

Labor supply shock: short-term effects

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This note focuses on short-term effects in connection with the supply effects introduced in the export relations in okt16 model version. In all exercises, we raise labor supply by approximately 10,000 persons. First, we compare the multiplier properties of okt16 with the previous model okt15. We then compare the sensitivity of the supply effects to changes in the supply elasticity. Finally, we consider different cases on how the additional labor supply can affect public expenditure.

1. Introduction

In the following, we present the short term properties of okt16 - focusing on the supply effects in exports. In all exercises we reduce the number of early retirees, which increases the labor supply. The shock is calibrated to give approximately 10,000 employed in the long run. The supply elasticity of exports is set to 0.7, unless specified otherwise.

The additional labor generates tax revenues for the public sector, that can be used to finance public expenditures. In the following, it is assumed that the higher labor supply leads to an expansion in public demand. To establish this link, we use the following two relations:

$$\begin{aligned} Qo1 / Qo1_{t-1} &= Qp1 / Qp1_{t-1} \\ flo1 / flo1_{t-1} &= flp1 / flp1_{t-1} \end{aligned} \quad (1)$$

The two relations ensure that public employment and investment grow *pari passu* with private employment and investment, section 4 below provides more details. The equations can be activated/deactivated with a switch dummy, Dco. Dco = 1 activates equation (1) and Dco = 0 makes public demand exogenous. In the exercises below, Dco is set to 1 unless specified otherwise.

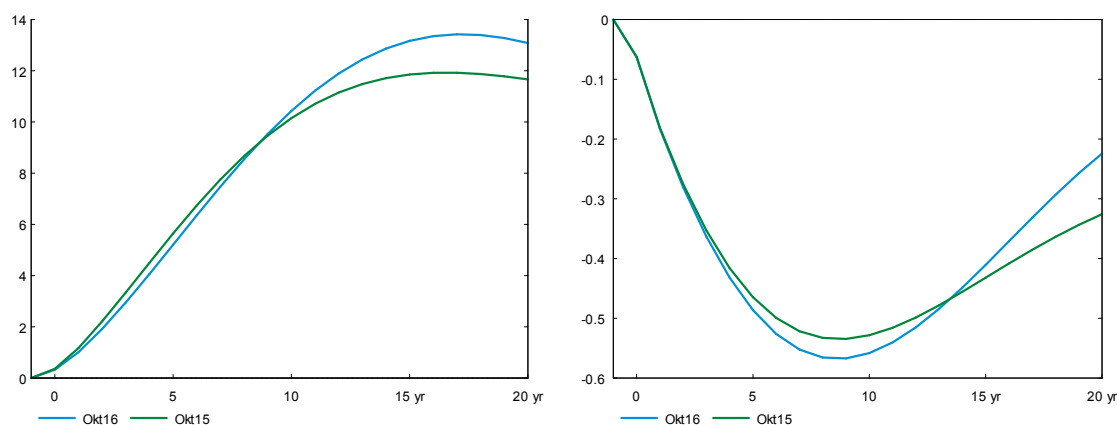
We consider the following three scenarios:

- Compare okt16 with the previous model version okt15.
- Use two different supply elasticities, 0.7 and 1.
- Consider different cases on how the additional labor affects public consumption.

The three scenarios are described below in section 2-4.

The effect of increasing labor supply differs between okt16 and okt15. There are a number of reasons for this. For example, some equations have been re-specified in the new model. The stochastic relations are re-estimated using a new data from the national accounts, and the new data has changed the baseline projection. This will affect the short term properties marginally. However, the crucial change in okt16 is the inclusion of supply effects in the export relations. The differences can be illustrated by comparing okt16 with the previous model version okt15.

Figure 1. Increase in labor supply, okt16 and okt15
Effect on employment (left) and real wage (right)



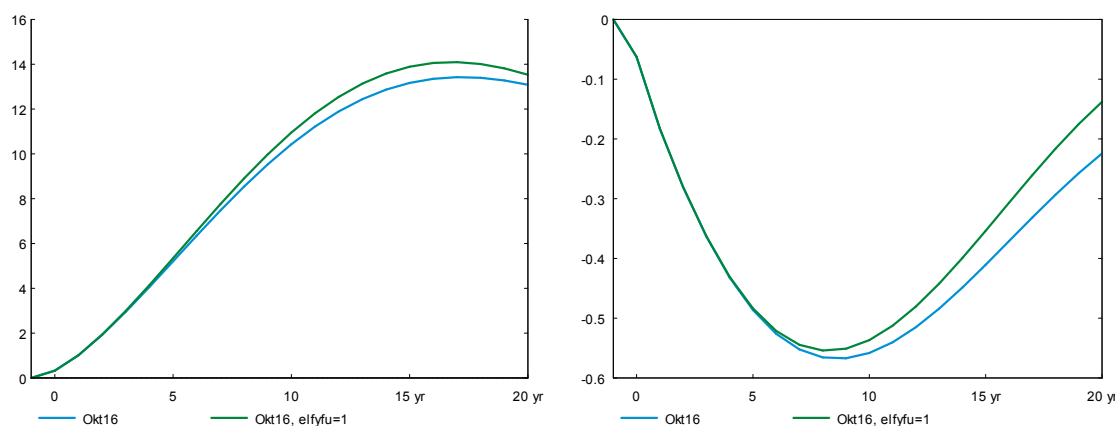
In the first 7-8 years of the experiment, employment reacts slightly stronger in okt15 than in okt16. The marginally larger employment increase in okt15 is caused by the difference between the

estimated coefficients, specifically in the factor block. The re-specifications mentioned above, in particular, the chosen specification of the supply effect in exports can also lead to some differences in the beginning. Needless to say, whatever the technicalities behind different short-term employment effects may be, the short-term employment effect of okt16 might be increased by re-specifying the short-term effect of structural change on exports. The supply effect on exports is included in the long-term export relation, which implies that the impact on exports and hence on employment is slowed down by the error-correction mechanism, and this dynamic adjustment may of course be re-specified.

In any case, the stronger short-term effect on employment in okt15 stimulates the hourly wage rate via the Phillips curve, and this additional short-term stimulation of the labor market in okt15 can explain that the peak fall in real wage is larger in okt16 than in okt15 according to the right-hand side panel in figure 1. After year 10, the special export-related supply effect of okt16 starts to dominate making the response of employment stronger in okt16 and making the fall of real wages smaller in okt16 after year 15. In the long run, the export-augmenting supply effect implies that the real wage will decrease less in okt16 than in okt15.

The effects of the additional labor supply also depends on the size of the supply elasticity (ADAM name *elfyfu*). The panel data analysis has clearly pointed out that changes in supply factors have a positive effect on market share. But the magnitude of the elasticity is open to discussion. In okt16, the supply elasticity is set to 0.7, cf. the model-group paper dsi080816. Below, we compare the effects of changing the supply elasticity from 0.7 to 1. The result is shown in figure 2. The higher supply elasticity produces stronger effect on employment, and the effect on real wage is lower with a higher elasticity. The difference between the two alternatives comes with a delay. In the first 5 years, the difference between having an export supply elasticity of, respectively, 0.7 and 1 is hardly visible in figure 2.

Figure 2. Increase in labor supply, supply elasticity of 0.7 and 1
Effect on employment (left) and real wage (right)



The speed at which the additional labor affects economic activities and employment depends on the assumption with respect to the reaction of fiscal policy to the higher tax revenues. We consider three cases. In the first case, employment and investment in the public sector follow employment and investment in the private sector, this is also the standard case described by equation (1) above. In the second case, the effect on public demand is delayed, so that public demand does not increase until the additional labor has increased private production and income. In the third case, public employment is increased immediately by the full long-term impact. This is achieved by raising public employment by approximately 6000 persons in the first year.

Figure 3. Increase in labor supply, Instant and delayed response in public consumption
Effect on employment (left) and real wage (right)

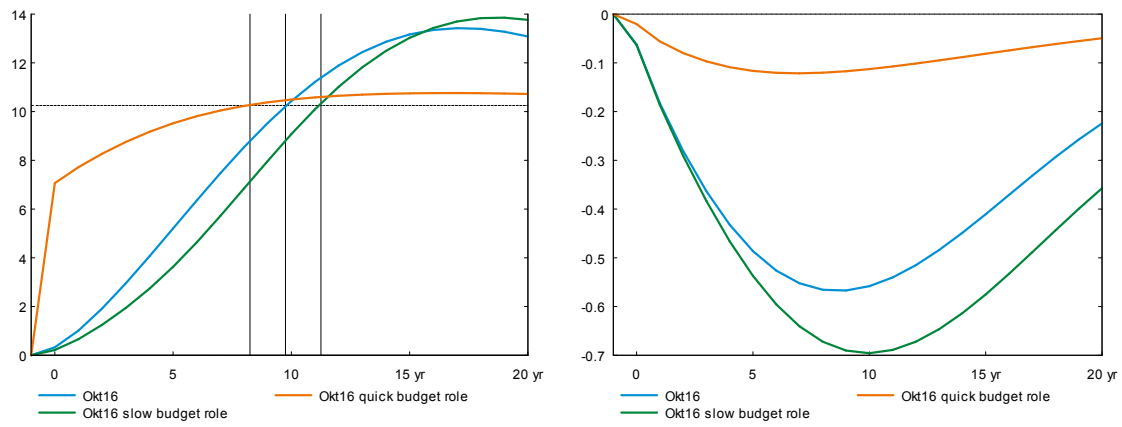


Figure 3 illustrates that the short-term effect on employment and real wage is very dependent on the assumed fiscal response. A quick response in public consumption speeds up the employment increase and reduces the temporary fall in real wages. The faster the impact on employment, the more favorable will be the result. The slow budget rule implies that the additional labor force will have to wait longer for a job, and the temporary negative impact on the real wage will be stronger.

2. Comparing okt15 and okt16

Here we compare the first 20 years effects in okt15 and okt16 to an increase in the labor supply (structural employment) permanently by 10,000 persons.

The experiment:

Early retirees Upfo is reduced by 10900 persons. Corresponds to approximately 10000 rise in employment Q.

okt15:

$Upfo = @Upfo - 10.9$

$Dco = 1$

okt16:

$Upfo = @Upfo - 10.9$

$Dfyfu = 1; Dco = 1$

The impact on employment and real wage was presented in section 1. It can now be confirmed in figure 4 panel 3 that the slightly higher employment increase in okt15 during the first 8 years has made the nominal wage reduction smaller in okt15 than in okt16. The wage reduction remains smaller in okt15 until year 15 reflecting that it takes about 15 years before the accumulated impact on unemployment becomes smaller in okt16.

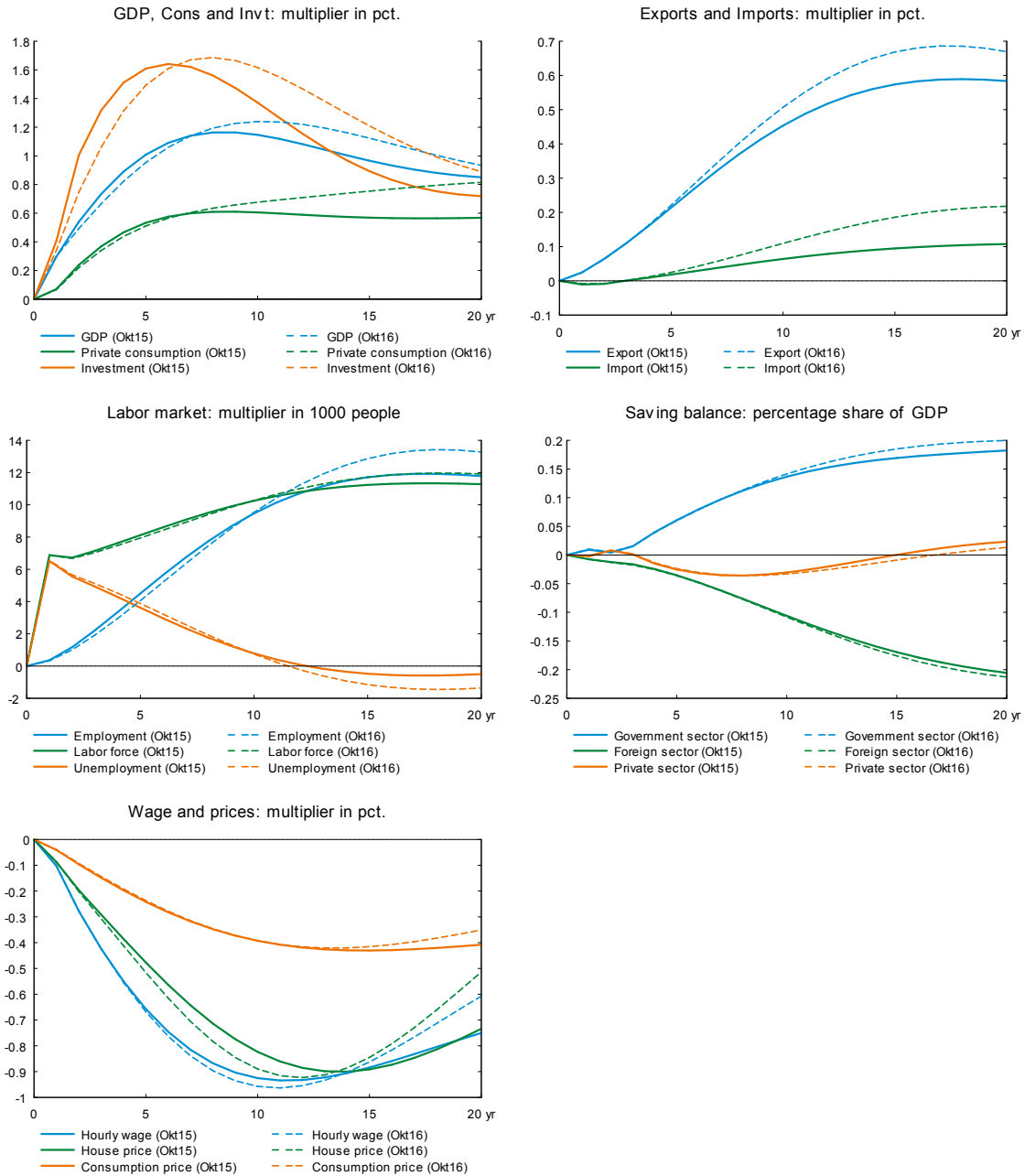
The stronger short-term response in employment in okt15 reflects a stronger GDP response. Figure 4 illustrates that the stronger short-term GDP increase in okt15 is not related to a stronger export increase. On the contrary, after 3 to 4 years export starts to increase by more in okt16 reflecting the moderately stronger wage reduction and the direct supply effect on exports in okt16.

Instead, the stronger short-term GDP response of okt15 reflects primarily a stronger investment response, which originates from a change in the factor block determining the demand for production factors. The change in this part of the model illustrates that the re-estimation and some minor re-specifications contribute to the difference between okt15 and okt16. Figure 4 also points to a slightly stronger impact on private consumption in okt15 until year 6, and this may reflect the stronger investment impact characterizing the first 6 years of the experiment on okt15.

At the end of the 20 year period considered, the expansive impact and the improvement of public finances are all higher in okt16 confirming the long-run importance of the supply effect included in the exports relations of okt16. Needless to say, the pass-through of the supply effect is delayed by the error-correcting coefficient of 0.15 in the export relations.

A major change in okt16 is the introduction of supply effects in the determination of exports, cf. DSI11nov16. The stochastic relations in okt16 are also re-estimated using a new data from the national accounts. Hence, some of the differences between the two models can also be attributed to the estimated coefficients. The short term effect on employment and output is larger in okt15, which is to a larger extent due to the estimated elasticities in the factor block. In the first couple of years the effect on exports is similar in the two models, implying that the supply effects in okt16 have no effect in the immediate term. As the additional labor is not automatically soaked up in the economy it leads to a rise in unemployment. The higher unemployment pushes down wages and improves competitiveness, which leads to expansion in production and employment. Roughly after three to four years, the effect on exports in okt16 begins to dominate the corresponding effect in okt15. It should also be noted that the supply effects in exports are included in the long-term relations, and an error correction coefficient of 0.15 requires some time for the effect to accumulate.

Figure 4. The effect of a permanent increase in labor supply



3. Different supply elasticities

Here we compare the first 20 years effects of changing the supply elasticity in the export relations.

The experiment:

Early retirees Upfo is reduced by 10900 persons. Corresponds to approximately 10000 rise in employment Q.

Upfo = @Upfo - 10.9

Dfyfu = 1; Dco = 1;

elfyfu = 0.7 (case 1), elfyfu = 1 (case 2)

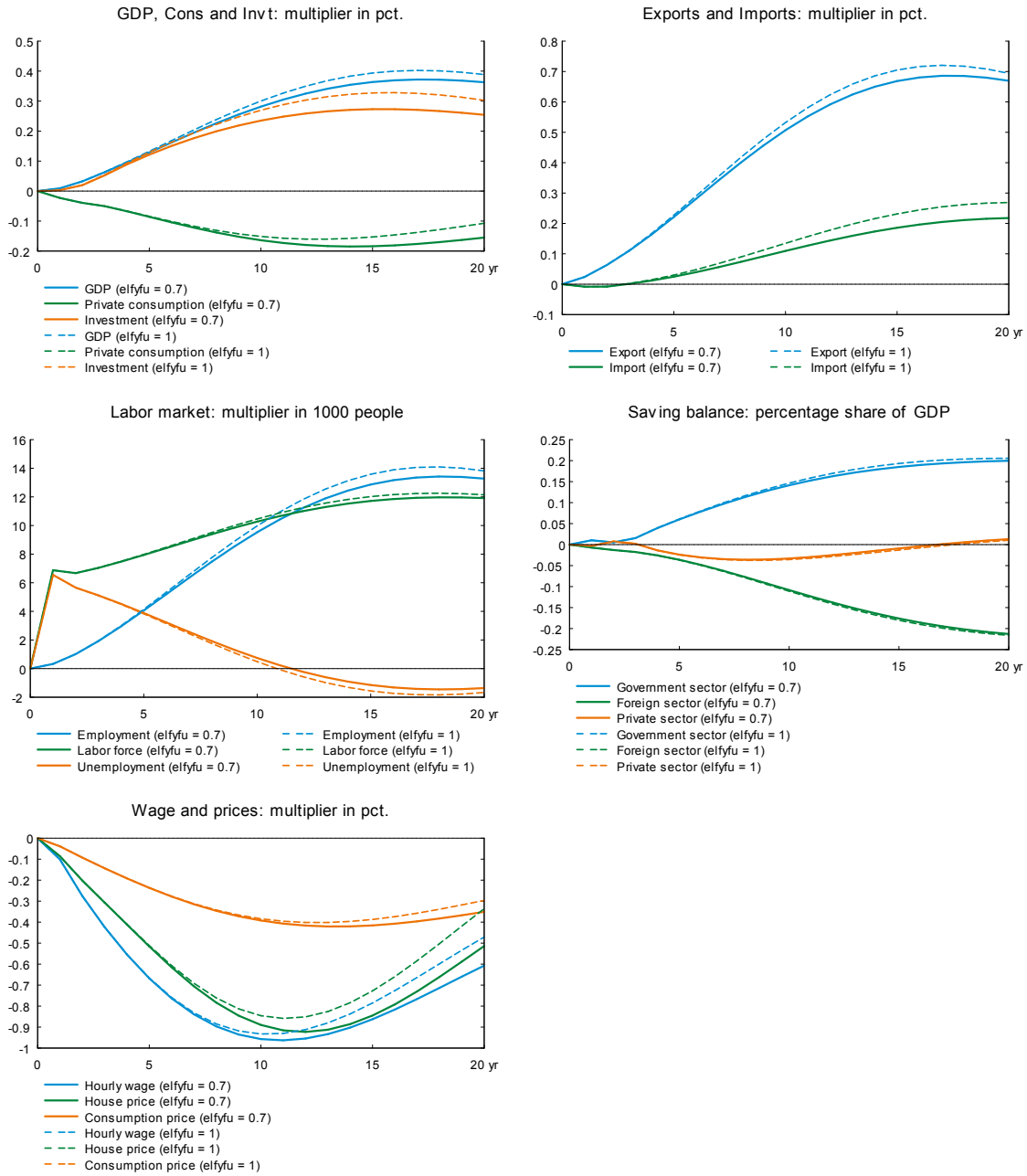
We consider two elasticities, $\theta = 0.7$ as estimated in DSI080816 and $\theta = 1$. The latter implies a full pass-through to exports.

During the first 5 years, a change in the supply elasticity makes no noticeable difference to the outcome. Thereafter, we can detect that the expansive impact on GDP and employment becomes stronger with a supply elasticity of 1. The stronger the impact on employment, the more moderate is the wage reduction. And the difference between the nominal wage reduction of okt16 and okt16 with a supply elasticity of 1 keeps growing throughout the illustrated 20 years period. This reflects that after 20 years, the increase of employment remains bigger with a higher supply elasticity.

As expected, the improvement of the public budget is stronger with a higher supply effect on exports, but one may note that the difference is rather small, see figure 5 panel 4.

In general, a supply elasticity of unity might have some nice properties, but the empirical evidence points toward a lower elasticity.

Figure 5. The effect of a permanent increase in labor supply



4. Labor supply shock and fiscal reaction

Here we compare the first 20 years effects of the labor supply shock with two different budget rules. As noted in section 1, the budget rules concern the reaction of public demand (employment and investment) and do not target the budget explicitly.

The experiment:

Early retirees Upfo is reduced by 10900 persons. Corresponds to approximately 10000 rise in employment Q.

Dco as dummy:

$Upfo = @Upfo - 10.9$

$Dfyfu = 1; Dco = 1$

Dco as trend:

$Upfo = @Upfo - 10.9$

$Dfyfu = 1$

$Dco <1 10> = 0.0163, 0.0392, 0.0911, 0.1978, 0.3775, 0.5987, 0.7858, 0.9002, 0.9569, 0.9820; Dco <11 20> = 1$

In the exercises so far, we have assumed that public consumption grows proportionally with private consumption. In reality, however, short-term fiscal reactions are often counter cyclical to business cycles, for example, taxes are reduced and public expenditures are expanded when the economy is in recession to avoid depression. Equation (1) stating the budget or public demand rule in section 1, should be seen as a long-term relation stating the trend, but adopting (1) throughout the whole period, i.e. setting Dco to 1 from year 1, can be misleading.

Alternatively, we insert a Dco that gradually approaches 1., cf. the box above, and the corresponding experiment is labeled *Dco as trend* below. More specifically, the Dco value gradually increases from 0.0163 in the first year to 1 in year 11 reflecting the values of a logistic trend with minimum 0, maximum 1, and inflection point placed close to year 5.

The implied slowing down of the effect on public demand reduces the employment and output effects of the additional labor supply. The smaller increase in public demand (with Dco as trend) reduces the impact on GDP, cf. figure 6 panel 1, and the smaller impact on employment increases the wage reduction as illustrated by figure 6 panel 5. The larger wage reduction improves competitiveness and stimulates exports, and at the same time, the lower domestic wage rate reduces the real income and holds back private consumption.

Consequently, the calculation with Dco trend produces higher exports and lower consumption than the standard calculation with the Dco dummy equal to 1. Towards the end of the 20 year period there is little difference between the employment effect of the two calculations. In year 20, employment is slightly higher in the calculation with Dco trend.

The more gradual increase of public demand with Dco trend increases the positive impact on the public budget, cf. figure 6 panel 4.

Figure 6. The effect of a permanent increase in labor supply

