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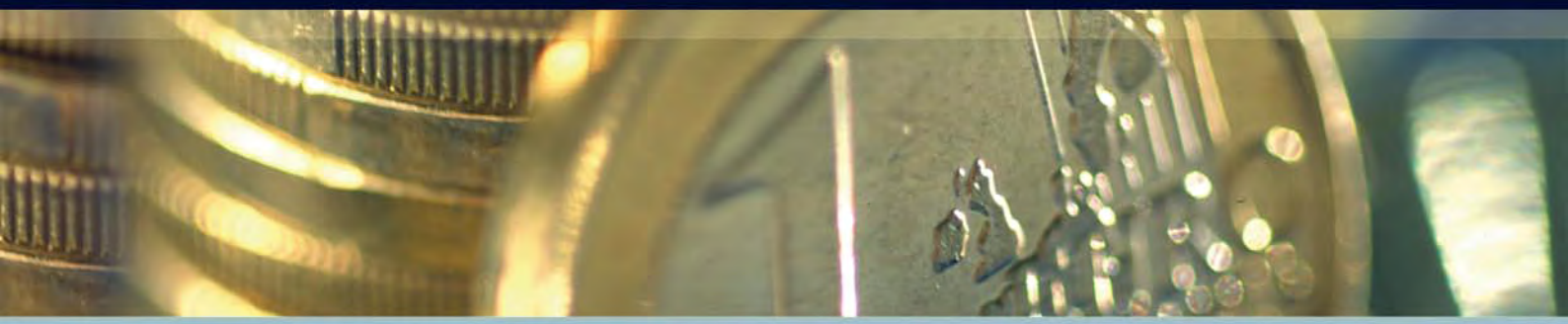

Macroeconomic effects of cost savings in public procurement

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Macroeconomic effects of cost savings in public procurement

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Abstract:

The paper analyses the macroeconomic gain from cost savings in public procurement in an extended version of the QUEST III macroeconomic model. Lower labour tax rates as response to cost savings from cheaper procurement (0.5 pp mark-up decline per year over 10 years and 20% of procurement) raise GDP, employment and consumption by 0.1% after 5 and 0.1-0.2% after 50 years. Alternative policies, such as lower capital taxes or higher public investment, have comparable or stronger long-run GDP effects, lower or comparable consumption effects, and zero employment effects; the supply expansion under lower capital taxes and higher public investment derives from additional investment. Macroeconomic benefits are approximately linear in the amount of cost savings. The gains depend on key parameters, such as the elasticity of labour supply or the productivity of public capital.

JEL classification: E20, H31, H32, H40
Keywords: procurement, taxation, public investment, aggregate supply

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1. INTRODUCTION

The market for public procurement is large: national and subnational authorities in Europe have purchased about 17% of EU GDP in 2007; in other OECD economies public procurement attains a similar market share. Hence, efficiency gains in public procurement can bring tangible macroeconomic benefits. Cheaper procurement relaxes the budgetary pressure and creates fiscal space. In addition, industry structure may adjust and productivity increase in sectors subject to increasing competition among procurement suppliers.

Despite the quantitative importance of government purchases, research on procurement is limited and mostly covers the theoretical or conceptual level. Dimitri et al. (2006) survey relevant theoretical concepts and provision schemes, discuss the pros and cons of alternative tendering procedures and analyse the impact of product and production characteristics on the appropriate contract design. The few empirical studies (e.g. Coppens, 2009; European Economics, 2006; Estache and Iimi, 2008) quantify the cost savings from transparency and competition in procurement markets; they conclude that rules and procedures that promote transparency and competition tend to reduce procurement prices substantially. Europe Economics (2006) estimates that EU legislation, increasing supplier competition, has led prices to decline by 2½-10 percent in about 20 percent of the procurement market.

Based on these cost saving estimates, the present paper investigates the long-run effect of cheaper procurement on output, employment and consumption. The analysis uses an ex-tended version of the QUEST III model of DG ECFIN (Ratto et al., 2009). The extension adds a procurement sector to the core model; this sector supplies government purchases and the utility component of private demand and charges a mark-up on producer prices.

The output, employment and consumption effects of lower procurement prices depend on how the government uses the fiscal space. The government may reduce taxes, increase the volume of public demand, raise transfer payments to households, or pay more subsidies to the private sector. The various policies differ in their demand and supply-side effects: lower labour and capital taxation tends to increase labour supply and investment; higher government consumption raises total demand, while government investment adds a long-run improvement of factor productivity to the demand-side effect; higher transfers may increase the reservation wage of workers, with a negative impact on labour supply; subsidies to the producers change the relative costs and prices in favour of the subsidised sectors of the economy.

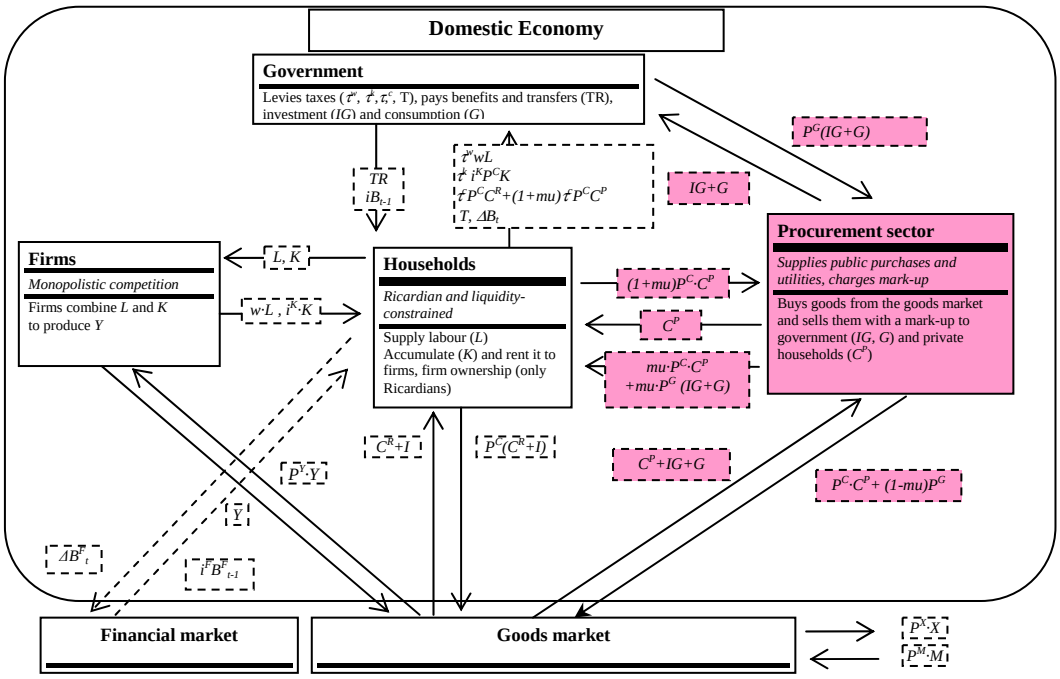
The paper concentrates on a scenario, where costs savings in procurement lead to lower labour income taxation. In addition, simulations for a reduction of the capital income tax and for higher volumes of government investment are presented and compared.

The paper has the following structure: Section 2 describes the modelling of cost savings and lower procurement costs in the QUEST III framework. Section 3 introduces the scenarios and compares the simulation results for the labour income tax, capital income tax and the public investment policies. Section 4 summarises the results and concludes.

2. MODELLING FRAMEWORK

The macroeconomic implications of cost savings in procurement are analysed in an extended version of QUEST III (Ratto et al., 2009) that adds a procurement sector to the core model. The Graph 1 provides a schematic overview.

Graph 1: Overview of the model



Source: Commission services

The procurement sector is a retailer: it buys goods and services from domestic production (Y), non-commodity imports (M) and commodity imports (OIL) at prices P^Y, P^M and P^{OIL} and sells them at a mark-up to the public and private sectors (see Graph 1). Bidding costs (BC) that accrue during the tendering procedure are expressed as a fraction of the contract value and can be added to the input prices P^Y, P^M and P^{OIL}. Sales prices in the procurement sector are:

(1) $$P_t^{PY} = (1+markup)\left(P_t^Y + BC_t\right)$$

(2) $$P_t^{PM} = (1+markup)\left(P_t^M + BC_t\right)$$

(3) $$P_t^{POIL} = (1+markup)\left(P_t^{OIL} + BC_t\right)$$

Increased competition between procurement suppliers reduces the mark-up they charge; it may also increase the bidding costs of suppliers. The simulations below therefore focus on net savings from procurement reform.

The procurement retailer supplies all government purchases and the share s^P of private consumption. The long-run shares of non-commodity (s^M) and commodity imports (s^{OIL}) are assumed identical between the private and the public sector, as are the elasticities of substitution σ^M and σ^{OIL}.

Total public consumption (G) is a CES function of non-commodity goods (NOIL) and commodities:

(4) $$G_t = \left[(1-s^{OIL})^{\frac{1}{\sigma^{OIL}}} \left(G_t^{NOIL}\right)^{\frac{\sigma^{OIL}-1}{\sigma^{OIL}}} + \left(s^{OIL}\right)^{\frac{1}{\sigma^{OIL}}} \left(G_t^{OIL}\right)^{\frac{\sigma^{OIL}-1}{\sigma^{OIL}}} \right]^{\frac{\sigma^{OIL}}{\sigma^{OIL}-1}}$$

Government consumption of non-commodity goods (G^{NOIL}) is a CES aggregate of non-commodity goods produced at home (G^{Y}) and non-commodity imports (G^{M}):

$$(5) \qquad G_t^{NOIL} = \left[(1-s^M)^{\frac{1}{\sigma^M}} \left(G_t^Y\right)^{\frac{\sigma^M-1}{\sigma^M}} + \left(s^M\right)^{\frac{1}{\sigma^M}} \left(G_t^M\right)^{\frac{\sigma^M-1}{\sigma^M}} \right]^{\frac{\sigma^M}{\sigma^M-1}}$$

For public investment (IG) it is analogously assumed:

$$(6) \qquad IG_t = \left[(1-s^{OIL})^{\frac{1}{\sigma^{OIL}}} \left(IG_t^{NOIL}\right)^{\frac{\sigma^{OIL}-1}{\sigma^{OIL}}} + \left(s^{OIL}\right)^{\frac{1}{\sigma^{OIL}}} \left(IG_t^{OIL}\right)^{\frac{\sigma^{OIL}-1}{\sigma^{OIL}}} \right]^{\frac{\sigma^{OIL}}{\sigma^{OIL}-1}}$$

$$(7) \qquad IG_t^{NOIL} = \left[(1-s^M)^{\frac{1}{\sigma^M}} \left(IG_t^Y\right)^{\frac{\sigma^M-1}{\sigma^M}} + \left(s^M\right)^{\frac{1}{\sigma^M}} \left(IG_t^M\right)^{\frac{\sigma^M-1}{\sigma^M}} \right]^{\frac{\sigma^M}{\sigma^M-1}}$$

Total (P^{G}) and non-commodity (P^{GNOIL}) price deflators for the public sector follow as:

$$(8) \qquad P_t^G = P_t^{IG} = \left[(1-s^{OIL}) \left(P_t^{GNOIL}\right)^{1-\sigma^{OIL}} + s^{OIL} \left(P_t^{POIL}\right)^{1-\sigma^{OIL}} \right]^{\frac{1}{1-\sigma^{OIL}}}$$

$$(9) \qquad P_t^{GNOIL} = P_t^{IGNOIL} = \left[(1-s^M) \left(P_t^{PY}\right)^{1-\sigma^M} + s^M \left(P_t^{PM}\right)^{1-\sigma^M} \right]^{\frac{1}{1-\sigma^M}}$$

Private household consumption (C) is a CES aggregate of non-commodity (C^{NOIL}) and commodity consumption (C^{OIL}), where C^{NOIL} is again a bundle of domestically produced goods (C^{Y}) and non-commodity imports (C^{M}):

$$(10) \qquad C_t = \left[(1-s^{OIL})^{\frac{1}{\sigma^{OIL}}} \left(C_t^{NOIL}\right)^{\frac{\sigma^{OIL}-1}{\sigma^{OIL}}} + \left(s^{OIL}\right)^{\frac{1}{\sigma^{OIL}}} \left(C_t^{OIL}\right)^{\frac{\sigma^{OIL}-1}{\sigma^{OIL}}} \right]^{\frac{\sigma^{OIL}}{\sigma^{OIL}-1}}$$

$$(11) \qquad C_t^{NOIL} = \left[(1-s^M)^{\frac{1}{\sigma^M}} \left(C_t^Y\right)^{\frac{\sigma^M-1}{\sigma^M}} + \left(s^M\right)^{\frac{1}{\sigma^M}} \left(C_t^M\right)^{\frac{\sigma^M-1}{\sigma^M}} \right]^{\frac{\sigma^M}{\sigma^M-1}}$$

The procurement sector supplies the components C^{POIL}, C^{PY} and C^{PM} of consumption C^{OIL}, C^{Y} and C^{M}; the non-procurement sector supplies C^{ROIL}, C^{RY} and C^{RM}:

$$(12) \qquad C_t^{OIL} = \left[(1-s^P)^{\frac{1}{\sigma^P}} \left(C_t^{ROIL}\right)^{\frac{\sigma^P-1}{\sigma^P}} + \left(s^P\right)^{\frac{1}{\sigma^P}} \left(C_t^{POIL}\right)^{\frac{\sigma^P-1}{\sigma^P}} \right]^{\frac{\sigma^P}{\sigma^P-1}}$$

(13) $$C_t^Y = \left[(1-s^P)^{\frac{1}{\sigma^P}} \left(C_t^{RY}\right)^{\frac{\sigma^P-1}{\sigma^P}} + \left(s^P\right)^{\frac{1}{\sigma^P}} \left(C_t^{PY}\right)^{\frac{\sigma^P-1}{\sigma^P}} \right]^{\frac{\sigma^P}{\sigma^P-1}}$$

(14) $$C_t^M = \left[(1-s^P)^{\frac{1}{\sigma^P}} \left(C_t^{RM}\right)^{\frac{\sigma^P-1}{\sigma^P}} + \left(s^P\right)^{\frac{1}{\sigma^P}} \left(C_t^{PM}\right)^{\frac{\sigma^P-1}{\sigma^P}} \right]^{\frac{\sigma^P}{\sigma^P-1}}$$

The steady-state share of procurement in private consumption s^P is identical for C^{OIL}, C^Y and C^M. Consequently, falling procurement prices do not lead to expenditure switching between C^{OIL}, C^Y and C^M. The simulations assume s^P=0.05; this value equals the share of utilities, where procurement legislation applies, in private consumption. Parameter σ^P is the elasticity of substitution between procurement and non-procurement goods and set to the low value σ^P=0.5; different values of σ^P leave the simulation results practically unchanged.

The price levels of total private consumption (P^C), non-commodity private consumption (P^{CNOIL}) and their components (P^{COIL}, P^{CY} and P^{CM}) follow from equations (10)-(14):

(15) $$P_t^C = \left[(1-s^{OIL}) \left(P_t^{CNOIL}\right)^{1-\sigma^{OIL}} + s^{OIL} \left(P_t^{COIL}\right)^{1-\sigma^{OIL}} \right]^{\frac{1}{1-\sigma^{OIL}}}$$

(16) $$P_t^{CNOIL} = \left[(1-s^M) \left(P_t^{CY}\right)^{1-\sigma^M} + s^M \left(P_t^{CM}\right)^{1-\sigma^M} \right]^{\frac{1}{1-\sigma^M}}$$

(17) $$P_t^{COIL} = \left[(1-s^P) \left(P_t^{OIL}\right)^{1-\sigma^P} + s^P \left(P_t^{POIL}\right)^{1-\sigma^P} \right]^{\frac{1}{1-\sigma^P}}$$

(18) $$P_t^{CY} = \left[(1-s^P) \left(P_t^{Y}\right)^{1-\sigma^P} + s^P \left(P_t^{PY}\right)^{1-\sigma^P} \right]^{\frac{1}{1-\sigma^P}}$$

(19) $$P_t^{CM} = \left[(1-s^P) \left(P_t^{M}\right)^{1-\sigma^P} + s^P \left(P_t^{PM}\right)^{1-\sigma^P} \right]^{\frac{1}{1-\sigma^P}}$$

The procurement retailer charges - a modelling assumption - identical mark-ups for commodity and non-commodity goods, so that the mark-up has no direct effect on the relative prices of domestically produced goods, non-commodity imports and commodity imports in neither the procurement nor the non-procurement sector. Hence, the demand for domestic production equals:

(20) $$Y_t = (1-s^M) \left(\frac{P_t^{CNOIL}}{P_t^{CY}} \right)^{\sigma^M} \left(1-s^{OIL}\right) \left(\frac{P_t^{C}}{P_t^{CNOIL}} \right)^{\sigma^{OIL}} \left(C_t + I_t + G_t + IG_t\right) + X_t$$

where C, I, G, IG and X are private consumption, private investment, public consumption, public investment and exports. Non-commodity and commodity imports are:

$$(21) \qquad M_t = s^M \left(\frac{P_t^{CNOIL}}{P_t^{CM}} \right)^{\sigma^M} \left(1 - s^{OIL}\right) \left(\frac{P_t^{C}}{P_t^{CNOIL}} \right)^{\sigma^{OIL}} \left(C_t + I_t + G_t + IG_t\right)$$

$$(22) \qquad OIL_t = s^{OIL} \left(\frac{P_t^{C}}{P_t^{COIL}} \right)^{\sigma^{OIL}} \left(C_t + I_t + G_t + IG_t\right)$$

The GDP deflator - including the procurement mark-up - is the demand-weighted average of domestic and export prices for domestically produced goods and includes the procurement retailer mark-up:

(23)

$$P_t^{GDP} = \left(1 - s^M\right)\left(1 - s^{OIL}\right) \left(\frac{P_t^{CNOIL}}{P_t^{CY}} \right)^{\sigma^M} \left(\frac{P_t^{C}}{P_t^{CNOIL}} \right)^{\sigma^{OIL}} \frac{P_t^{CY} C_t + P_t^{Y} I_t + P_t^{PY}\left(G_t + IG_t\right)}{Y_t} + \frac{P_t^{X} X_t}{Y_t}$$

The simulations analyse and compare strategies for the government to use the fiscal space created by costs savings in public procurement. The nominal government debt *B* evolves according to the budget constraint:

$$(24) \qquad B_t = \left(1 + i_t\right) B_{t-1} + P_t^G (G_t + IG_t) + TR_t - \tau_t^w W_t L_t - \tau_t^c P_t^C C_t - \tau_t^k i_t^K P_t^I K_{t-1} - T_t^{LS}$$

where i is the nominal interest rate on outstanding government debt, TR are transfers, τ^w is the tax on labour income, τ^c the VAT on private consumption, τ^k the tax on capital income and T^{LS} a lump-sum tax (see also Graph 1). In light of the costs savings, the government can either reduce the tax burden of households or increase real government spending, without compromising the stability of public debt.

3. POLICY SCENARIOS

Total government expenditure equals 22% and private consumption 62% of GDP in the EU-27. Circa 17% of EU-27 GDP is procurement relevant: Government purchases and public investment account for 14% of GDP; 3% of GDP (around 5% of private consumption) is private demand for utilities that are subject to procurement legislation.

Higher transparency and discipline in public procurement is expected to increase competition for work, supply and service contracts and to raise the number of bids per tender. Survey-based analysis in Europe Economics (2006) finds costs savings for contracting authorities of 2.5-10% of the intended contract value, varying across sectors and industries; the savings are a positive function of the number of bids per tender. The study also reports that administrative costs of participating in tenders have increased by 0.2% of the average contract value at the same time. Similarly, the econometric evidence in Coppens (2009) suggests average costs savings of 5.5% of the contract value from European procurement legislation reform.

European legislation does not cover the entire procurement sector; only about 20% of estimated total procurement is published in the Official Journal of the European Communities and hence affected by the regulatory reform at the EU level. The empirical evidence furthermore suggests that gains from

transparency and reform do not materialise immediately to the full extent, but need several years to completely phase in (Europe Economics, 2006).[1]

Based on the Europe Economics (2006) and Coppens (2009) cost saving estimates, the baseline scenario takes a prudent stance and assumes a 5% net cost saving, i.e. cost saving from higher competition net of increased bidding costs, applying to 20% of total procurement. The baseline scenario considers the situation, in which cost savings gradually phase in. Specifically, the procurement price mark-up declines in annual steps of 0.5 percentage points over a period of ten years, saving 0.5% of contract value in the first year and 5% of contract value from the year 10 on.

The key scenario in this paper, which is discussed in most detail, considers the effects of a labour income tax cut that transfers cost savings in government procurement to the private sector. The scenarios of reducing capital income taxes and increasing public investment are considered in addition to illustrate the different effects on aggregate supply and demand components.

In the labour and capital income tax cut scenarios, tax rates are adjusted to stabilise the stock of government debt at the target level b^T=0.6 and to contain deficits and surpluses of the public budget; government consumption and investment are kept constant in real terms:

$$(25) \qquad \tau_t = \tau_{t-1} + \alpha^B \left(\frac{B_{t-1}}{4P^Y_{t-1}Y_{t-1}} - b^T \right) + \alpha^{DEF} \Delta \left(\frac{B_t}{P^Y_t} \right)$$

For the labour tax the rule parameters are α^B=0.25 and α^{DEF}= 0.50; for the capital they are set to α^B=0.50 and α^{DEF}= 0.50. This choice of α^B and α^{DEF} ensures debt to stabilise at the target level about 15 years after the initial shock in both cases.

In the scenario where costs savings translate into higher real government investment, the later is determined as:

$$(26) \qquad IG_t = \left(\frac{P^G_0}{P^G_t} - 1 \right) G_t + \frac{1}{P^G_t} IG_0,$$

where the subscript 0 refers to values in the pre-reform steady state. The fall of P^G leads to an increase in *IG* such that nominal government spending remains constant at pre-reform levels.[2]

3.1. REDUCING THE LABOUR INCOME TAX

In the first scenario, the tax rate τ^w on labour income decreases in reaction to cost savings in public procurement. The tax cut reduces the wedge between gross and net wages. Labour supply increases for a given gross wage:

$$(27) \qquad \omega (1 - L_t)^{\kappa} = \left[\frac{(1-slc)(1-h)}{C^{NLC}_t - hC^{NLC}_{t-1}} + \frac{slc}{C^{LC}_t} \right] \frac{1-\tau^W_t}{1+\tau^C_t} \frac{W_t}{P^C_t} \eta^W_t$$

The parameter ω is the relative weight of leisure in the household's utility function, κ^{-1} the elasticity of labour supply, *slc* the share of liquidity-constrained households (*LC*), h captures consumption

[1] The present analysis takes these estimates as given inputs and does not trace them back to reform-related structural changes in the procurement market. For discussion of the impact of market structure on procurement costs see e.g. Dimitri et al. (2006) and Estache and Iimi (2008).

[2] Prices of domestic goods net of the procurement mark-up (P^Y) are used instead of GDP prices including the procurement mark-up (P^{GDP}) to deflate nominal debt, so that real debt does not automatically increase as public procurement becomes cheaper.

habits, and η^W is a wage mark-up that depends on the market power of the suppliers of heterogeneous labour services.

The tax cut ceteris paribus increases lifetime income and lifetime consumption of the intertemporal optimisers. Given the budget constraint:

$$(28) \qquad \left(1+\tau_t^c\right)P_t^C C_t^{LC} = \left(1-\tau_t^w\right)W_t L_t + TR_t - T_t^{LS}$$

it also raises consumption demand from liquidity-constrained households.

As mentioned in the discussion of cost saving scenarios above, the impact of legislative reform on procurement costs requires time to materialise to the full extent. Table 1 presents the *phase-in* scenario, where the mark-up declines in annual steps of 0.5 percentage points (pp) over 10 years and then remains constant at 5 pp below the initial value for 20% of total procurement. Nominal public expenditure on procurement is 0.4% lower after 5 and 0.7% lower after 50 years, which following rule (25) implies an income tax reduction of 0.2 pp after 5 and 0.3 pp after 50 years. Real GDP, employment and consumption are 0.1% and 0.1-0.2% above pre-reform levels after 5 and 50 years.

Table 1: Stepwise 5 pp mark-up reduction on 20% of procurement

Year	Public purchases (nominal)	Income tax rate	GDP (real)	Employment	Consumption (real)	Investment (real)
1	-0.11	-0.05	0.02	0.03	0.01	0.03
2	-0.17	-0.09	0.04	0.04	0.03	0.05
3	-0.23	-0.13	0.05	0.06	0.05	0.08
5	-0.35	-0.20	0.08	0.09	0.10	0.13
10	-0.62	-0.34	0.14	0.14	0.18	0.17
15	-0.64	-0.31	0.14	0.13	0.18	0.14
20	-0.64	-0.31	0.14	0.13	0.19	0.14
30	-0.65	-0.32	0.15	0.13	0.19	0.14
40	-0.66	-0.32	0.15	0.13	0.20	0.14
50	-0.66	-0.32	0.15	0.13	0.20	0.14

Note: The numbers are percentage (percentage-point for tax) deviations from the pre-reform baseline.

Table 2 shows the impact of an *immediate* 5 pp cut in procurement mark-ups applying to 20% of total procurement. The short-run effects are - as expected - stronger than in the phase-in scenario and long-run effects very similar to those in Table 1. The 5 pp mark-up cut reduces the nominal expenditure on public procurement by 0.6% after 5 and 0.7% after 50 years; the associated tax cut amounts to 0.4 pp after 5 and 0.3 pp after 50 years. Real GDP, employment and consumption increase by 0.1-0.2% after 5 and 50 years.

Table 2: Immediate 5 pp mark-up reduction on 20% of procurement

Year	Public purchases (nominal)	Income tax rate	GDP (real)	Employment	Consumption (real)	Investment (real)
1	-0.61	-0.32	0.11	0.12	0.14	0.15
2	-0.62	-0.38	0.14	0.15	0.17	0.18
3	-0.63	-0.39	0.14	0.15	0.18	0.18
5	-0.65	-0.35	0.14	0.14	0.18	0.16
10	-0.66	-0.31	0.13	0.13	0.17	0.12
15	-0.67	-0.31	0.14	0.13	0.18	0.12
20	-0.67	-0.31	0.14	0.13	0.18	0.12
30	-0.68	-0.31	0.14	0.13	0.19	0.13
40	-0.68	-0.31	0.15	0.13	0.19	0.13
50	-0.68	-0.31	0.15	0.13	0.19	0.13

Note: The numbers are percentage (percentage-point for tax) deviations from the pre-reform baseline.

The macroeconomic gains increase in an approximately linear way with the cost savings: in an optimistic scenario, in which cost savings apply to all procurement (Table 3), the short-run and long-run gains are roughly five times bigger than in the case, where cost savings emerge in only 20% of procurement (Table 1).

Table 3: Stepwise 5 pp mark-up reduction on 100% of procurement

Year	Public purchases (nominal)	Income tax rate	GDP (real)	Employment	Consumption (real)	Investment (real)
1	-0.55	-0.25	0.11	0.12	0.05	-0.16
2	-0.85	-0.45	0.18	0.20	0.15	-0.27
3	-1.15	-0.65	0.25	0.27	0.25	-0.39
5	-1.77	-1.01	0.40	0.42	0.46	0.60
10	-3.09	-1.66	0.66	0.65	0.86	0.76
15	-3.17	-1.53	0.66	0.61	0.86	0.66
20	-3.20	-1.54	0.67	0.61	0.89	0.64
30	-3.23	-1.54	0.70	0.62	0.91	0.65
40	-3.26	-1.54	0.71	0.62	0.93	0.65
50	-3.28	-1.55	0.71	0.62	0.93	0.65

Note: The numbers are percentage (percentage-point for tax) deviations from the pre-reform baseline.

The employment and output effects of the tax reduction heavily depend on the elasticity of labour supply, κ^{-1}, which is shown in equation (27). In this context, the substantial uncertainty surrounding empirical estimates of κ^{-1} should be acknowledged. The analysis of Fiorito and Zanella (2008) finds elasticities of 0.1 for hours worked at the individual level and of 1 at the aggregate level capturing changes in both employment and hours worked. Evers et al. (2008) survey estimates from about 20 empirical studies; values for the elasticity of male labour supply vary between -0.12 and 0.45, with a median of 0.08, while estimates of female labour supply range between -0.08 and 1.23, with a median of 0.26.

The results in Tables 1-3 adopt κ^{-1}=0.2. Table 4 replicates the scenario from Table 1 with κ^{-1}=0.1 to check the impact of a lower elasticity of labour supply. The results demonstrate the output, employment and consumption gains from labour tax cuts to be very sensitive with respect to κ^{-1}. Under κ^{-1}=0.1 the gains after 5, 10 and 50 years are 2-3 times smaller than the gains under κ^{-1}=0.2. Table 4 also indicates private consumption to fall initially due to temporarily lower consumption demand from intertemporal optimising households; the expected fall of consumer prices and associated increase in the real interest rate induce forward-looking households to reduce current in favour of future consumption.

Table 4: Stepwise 5 pp mark-up reduction under lower elasticity of labour supply

Year	Public purchases (nominal)	Income tax rate	GDP (real)	Employment	Consumption (real)	Investment (real)
1	-0.12	-0.03	0.01	0.01	-0.02	0.03
2	-0.18	-0.07	0.01	0.02	-0.01	0.03
3	-0.24	-0.10	0.02	0.02	0.01	0.04
5	-0.37	-0.16	0.03	0.03	0.03	0.04
10	-0.61	-0.27	0.06	0.06	0.09	0.03
15	-0.61	-0.25	0.05	0.06	0.08	0.03
20	-0.61	-0.25	0.06	0.06	0.08	0.02
30	-0.60	-0.25	0.06	0.06	0.08	0.03
40	-0.60	-0.25	0.06	0.06	0.08	0.03
50	-0.59	-0.25	0.06	0.06	0.08	0.03

Note: The numbers are percentage (percentage-point for tax) deviations from the pre-reform baseline.

3.1. REDUCING THE CAPITAL INCOME TAX

Reducing the tax rate on capital income, τ^k, is an alternative way to transfer the government's cost savings to the taxpayer. The lower tax rate increases the net marginal return to capital. Given the higher return, firms increase the investment in capital, which raises the capital stock. In QUEST III the relevant first order condition for capital reads:

$$\varepsilon\left(1-\tau_t^k\right)(1-\alpha)\frac{P_t^Y}{P_t^I}\frac{Y_t+FCY_tTFP_t}{K_t}+\tau_t^k\delta = Q_t-\left(1-i_t-\pi_t^I-\delta\right)Q_{t+1}+a_1\left(UCAP_t-1\right)+a_2\left(UCAP_t-1\right)^2 \quad (29)$$

where the variables K, i, π^I, FCY, TFP, Q and $UCAP$ are the capital stock, the nominal interest rate, inflation of the investment good deflator, fixed costs of production, labour-augmenting productivity, Tobin's q and capacity utilisation; the parameters ε, 1-α, δ, a_1 and a_2 quantify the price mark-up in the productive sector, the output elasticity of capital, the capital depreciation rate and linear as well as quadratic adjustment costs.

Table 5 reports the results for the scenario of stepwise cost savings, which corresponds to the assumptions in Table 1. The procurement mark-up falls by 0.5 pp per year, reaches the level of 5 pp below the initial baseline after 10 years and then remains constant at this lower level; the mark-up decline applies to 20% of the procurement sector.

Table 5: Stepwise 5 pp mark-up reduction on 20% of procurement

Year	Public purchases (nominal)	Capital tax rate	GDP (real)	Employment	Consumption (real)	Investment (real)
1	-0.11	-0.02	0.00	0.00	-0.08	0.08
2	-0.16	-0.08	0.00	0.00	-0.09	0.13
3	-0.22	-0.17	0.01	0.00	-0.09	0.17
5	-0.32	-0.37	0.02	0.01	-0.08	0.25
10	-0.51	-0.66	0.05	0.01	-0.06	0.38
15	-0.47	-0.59	0.07	0.01	-0.04	0.42
20	-0.42	-0.62	0.09	0.01	-0.02	0.48
30	-0.35	-0.62	0.12	0.01	0.00	0.57
40	-0.29	-0.63	0.15	0.01	0.02	0.65
50	-0.24	-0.64	0.17	0.01	0.04	0.71

Note: The numbers are percentage (percentage-point for tax) deviations from the pre-reform baseline.

While employment practically remains constant, private investment increases substantially in Table 5. The consumption gains are smaller than in Table 1 as intertemporal optimisers reduce consumption in favour of investment. Initial GDP gains are lower than in the case of the labour tax cut, but long-run GDP effects are slightly higher. The positive long-run GDP effect derives from increasing investment. Capital deepening allows higher output at constant employment, but also requires replacement investment to increase.

3.3. INCREASING PUBLIC INVESTMENT

Re Instead of cutting taxes to transfer the cost saving from procurement legislation reform to households, the government can also increase real public demand. The latter comprises government consumption and investment. Higher public investment, I^G, increases the stock of public capital per efficient worker, K^G:

$$K_t^G = I_t^G + \left(1-\delta^G-\Delta\ln TFP_t-\Delta\ln N_t\right)K_{t-1}^G \quad (30)$$

where δ^G and N are the depreciation rate of public capital and the population size. Public capital, such as infrastructure, improves the productivity of private capital and labour and increases the economy's output for given volumes of private capital and employment:

$$(31) \qquad Y_t = A_t \left(UCAP_t K_t\right)^{1-\alpha} \left(\left[L_t - FCL_t\right] TFP_t\right)^{\alpha} \left(K_t^G\right)^{1-\alpha^G} - FCY_t TFP_t$$

with FCL and $1-\alpha^G$ as the fixed costs of employment and the marginal elasticity of output to the government capital stock.

Table 6 reports results for the stepwise realisation of cost savings that underlies Tables 1 and 5. The price mark-up in procurement declines by 0.5 pp per year to reach the level of 5 pp below the initial baseline in year 10 and remains at this value thereafter; the mark-up reduction applies to 20% of total procurement.

Table 6: Stepwise 5 pp mark-up reduction on 20% of procurement

Year	Public purchases (nominal)	Public investment	GDP (real)	Employment	Consumption (real)	Investment (real)
1	0.00	0.63	0.00	0.00	-0.13	-0.10
2	0.00	0.99	0.00	0.00	-0.12	-0.15
3	0.00	1.34	0.01	0.00	-0.12	-0.19
5	0.00	1.99	0.02	0.00	-0.11	-0.13
10	0.00	3.02	0.09	0.02	-0.07	-0.20
15	0.00	2.83	0.14	0.01	-0.02	-0.07
20	0.00	2.72	0.18	0.01	0.02	0.02
30	0.00	2.67	0.24	0.01	0.09	0.15
40	0.00	2.70	0.29	0.01	0.13	0.21
50	0.00	2.76	0.32	0.01	0.16	0.25

Note: The numbers are percentage (percentage-point for tax) deviations from the pre-reform baseline.

The macroeconomic benefits of higher public investment materialise only with longer lags. The long-term GDP effect (0.3% after 50 years) is bigger than in the comparable tax cut scenarios of Tables 1 and 5, however. Government investment increases by 3% after 50 years, whereas - as with the capital tax reduction - employment remains constant. Private investment and consumption fall over the first 15 years, as intertemporal optimising households loose profits from the procurement mark-up, while net exports increase. The long run consumption gains (0.2% after 50 years) are comparable to the labour and higher than under the capital tax reduction. The long-run impact on investment (0.3% after 50 years) lies in between the impact of the two tax policy scenarios.

Analogously to the importance of the labour supply elasticity for the macroeconomic gain from lower labour taxes, the supply-side effect of public investment depends on the elasticity of output with respect to public capital in the production function (31). The QUEST III calibration sets $1-\alpha^G=0.09$; higher values increase the positive long-run effect of public investment, whereas lower values would reduce the attractiveness of public investment as a policy option.

4. CONCLUSIONS

A reform of legislation and procedures that reduces profit margins in the procurement market can substantially reduce costs for the public sector. The efficient use of such savings may also have sizable macroeconomic benefits. In the baseline scenario, a *gradual* reduction of the labour tax that transfers budgetary savings from lower mark-ups - over 10 years the mark-up falls by 0.5 pp per year in 20% of the procurement market - to the private sector, real GDP, employment and consumption increase by 0.1-0.2% above their pre-reform baseline values after 5 and 50 years. An *immediately* effective 5 pp decline of the price mark-up in 20% of the procurement market amplifies the short-run effect and has similar long-run implications; real GDP, employment and consumption increase by 0.1-0.2% after 5 and 50 years. The macroeconomic impact is roughly proportional to the mark-up reduction; real GDP, employment and consumption gains increase proportionately to the volume of cost savings. The output and employment effects of the labour tax cut depend on the elasticity of labour supply; estimates of the latter are surrounded by substantial uncertainty. An elasticity of 0.1, instead of the benchmark value of 0.2, reduces the short-run and long-run macroeconomic benefits 2-3 times.

Lower capital taxes and higher government investment are alternative ways of using the fiscal space from cheaper procurement. Capital tax reductions are less beneficial in GDP, employment and consumption terms after 5 years, but strongly increase private investment. The long-run GDP gains are slightly higher than with the labour tax cut; but as consumption and employment remain close to pre-reform levels, the positive GDP effect is driven by the strong long-run increase in private investment.

Spending the budgetary savings on additional public investment is less beneficial than the labour tax cut but similar to the capital tax in terms of GDP and employment effects after 5 years. Private consumption and investment fall in the short run. Long-run GDP gains are bigger than under the tax reductions. Consumption grows similar to the labour and stronger than under the capital tax rule; the opposite holds for investment; employment remains at the pre-reform level. Similar to the capital tax cut, the supply expansion derives from capital deepening without employment growth. The supply-side effect of government investment depends on the elasticity of output with respect to public capital in the production function; higher values increase and lower ones reduce its positive long-run effect on GDP, consumption and private investment.

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