneurs, labor from monopolistically competitive unions (who buy labor from households and are subject to nominal wage rigidities), and raw materials from the world raw-materials market. Entrepreneurs receive loans from banks (subject to a zero-profit competitive constraint), which take households' deposits. Entrepreneurs then purchase capital and rent it to manufacturers, and decide the rate of capital utilization, which is subject to increasing utilization costs. In addition, the capital stock is subject to shocks that can result in bankruptcy and undermine entrepreneurs' loan repayment ability. Banks are subject to monitoring/state verification costs. Manufacturers are subject to nominal rigidities in price setting, and also to real rigidities in labor hiring and in the use of raw materials. Capital goods' producers are subject to investment adjustment costs, and finance their activities from a combination of domestic and foreign sources. Manufacturers' domestic sales are purchased by distributors, while foreign sales are purchased by import agents that are domestically owned but are located in each export destination region (who then sell their product to foreign distributors).

Distributors. A distribution sector assembles non-tradable goods along with domestic and foreign tradable goods with imported inputs, with changes in the latter being subject to adjustment costs. This private sector output is then combined with a publicly-owned capital stock (infrastructure) and foreign output in order to produce domestic final output which is sold to consumption goods' producers, investment goods producers, and to final goods import agents located at foreign country. Distributors are subject to nominal rigidities (sticky price setting). Consumption goods output is sold to retailers and the government; investment goods output is sold to domestic capital goods producers and the government.

Retailers. A monopolistically competitive retail sector sells the goods to consumers at flexible prices, but with adjustment costs associated with changes in sale volumes. This feature contributes to generate inertial consumption dynamics, allowing a smoother path of consumption consistent with time series data. Retailers combine final consumption good composite from consumption goods producers and raw materials from raw materials producers. They are subject to adjustment costs to changes in raw material inputs. Their price setting is subject to real rigidity by way of costly adjustments of sale volume to changes in demand.

Figure 1. Simplified Presentation of GIMF Sectors 1/



1/ Arrows indicate flow exchange of goods and/or services among sectors. These sectors are replicated for each of the three regions. A more detailed diagram representation can be found in KLMM.

Government. The government utilizes domestic and foreign inputs to produce a government consumption good. In addition, the government spends in public capital (infrastructure), which is used as an input in private production, as explained above. Finally, the government also makes lump-sum transfers to households. Government expenditures are financed with debt issuance, and several forms of distortionary taxes (as mentioned above), plus lump sum taxes. This means that fiscal policy consists of public investment, public consumption, transfers to HH, lump sum taxes, consumption taxes, investment income taxes, and labor taxes. Notice that the production of a government good is introduced to allow import content in government output (often high content of investment goods and low content of consumption goods). Government allocation of resources therefore plays a key role for the real economy, especially as government investment augments the stock of infrastructure and results in protracted and long-lasting effects on private investment, and labor supply and demand. Fiscal policy is modeled so that it complies with two objectives: debt sustainability, and cycle smoothing. Non-explosive debt dynamics are ensured adjusting expenditure to stabilize the overall fiscal balance at a long-run level chosen by policy (long-run debt ratio target). Stabilization of the business cycle is achieved through a structural balance rule that responds to the size of the output gap.[3]

[3] The Hungarian authorities expressed commitment to pass legislation for the adoption of an European-style structural balance rule for the general government before the end of 2013.

IV. CALIBRATION

This section calibrates the GIMF model to key features of the Hungarian economy. When there are no specific estimates for Hungary, main structural parameters are kept the same as KLLM, in line with the literature. Other parameters are derived from national accounts, ComTrade, and GFS databases. Table 1 lists the main long-run assumptions, which correspond to the steady state. It represents the baseline projection against which the policy simulations are compared in the following sections.

Hungary represents 0.15 percent of world population and 0.25 percent of world GDP (PPP adjusted). The steady-state world technology growth rate is set at 1.5 percent per year, and the world population rate is set to grow at 1 percent. Inflation was set at 2 percent in Hungary and the euro area (EU), and at 2.5 percent in the rest of the world (RW). The world real interest rate is equalized across countries at 3 percent per annum[4]. The external financing premium function is calibrated to produce 250 basis points premium over international interest rates at steady state net foreign liabilities to GDP ratio of 0. Factor shares in aggregate production are set at 40 percent for capital and 60 percent for labor for the three regions. The calibrated shares of labor for the Hungarian tradable sector is 54 percent, and for the non-tradable sector is 71 percent, which are higher than in the other two regions.

The liquidity constrained agents are assumed to represent 30 percent of consumers in Hungary, 30 percent in the euro area and 40 percent in the rest of the world. The share of these agents in dividend income is assumed to be half of their share in the population. The real and price adjustments costs are calibrated to yield plausible dynamics over the first couple of years following the shock. The calibrations of the parameters affecting preferences, economic sectors, and other structural parameters are presented in Appendix I.

Table 1 also shows the decomposition of steady-state GDP at producer prices into its expenditure components. Investment shares are set at 17.8 percent for Hungary, 18.3 percent for the euro area and 20 percent for the rest of the world. The rest of the expenditure shares are obtained endogenously from the evolution of the economy, including as a result of preference and technology parameters. The resulting values are in line with the historical data.

The bottom section of Table 1 shows the calibrations for the government revenue and expenditure shares in percent of GDP. Revenues are set at 45 percent of GDP (general government), in line with recent historical trends. The long-term debt target is set at 50 percent, which is the upper threshold set in the Hungarian Constitution. This long-term steady state debt stock, together with equilibrium interest rates and long-term growth, result in a primary surplus of ¼ percent of GDP in steady-state. Government consumption is calibrated at 17.5 percent of GDP for Hungary, which is about the value of the sum of general government expenditure in goods and services and wages and salaries. Investment is calibrated at 3 percent of GDP, also

[4] The subjective (or "pure") discount factors are calculated consistent with these values.

Table 1. Calibration

	HN	EU	RW
GDP (% of World Nominal)	0.25	22.24	77.51
Production Function (% of GDP)			
Capital/GDP (CAPITAL)	40	40	40
dividend income (DIVINCOME)	6.407	5.233	1.464
capital income (CAPINCOME)	33.593	34.767	38.536
Labor (LABOR)	60	60	60
nontradables (LABOR_NTG)	66	66	66
tradables (LABOR_TG)	51	51	51
Factor Shares (% total)			
Tradables Production			
capital (FACSHARE_KT)	45.509	46.184	48.242
labor (FACSHARE_LT)	54.491	53.816	51.758
Nontradables Production			
capital (FACSHARE_KN)	29.482	30.355	33.02
labor (FACSHARE_LN)	70.518	69.645	66.98
National Expenditure Accounts (% of GDP)			
Consumption (CONS)	61.70	58.20	60.50
liquidity-constrained (C_LIQ)	14.05	12.76	18.66
forward-looking (C_OLG)	47.65	45.44	41.84
Investment (INV)	17.80	18.30	20.00
Government Expenditures (GOV)	20.50	23.50	19.50
on consumption			
total (GOVCONS)	17.50	20.50	17.00
on investment (GOVINV)	3.00	3.00	2.50
Net Exports (TBAL)	0.00	0.00	0.00
Exports (EXPORTS)	78.89	20.15	5.75
final goods (EXPORTS_D)	60.25	14.67	3.43
intermediate goods (EXPORTS_T)	18.64	5.48	2.33
Imports (IMPORTS)	78.89	20.15	5.75
final goods (IMPORTS_D)	50.68	12.09	4.20
consumption goods (IMPORTS_C)	32.04	8.22	2.55
investment goods (IMPORTS_I)	18.64	3.87	1.64
intermediate goods (IMPORTS_T)	28.21	8.07	1.55
National Income Accounts (% of GDP)			
Wage Income (WAGEINCOME)	42.00	35.50	46.50
Dividend Income (DIVINCOME)	6.41	5.23	1.46
Capital Income (CAPINCOME)	33.59	34.77	38.54
Taxes on Wages (TAXREV_L)	18.00	24.50	13.50
Taxes on Capital (TAXREV_K)	2.50	2.80	3.60
Interest Rates (Levels in %)			
Nominal Policy (INTMP)	4.98	4.98	5.47
Nominal Short-Term (INT)	4.98	4.98	5.47
Real Short-Term (RR)	3.00	3.00	3.00
Fiscal Sector (% of Nominal GDP)			
Govt Spending (G)	44.74	40.06	27.79
Govt Consumption (GOVCONS)	17.50	20.50	17.00
Govt Investment (GOVINV)	3.00	3.00	2.50
Transfers	24.24	16.56	8.29
general (TRANSFER)	24.24	16.56	8.29
targeted (TRANSFER_TARG)	0.00	0.00	0.00
OLG (TRANSFER_OLG)	0.00	0.00	0.00
LIQ (TRANSFER_LIQ)	0.00	0.00	0.00
Govt Revenue (GOVREV)	45.00	40.50	28.00
Tax Revenue (TAXREV)	45.00	40.50	28.00
lumpsum (LSTAX)	6.50	2.50	1.90
labor (TAXREV_L)	18.00	24.50	13.50
capital (TAXREV_K)	2.50	2.80	3.60
consumption (TAXREV_C)	18.00	10.70	9.00
Government Debt (B)	50.00	85.00	40.00
government deficit (GOVSUR)	2.18	3.71	1.93
primary balance (PRIMSUR)	0.26	0.44	0.21
interest payments (INTCOST)	2.44	4.15	2.14

consistent with historical trends[5]. The calibrations for EU and RW are also displayed in the second and third columns of Table 1.

Table 2. Trade Matrix

	HN	EU	RW
GDP (% of world nominal GDP)	0.249	22.241	77.510
Population Size (% of world)	0.150	5.121	94.729
Aggregate Exports (EXPORTS)	78.887	20.154	5.751
to Hungary	...	0.498	0.110
to Euro Area	44.344	...	5.641
to Rest of World	34.543	19.656	...
Final Goods (EXPORTS_D)	60.245	14.673	3.426
to Hungary	...	0.340	0.065
to Euro Area	33.575	...	3.360
to Rest of World	26.670	14.333	...
Intermediate Goods (EXPORTS_T)	18.642	5.481	2.325
to Hungary	...	0.158	0.045
to Euro Area	10.769	...	2.280
to Rest of World	7.873	5.323	...
Aggregate Imports (IMPORTS)	78.887	20.154	5.751
from Hungary	...	0.497	0.111
from Euro Area	44.501	...	5.640
from Rest of World	34.386	19.657	...
Final Goods (IMPORTS_D)	50.679	12.087	4.198
consumption goods (IMPORTS_C)	32.037	8.221	2.554
investment goods (IMPORTS_I)	18.642	3.866	1.644
from Hungary	...	0.376	0.086
from Euro Area	30.384	...	4.113
from Rest of World	20.295	11.711	...
Intermediate Goods (IMPORTS_T)	28.208	8.067	1.553
from Hungary	...	0.121	0.025
from Euro Area	14.117	...	1.527
from Rest of World	14.091	7.946	...

Table 2 presents the international trade flows among the three regions, as obtained from the Comtrade and Dots databases. It is important to notice that the model's internal consistency requires that world trade is balanced in net terms. Exports for Hungary are set at near 80 percent, somewhat below current estimates (affected by recession in the context of the global crisis), but in line with historical trends. Of this, about ¾ is final goods and ¼ is intermediate goods. In a steady-state, the model requires that aggregate exports are equal to aggregate imports, so the later are also at near 80 percent of GDP. About ¼ of total imports are investment goods, and the rest is divided between consumption goods and intermediate goods in roughly the same amounts.

Table 3 shows the parameter calibrations for the monetary authority's endogenous policy response and also for fiscal policy. The central bank responds to lagged interest rates, the

[5] It is expected that government investment will increase in the near future to around 4 percent of GDP as a result of an increase in EU transfers, which are largely allocated to public investment. The calibration therefore assumes that public investment returns to levels similar to those observed in recent years afterwards.

inflation gap between CPI and core prices, and CPI inflation (concurrent and one-period-ahead expected, see KLLM for details). Fiscal policy responds to the size of the output gap. The government endogenous rule targets a stabilization of the overall fiscal surplus around its steady state level, but allows larger deficits (surpluses) if output is below (above) potential. The sensitivity of the response of the surplus has been calibrated to fit the historical data series. Notice that this fiscal policy rule is not as the one introduced in 2012, which is anchored around the stock of public debt.[6] However, under the EU rules, members are expected to start the process for the adoption of structural balance rules, in line with the calibrated rule. As the analysis focuses on long-term implications of permanent fiscal consolidations, it is assumed that Hungary adopts a structural balance rule within the not too distant future.[7]

Table 3. Policy Rules

	HN	EU	RW
Monetary: Weight on the			
lagged interest rate (DELTAI)	0.25	0.30	0.30
inflation gap			
core (DELTAPIE)	0.50	1.13	0.75
weight on inflation:			
contemporaneous (PIEWT0)	0.80	0.25	0.25
1 Periods Ahead (PIEWT1)	0.20	0.75	0.75
real output gap (DELTAY)	0.00	0.00	0.00
real output growth (DELTAYGR)	0.00	0.00	0.00
nom. exchange rate target(DELTAE)	0.00	0.00	0.00
NEER (DELTANEER)	0.00	0.00	0.00
Fiscal: weight on excess			
output gap (DAMP_GDPGAP)	0.25	0.49	0.35
government debt (DAMP_DEBT)	0.00	0.00	0.00
inflation (DAMP_PIE)	0.00	0.00	0.00
tax revenues (DAMP_TAX)	0.00	0.00	0.00

V. POLICY SIMULATION: FISCAL CONSOLIDATION INSTRUMENTS

The policy simulation exercise considers seven broad instruments that can be used for fiscal consolidation. On the revenue side, the instruments include consumption taxes, corporate taxes and labor income taxes. On the expenditure side, a reduction in government consumption, government investment, general transfers (lump-sum), and targeted transfers to liquidity-constrained consumers (lump-sum). For comparability purposes all instruments are calibrated to achieve 1 percent of GDP permanent improvement in the overall fiscal balance starting in 2013. Figure 2 shows graphically the policy simulations. Each chart has seven lines representing the evolution of the indicator in the chart title for each of the seven fiscal consolidation instruments.

[6] According to this rule, if GDP growth is positive, the growth of the nominal debt stock for the next budget period (d) cannot exceed the difference between inflation (p) and half the real GDP growth rate (g): $d < (p - ½\, g)$. If growth is negative, however, any fiscal deficit is allowed, subject to other institutional constraints.

[7] See footnote 3.

All charts are expressed as deviations in percent of GDP from the baseline simulation (no policy change). Notice that these simulations assume that the fiscal space created by interest savings is spent as government consumption, so that to keep the overall balance consolidation constant at one percent of GDP (Figure 2). As a result, the primary surplus deteriorates over time after the initial adjustment, while interest expenditures gradually decline (see charts on primary balance and interest expenditure). Other differences across simulations are determined by the endogenous behavior of all participants in the economy, as per the parametric calibration.

The first observation is that a fiscal consolidation is more effective in reducing public debt to GDP if it reduces government consumption or induces a decline in private consumption. The simulations indicate that in all cases the public debt would be between eight and ten percent of GDP lower than the baseline by 2025, depending on the policy instrument used.

Consolidation of Government Investment

A fiscal consolidation achieved by cutting public investment appears as the least desirable option, both in the short and long terms. The impact on output is the most severe and protracted of all instruments considered (Figure 3). There is a sustained decline in GDP relative to baseline of about 1 percentage point every five years for every percentage point of fiscal consolidation. By 2025 GDP is three percent lower than baseline, and five percent by 2050.

Aggregate demand declines immediately by about 0.5 percent of GDP. This reduces firms' demand for both capital and labor in the short term. As government investment is lower, the stock of public capital declines. This gradually reduces productivity and undermines potential output. The decline in demand of factors of production therefore becomes protracted, and households' incomes and consumption progressively erode over time (Figure 3). Private investment declines over time, resulting in a reduction in total real investment that accumulates to around two percent of GDP below baseline after 10 years. As the stock of private capital declines, the amount of investment necessary to maintain it at the desired level is lower.

The external sector balance improves initially in about the same magnitude as the fiscal balance (Figure 3), but this improvement gradually erodes as the economy looses competitiveness over time (Figure 4). This improvement is explained broadly ½ by an increase in exports and ½ by a decline in imports. Interestingly, there is real exchange rate appreciation, mainly as the protracted consumption decline is slower than the decline in output, a result driven by habit persistence in consumer preferences[8].

[8] GIMF assumption on habit persistence is simplified to a weak form of consumption inertia. The retailers sector (producing a consumption composite good and sells it to households for final consumption) plays a key role to obtain parsimonious consumption dynamics, by way of two assumptions: (a) costs to deliver fast changes in the purchase of raw material inputs and; (b) price setting rigidities that make it costly to accommodate rapid changes in demand. This setup permits realistic consumption dynamics within an OLG agents framework while also avoiding problems of aggregation.

Figure 2: Permanent Fiscal Consolidation Using Alternative Fiscal Instruments (Differences Relative to Baseline, in Percent of GDP)

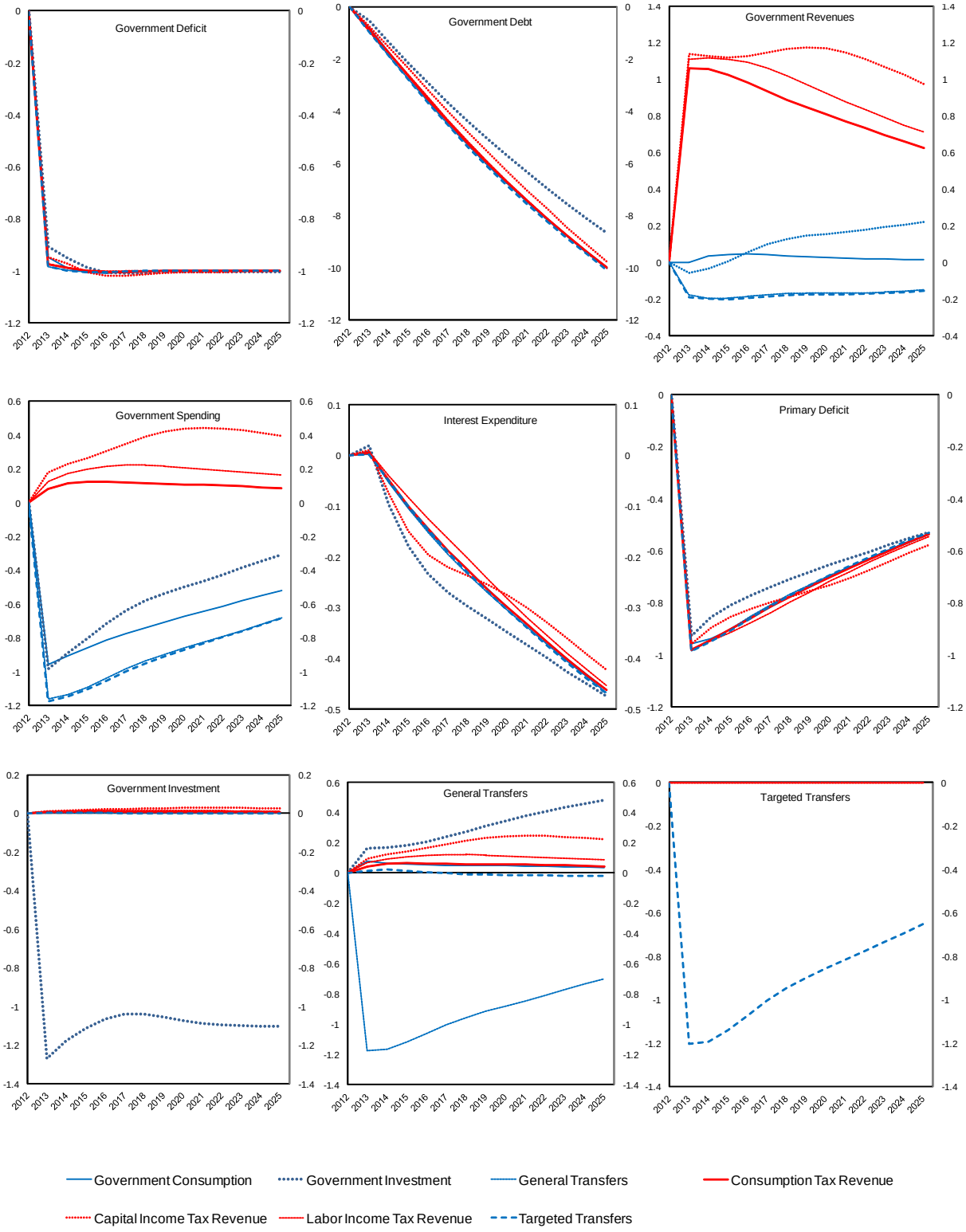


Figure 3: Impact of 1 Percent of GDP Permanent Fiscal Consolidation on National Accounts
(Differences relative to the case of no consolidation, in percent)

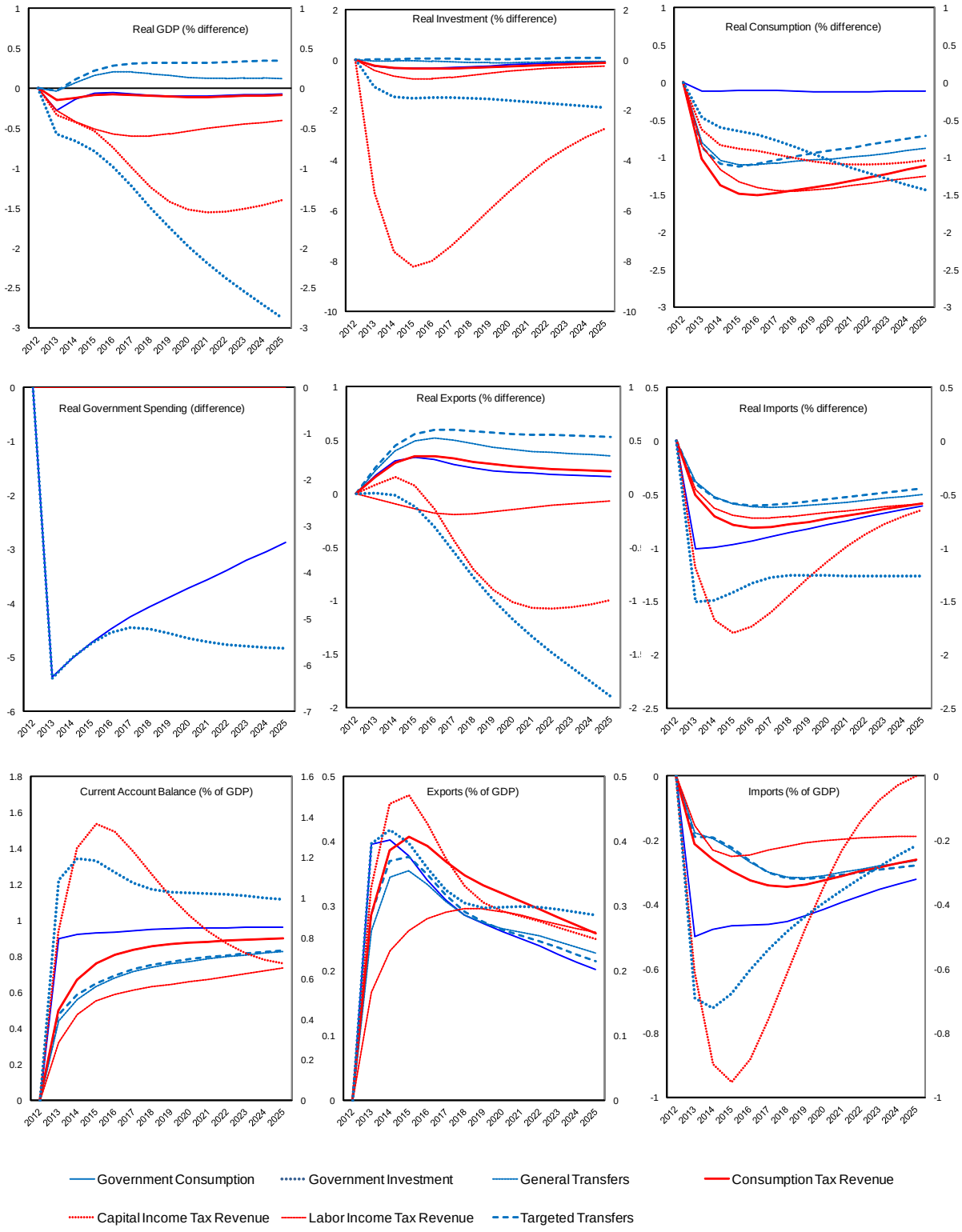
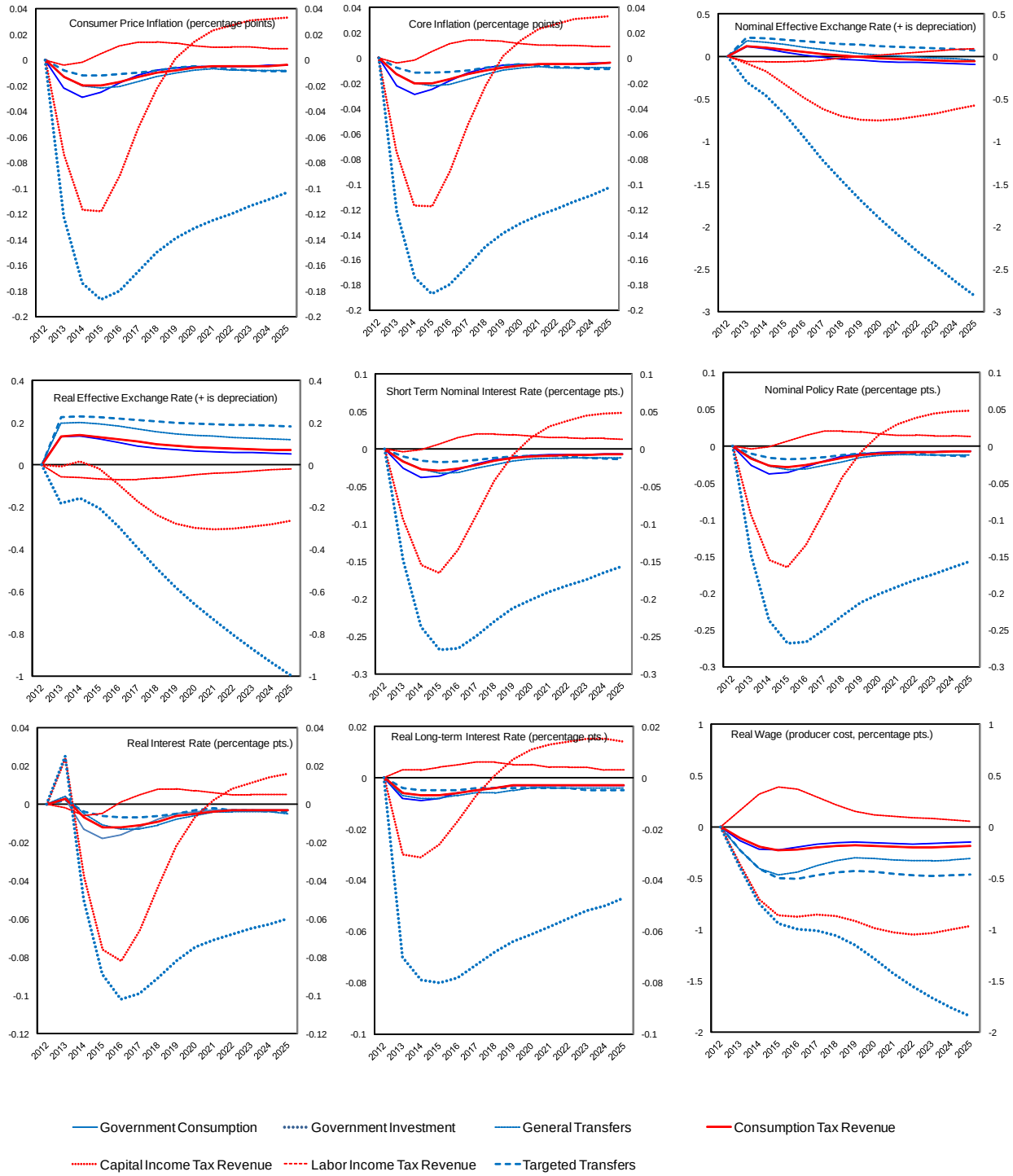


Figure 4: Impact of 1 Percent of GDP Permanent Fiscal Consolidation on Inflation, Exchange Rates and Interest Rates
(Differences Relative to the Case of No Consolidation, in Percent)



Consistent with these developments, there is a decline in inflation and interest rates that is largest in magnitude compared to other forms of consolidation (Figure 4). Consumer and core inflation decline 0.1 percentage points below baseline in the short term, with this decline picking by year three at near 0.2 percentage points. The net effect is also a decline in real interest rates, as de-investment across sectors materializes. The decline in real wages is the most significant when comparing across all consolidation instruments considered, at 1 percent after five years, and more than 3 percent in the long–term (beyond the time horizon span shown in the chart in Figure 4).

Consolidation of Government Consumption

If fiscal consolidation is achieved with a reduction of government consumption in goods and services and/or wage expenditures, aggregate demand declines in the short-term about ¼ percent below baseline (Figure 3). Afterwards it recovers, but only partially, remaining short of the baseline level. Notice that this result would in general be different to the predicted fiscal multiplier of a fiscal stimulus, which is a transitory policy by definition. In sharp contrast with a cut in public investment, private investment remains almost unaffected, and private consumption increases to almost fully offset the decline in public consumption. The current account balance improves proportionally, with roughly a ½ split between an improvement in exports and a decline in imports. This mild economic response is largely explained by the high degree of openness of the Hungarian economy. The demand impact from public consumption retrenchment has a large impact on the demand of imports, rather than on domestic goods.

Inflation decline is minimal, and the nominal and real exchange rate show a small amount of depreciation that peaks in the first year at 0.2 percent compared to baseline (for both core and CPI). Real wages decline by less than 0.5 percent in the short–term, and partially recover over the long-term

Consolidation of Government Transfers—General and Targeted

The initial impact of a cut in transfers on output is mute (Figure 3). Consumption declines immediately and in the same amount as the transfers' cut. Moreover, output increases in the medium and long term relative to baseline, and more so in the case of a cut in targeted transfers (0.4 percent of GDP relative to baseline) than in the case of general transfers (0.1 percent). The current account balance improves relative to baseline, but less than in the cases of consolidation via government consumption and investment analyzed above. The current account improves by 0.4 percent of GDP on impact, and continues to improve over time to stabilize at around 0.8 percent of GDP above baseline. This different current account behavior is the result of a milder decline in imports than in the two cases above.

The muted impact on output in the short term is explained by the endogenous response of the economy. Unlike in the case of a consolidation cutting public investment, total investment remains virtually unaffected. As households disposable income is reduced with the cut in transfers, labor participation increases, boosting output and having an offsetting effect. With lower overall household income the decline in consumption becomes protracted and results in permanent currency depreciation in real terms (mainly from a nominal depreciation). Moreover,

the currency depreciation reduces the producer-cost of labor, further increasing the demand for labor and output. All in all, the improvement in external competitiveness allows output to remain at the same level as in baseline in the short term despite a decline in private consumption as the external demand offsets the decline in domestic demand.

Over the medium and long terms, the improvement in competitiveness results in higher output permanently. The increases in labor participation and labor demand explained above is large and protracted, given the permanent nature of the cut in transfers. In addition, the gradual reduction in government debt reduces interest rates further, creating fiscal space which in the simulation is allocated to government consumption and provides further stimulus to aggregate demand. This allows some reversal of the short-term improvement in external accounts (Figure 4). In addition, the sustained improvement in the external balance results in private sector accumulation of net foreign assets, and a gradual increase in the non-wage income of the OLG (forward-looking non-myopic) consumers. This last effect reduces the negative short-term impact of the cut in transfers and contributes to the gradual recovery in consumption.

The dynamics analyzed above are more pronounced in the case of a cut in transfers that are targeted to liquidity-constrained agents, in comparison with the case of a cut in general transfers. As liquidity-constrained agents do not accumulate assets by assumption, they have less room to cushion the decline in income with other sources of income and savings, and their response is more pronounced (also because the same amount of fiscal consolidation is concentrated in a smaller number of households).

Consolidation with Consumption Taxes

Increasing consumption taxes permanently to achieve an improvement in the overall balance of 1 percent of GDP reduces growth by 0.2 percent in the first year (Figure 3). Afterwards, GDP growth recovers in a small amount, but never back to baseline levels. Private consumption, however, declines significantly, more than in any other policy instrument considered. Real consumption declines 1 percent of GDP in the first year, 1.5 percent by the third year, and recovers gradually afterwards. The recovery, however, is explained in part by the assumption on the allocation of the fiscal space created by the reduction in public debt to government consumption, as explained above.

The external accounts improve, as expected, but, interestingly, less so than under a reduction in government investment and government consumption (Figure 3). The current account balance increases gradually to reach 0.8 percent of GDP by year three and stabilizing below 1 percent of GDP in the long–term. This is determined by an increase in exports that peaks at 0.4 percent of GDP by year three and a contraction in imports that is somewhat more protracted and peaks also at near 0.4 percent of GDP. Inflation declines to 0.02 percentage points below baseline over the first three years, as the impact on prices of a decline in consumption offsets the price level effect of taxes, but then recovers back to baseline in the long–term (Figure 4). Interest rates also reflect the lack of demand and move downward, while the nominal exchange rate depreciates by less than 0.2 percent, and allows a real exchange rate depreciation of about the same amount. This exchange rate depreciation is very protracted.

The results above indicate that there is a contractionary effect, including a decline in growth, inflation, interest rates, and exchange rate depreciation. This contraction, however, is small relative to the size of the consolidation. The decline in output is less than ¼ the size of the improvement in the fiscal surplus targeted, and inflation, interest rate, and exchange rates show relatively small changes. The reasons behind this result are twofold. First, the increase in consumption taxes stimulates savings. As a result forward looking (OLG) consumers internalize an increase in wealth income, which moderates the decline in consumption (aided also by habit persistence in consumption). The decline in interest rates also increases investment and the capital stock, moderating the decline in output as time passes. This also explains why real wage declines, as determined by a lower demand, but less so than under other consolidation options (0.2 percent below baseline by year three, protracted). Second, with Hungary being a very open economy, the external balance improves considerably, more than ¾ the size of the consolidation, as the exchange rate depreciates in real terms. This implies that the switching effect from domestic to external demand is relatively large, cushioning the domestic demand impact.

Consolidation with Corporate Income Taxes

A consolidation with taxes on corporations is contractionary in the short–term, and becomes significantly more so in the medium term, second only to a reduction in government investment. Output declines 0.4 percentage points below baseline in the first year, then 0.5 percent by year five, and continues to stimulate a steady decline in output that peaks after ten years, at 1.5 percentage points below baseline (Figure 3). The main driver of this result is a decline in private investment, which is sustained for a long period of time until the point the capital stock reaches its desired level. Indeed, investment over 5 percentage points below baseline in year 1, and more than 8 percentage points by year 3, when it reaches its lowest point. This investment decline is far more significant than in any other of the policy alternatives considered. It is interesting to notice that in year 1 private consumption declines to 0.6 percent below baseline, which is about ½ of the decline that would be obtained under the other two tax alternatives and also if government transfers were reduced. This indicates that the distributional impact of this option is, however, not without cost. Notice that real wages also exhibit a significant decline, of about the same magnitude than the one predicted under a decline in government investment during the first five years after the policy is implemented. By year five real wages are 1 percent below baseline, and remain at around that level thereafter (Figure 4).

The external accounts show the biggest improvements in the short term of all policy alternatives under analysis. The improvement in the current account balance peaks at 1 ½ percent of GDP by year 3 (Figure 3). Of this, about 1 percent is due to a contraction in imports, which in this case are augmented by the decline in imports of investment goods, and ½ percent by an increase in exports.

Inflation decline is of more than 0.1 percent below baseline, consistent with the general decline in aggregate demand and output. This is not a big amount, but is the second largest decline when comparing across the consolidation alternatives. The same observation applies to nominal and real interest rates. As with the case of a cut in government investment, the real exchange rate appreciates, a result that appears unintuitive given that the decline in output and demand is

second to largest. The underlying reasons are the same as in the case of government investment consolidation.

Consolidation with Labor Taxes

A consolidation by increasing labor taxes reduces GDP by 0.3 percentage points below baseline in the first year, and the decline continues to increase until year 5 at 0.6 percentage points below baseline (Figure 3). This decline is larger than obtained by cutting government consumption or transfers, and broadly in line with corporate income taxes in the initial years. However, unlike in the cases of corporate taxes and government investment, output recovers after year 5, although this recovery is slow and driven mainly by the assumption of the allocation of fiscal space resulting from public debt reduction to government consumption. The underlying forces behind this decline in output, however, are different than in these two alternative policy options. The main driver is a decrease in labor participation. Evidence of this is that it is the only policy alternative that results in an increase in real wages (Figure 4). As a result, the return to capital declines and investment is reduced (¾ percentage points below baseline by year 3). With lower household incomes, consumption declines in the short term significantly, almost on par with the result under a cut in consumption taxes, which showed the deepest departure from baseline. This decline is also very protracted, as the reduction in investment further reduces the demand for labor and the initial real wage increase gradually reverses.

The improvement in the external sector is the smallest across all the consolidation alternatives. The improvement of the current account is near 0.4 percent of GDP in the first year, and gradually increases to around 0.6 percent in the long term. This improvement is mainly driven by the decline in domestic demand, of both private consumption and investment, and therefore it is more protracted than in the other alternatives. Exports improvement is the lowest of all alternatives up until year five, when it is 0.3 percent of GDP above baseline.

Inflation and interest rate dynamics show a minor decline in the near term, remaining below baseline, but then increase to above baseline and remain there after year 3 (Figure 4). This behavior is consistent with the patterns of labor participation and investment explained above. The quantitative values of these changes, however, are not significant.

VI. CONCLUSIONS

This paper uses a general equilibrium calibration for Hungary to simulate the economic impact of a permanent fiscal consolidation using different fiscal policy instruments. The results indicate that a fiscal consolidation that focuses on current expenditures is in general more conducive to growth and investment. In particular, a consolidation of government transfers can stimulate labor participation, with the resulting increase in the return to capital yielding an increase in investment and output in the long term. The results in this paper indicate that a consolidation of transfers increase GDP to above baseline (no policy change) in the long–term by ½ percent, after a minor initial contractionary impact in year 1. On the other extreme of the policy spectrum, a fiscal consolidation cutting capital expenditures is the least preferred option, as it results in large and protracted declines in private investment, output, and real wages. Output

declines ½ percent of GDP on impact, and continues to decline to more than triple the initial amount of fiscal consolidation in the long term.

Table 4: Maximum Declines Relative to Baseline after 1 Percent of GDP Consolidation

	Deviation from baseline			Ranking			
Fiscal Consolidation Instrument	GDP	Investment	Real wage	GDP	Investment	Real wage	Avg.
Consumption taxes	-0.15	-0.36	-0.15	3	4	3	3
Corporate taxes	-1.56	-8.24	-1.56	6	7	6	6
Labor taxes	-0.60	-0.75	-0.60	5	5	5	5
Government consumption	-0.28	-0.34	-0.28	4	3	4	4
Government investment	-2.88	-1.90	-2.88	7	6	7	7
General transfers	-0.04	-0.12	-0.04	2	2	2	2
Targeted transfers	-0.03	0.01	-0.03	1	1	1	1

Source: Staff estimates.
Declines in GDP and investment are measured in percentage points of GDP; declines in real wages are measured in percent of the baseline level.

A permanent fiscal consolidation achieved by increasing taxes yields intermediate results in terms of the contraction of GDP and investment. All tax increases reduce GDP in the short and long terms. However, their impact on the economy varies significantly depending in the category of tax considered.

An increase in corporate income taxes has the most negative impact on GDP. Its impact compounds over time as investment declines and so does the stock of capital in the economy, which ends up reducing real wages. This contractionary impact is comparable in size to that of a consolidation of government investment. The decline in GDP is less than ½ percent in year 1, and then output declines in a protracted manner to around 1 ½ percent of GDP below baseline more in the long term.

On the other hand, an increase in labor taxes has less impact on investment, but a more negative impact on labor participation. GDP does not decline as much, in part because real wages increase following the reduction in labor supply, mitigating the decline in employment and thus partially offsetting the decline in the returns to capital that would occur otherwise.

Taxes on consumption appear as the least costly option in terms of growth and investment among all tax policies under consideration, but also the one that result in the deepest decline in consumption during the first five years. Consumption taxes also improve external competitiveness. This last effect is significant in quantitative terms given that Hungary is a very open economy, with exports averaging around 80 percent of GDP in the past few years. Because of this reason, taxes on consumption turn out to affect external demand in a large proportion, therefore limiting the impact on the demand for domestically-produced goods. Table 4 summarizes the results mentioned above. The three left columns report the largest declines relative to baseline for GDP, investment and real wages over 2013-2025. The three right columns display rankings of each indicator and an overall average ranking across the seven policy instruments analyzed.

An important issue to remark is that some of the fiscal consolidation policy instruments may have a comparable impact on GDP growth, but their distributional (and social) consequences can be very different. This is particularly so in the case of fiscal consolidation by increasing taxes. A consolidation achieved with consumption and labor taxes tends to weigh more heavily on households than a consolidation with corporate income taxes. However, it is important to notice that this is less obvious when it comes to considering the distributional implications of expenditure-based consolidations, as noted above.

The results above should be interpreted with caution, as they are subject to caveats. First, the results are specific to the model set up and transmission channels assumed. This is a typical caveat that applies to any model-based policy simulation. For example, Benk and Jacab (2012) find that non-Keynesian effects may dominate over the contractionary forces of a fiscal consolidation in the medium term. They show that, in order for a consolidation to be expansionary, it is necessary to have a decline in the sovereign premium that reduces interest rates further. Also, some channels potentially affecting growth are not modeled explicitly. For example, if transfers to private agents (OLG and LIQ) affect investment in human capital such as in health and education, then it is possible that the growth effects of a consolidation of government transfers as predicted in the model are underestimated. Second, the results above assume that the consolidation is fully credible after it is announced, meaning that all participants in the economy internalize the policy change in full and anticipate no policy reversals or implementation problems. This assumption is critical to the investment and output results obtained, which are largely based on forward-looking behavior assumptions in a context of rational (OLG) consumers and investors.

APPENDIX 1. DYNAMIC PARAMETERS CALIBRATIONS

Table A.1. Preferences and Population Related

	HN	EU	RW
Elasticities of Substitution in Utility			
Intertemporal (1/GAMMA)	0.5	0.5	0.5
Labor and Consumption			
OLG Agents (ETA_OLG)	0.827	0.832	0.798
Elasticity of Labor Supply			
OLG Agents	0.5	0.5	0.5
LIQ Agents	0.5	0.5	0.5
Other Structural Parameters			
Habit Persistence (NU)	0.4	0.4	0.4
'Pure' Discount Factor (BBETA)	98.176	99.046	98.012
Probability of Survival (THETA)	0.95	0.95	0.95
Income Decline Rate (CHI)	0.95	0.95	0.95
Marginal Propensity to Consume (MPC)	4.522	4.665	4.974
Share of LIQ Agents (PSI)	0.3	0.3	0.4

Table A.2. Production, Distribution and Finance

	HN	EU	RW
Depreciation Rate for			
business capital stock (DEPKBAR)	0.1	0.1	0.1
public capital stock (DEP_KG1)	0.04	0.04	0.04
public durables stock (DEP_KG2)	0.04	0.04	0.04
P-share for Investment	0.314	0.329	0.089
Financial Accelerator			
Borrower Riskiness			
tradables (ZIGGY_T)	0.452	0.452	0.452
nontradables (ZIGGY_N)	0.452	0.452	0.452
Cost of Bankruptcy			
tradables (MU_T)	0.357	0.357	0.357
nontradables (MU_N)	0.357	0.357	0.357
Elasticities of Substitution			
between varieties in all sectors			
Nontradables (SIGMA_N)	11	11	11
Tradables (SIGMA_T)	11	11	11
Retail (SIGMA_R)	21	21	21
Consumption Goods (SIGMA_C)	21	21	21
Investment Goods (SIGMA_I)	21	21	21
Real Wages (SIGMA_U)	11	11	11
Final Imports (SIGMA_DM)	41	41	41
Intermediate Imports (SIGMA_TM)	41	41	41
Markups on Price (in %)			
Nontradables (MUN)	10	10	10
Tradables (MUT)	10	10	10
Retail (MUR)	5	5	5
Consumption (MUC)	5	5	5
Investment (MUI)	5	5	5
Real Wages (MUW)	10	10	10
Final Imports	2.5	2.5	2.5
Intermediate Imports	2.5	2.5	2.5
Elasticities of Substitution			
Home versus Foreign			
consumption (XI_C)	1.5	1.5	1.5
investment (XI_I)	1.5	1.5	1.5
intermediate (XI_T)	1.5	1.5	1.5
Among Foreign			
final (XI_DM)	1.5	1.5	1.5
intermediate (XI_TM)	1.5	1.5	1.5
Tradable/Nontradable (XI_A)	0.5	0.5	0.5
Capital versus Labor			
nontradables (XI_ZN)	0.99	0.99	0.99
tradables (XI_ZT)	0.99	0.99	0.99

Table A.2. Production, Distribution and Finance (Concl'd.)

	HN	EU	RW
Bias Parameters			
Home Bias			
consumption (ALPHA_CH)	0.525	0.934	0.93
investment (ALPHA_IH)	0.305	0.927	0.895
intermediate (ALPHA_TH)	0.409	0.894	0.921
Nontraded vs Traded (ALPHA_N)	0.514	0.511	0.58
Labor Over Capital			
nontradables (ALPHA_N_U)	0.701	0.691	0.666
tradables (ALPHA_T_U)	0.54	0.532	0.513
Trade-Related Bias Parameters			
Domestic over Iported Tradables for			
intermediate goods (ALPHA_TH)	0.409	0.894	0.921
consumption goods (ALPHA_CH)	0.525	0.934	0.93
investment goods (ALPHA_IH)	0.305	0.927	0.895
Among Foreign Countries for			
final imports (ZETA_D)			
from Hungary		0.045	0.015
from Euro Area	0.747		0.985
from Rest of World	0.253	0.955	
intermediate imports (ZETA_T)			
from Hungary		0.022	0.012
from Euro Area	0.674		0.988
from Rest of World	0.326	0.978	
Nominal Rigidities			
Real Wage (PHI_P_U)	40	60	40
Consumption Price (PHI_P_C)	45	60	40
Investment Price (PHI_P_I)	45	60	40
Nontradables Price (PHI_P_N)	45	60	40
Tradables Price (PHI_P_T)	45	60	40
final goods (PHI_P_DM)	45	20	30
intermediate goods (PHI_P_TM)	45	20	30
Real Adjustment Costs			
Labor Demand (PHI_U)	1	1	1
Consumption (PHI_C)	2	2	2
Investment (PHI_I)	1	1	1
Imports of			
consumption goods (PHI_FC)	1	1	1
investment goods (PHI_FI)	1	1	1
tradable goods (PHI_FT)	1	1	1

Table A.3. Corporate Sector Calibration

	HN	EU	RW
Corporate Sector (% GDP unless otherwise stated)			
Aggregate Capital Stock			
utilized (K)	142.229	146.225	159.808
equity price (level)	1.042	0.989	1.037
investment (I)	17.8	18.3	20
current price (level; PI)	1.042	0.989	1.037
Tradables Capital Stock			
utilized (KT)	72.134	73.631	78.852
equity price (level; QT)	1.042	0.989	1.037
investment (IT)	9.028	9.215	9.868
current price (level; PI)	1.042	0.989	1.037
Nontradables Capital Stock			
utilized (KN)	70.096	72.594	80.956
equity price (level; QN)	1.042	0.989	1.037
investment (IN)	8.772	9.085	10.132
current price (level; PI)	1.042	0.989	1.037
All Firms			
net worth (NW)	72.903	74.951	81.914
debt (BPRIV)	72.903	74.951	81.914
insolvencies (%)	8	8	8
leverage ($; LEVERAGE_T)	100	100	100
Tradables Firms			
net worth (NWT)	36.974	37.741	40.418
debt (BPRIV_T)	36.974	37.741	40.418
insolvencies (%; BUST_T)	8	8	8
leverage (%; LEVERAGE_T)	100	100	100
premia			
equity (EQPT)	8.209	8.209	8.209
external financing (XFPT)	2.5	2.5	2.5
Nontradables Firms			
net worth (NWN)	35.929	37.21	41.496
debt (BPRIV_N)	35.929	37.21	41.496
insolvencies (%; BUST_N)	8	8	8
leverage (%; LEVERAGE_N)	100	100	100
premia			
equity (EQPN)	8.209	8.209	8.209
external financing (XFPN)	2.5	2.5	2.5

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