8. The Short and Long Run Impacts of the GAP

8.1. The Short Run Impact of the GAP

In the charts below, we report the impulse response functions (as deviations from the steady state) of a public investment to GDP ratio increase, in which π_1 = 0.026 for four years, and, then, the parameter returns to the steady state value, π_1 = 0.018. The simulations show the dynamics of variables for the four implementation delays: one quarter (solid line); eight quarters (dotted line); 12 quarters (dashed line); and 16 quarters (dotted-dashed line). The three-year lag is the baseline IRF, due to the fact that it shows the best fit to the data. We report simulations for the more flexible fiscal adjustment scenario, in which the deviation of the public debt to output ratio and s, the steady state ratio, is less than 5% in 15 years. We chose this case to be the baseline, in order to allow a more expansionary effect of the GAP in the short run. In this way, charts report the most favorable scenario for the GAP.[30]

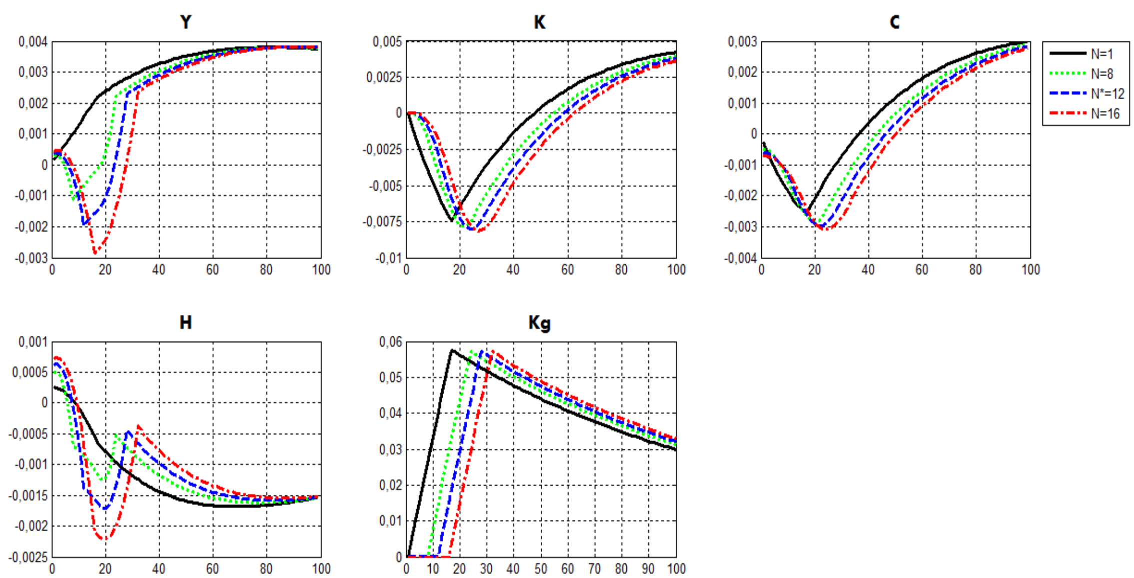
Even in this environment of more fiscal flexibility, the increase in public spending is associated to a recessive effect on output in the short run, for any lag larger than one quarter. For the three-year lag, the fall in the output stays around 0.2%, and can decrease to 0.3% if the time-to-build process reaches four years. Another important point is that the long run expansionary effect of GAP is modest in the three presented cases, and the growth peak may be achieved in a very large period. For instance, when higher taxation is over consumption, the output achieves the growth peak of 0.4% in 20 years, and it may be reduced to a little more than 0.2% in alternative financing schemes. Yet, in spite of being modest, the public investment impact on output is very persistent, due to the low value associated to the low public capital depreciation in Brazil. Therefore, the transition dynamics of variables are very long, achieving more than fifty years.

In the first chart, K^g reports the public capital stock growth. The variable is shown only for the case of taxation over consumption, since its path for the

[30] In the next section, we will see that, in a three-year lag, the flexibility of the fiscal adjustment has a stronger effect in the medium to long run. However, for lower lags (mainly of one quarter), the tighter fiscal adjustment tends to decrease the output growth in the short run. Therefore, we chose to report the adjustment scenario of fifteen years, in order to allow a more expansionary effect of the GAP in the short run.

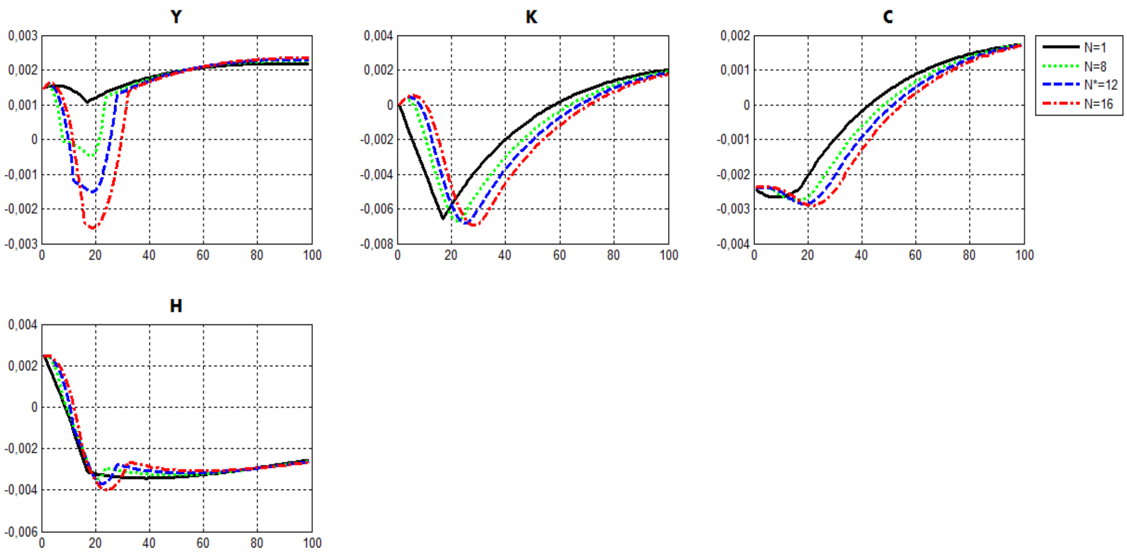
other cases is analogous. In this chart, we can note that different time-to-build processes may induce very distinctive short run dynamics, even though the increase in the public capital stock, of almost 6%, is the same for different spending delays. When the public investment is implemented immediately, the public capital growth path achieves the highest value in four years. Nevertheless, even for the least lag (of two years), the growth peak occurs two years later in comparison to the previous case. For even higher delays, the peak can be postponed to seven or eight years. Therefore, the impact of the public capital on the production function is increasingly procrastinated, as implementation delays of public investment increase.

Figure 8 – Responses for the shock on public investment: Consumption taxes (τ^c)



With respect to the private capital stock, the common dynamics to the three charts is an attenuation of the output fall in the short run, as the public investment requires more time to be executed. In the medium term, however, the effect is reversed, since the variable reaches a deeper bottom value. In fact, in the case of taxation on capital, the decline in the stock may achieve more than 1%, something absent from lower spending delays. Considering the long run path, the fiscal adjustment based on taxation over consumption induces a higher capital accumulation, whose stock grows almost 0.5% in 25 years. However, for this same time horizon, when the adjustment occurs through means of higher taxation over capital, the stock remains 0.2% under the steady state level. This comparison makes it clear how different financing schemes may induce very distinct long run dynamics.

Figure 9 – Responses for the shock on public investment: Labor taxes (τ^h)



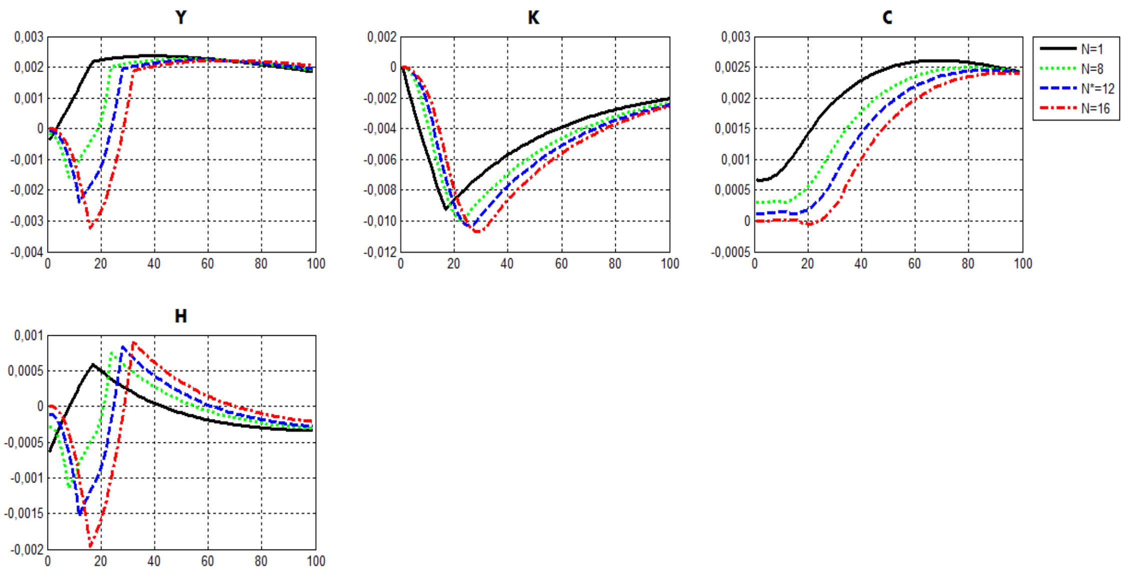
The consumption variable, on the other hand, exhibits dynamics for different lags that is similar to the previous one, except for the case of higher taxes on capital. In this case, the increase in taxes reduces the flow of saving over the business cycle. Therefore, the consumption remains above the steady state level in the transition dynamics, achieving a growth peak of little more than 0.25%. Moreover, as it occurs to other variables, the long run growth is higher when government expenditures are financed through taxation on consumption (more than 0.3%). In the case of higher taxes on hours worked, the peak is reduced to 0.2%.

Finally, the initial increase in hours worked is rapidly reversed when higher taxes are imposed to consumption or labor.[31] This effect is due to the decrease in wages earned by the agent in both cases. In fact, the fall in hours

[31] Ramey (2011) emphasizes that, in opposition to lump-sum taxes, distortive financing schemes tend to induce, in the neoclassical growth model, recessive effects on hours worked and on output.

worked may reach 0.4% in a four-year lag scenario, when the government finances expenditures through higher labor taxes. Considering the case of higher taxation on capital, hours worked fall immediately in the short run (between 0.1% and 0.2%), and the decline achieved increases with the delays in government spending. Subsequently, the variable grows less than 0.1%. It is worth mentioning that, in the three cases, the time-to-build process attenuates the short run dynamics of hours worked. This result, similarly to the decrease in consumption, is due to the positive wealth-effect caused by the increase in the public capital stock.

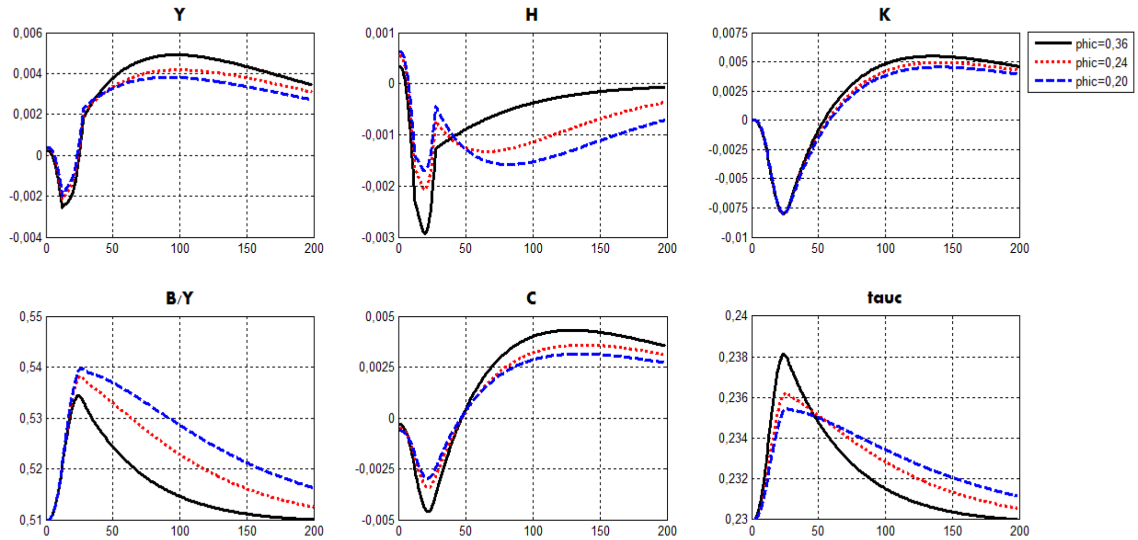
Figure 10 – Responses for the shock on public investment: Capital taxes (τ^k)



8.2. The Impact of Tight and Loose Fiscal Adjustments

In this section, we analyze how different fiscal adjustment degrees affect the patterns of macroeconomic variables in the short and long run. In the following figures, we report the impulse response functions to a public investment shock for the three-year spending delays. However, for each government expenditure financing scheme, we impose values to φ_c, φ_h and φ_k that correspond to the five (solid line), ten (dotted line) and fifteen-year (dashed line) scenarios for the fiscal adjustment. In the charts, we also report the different values associated to parameters φ_j, $j = c, h, k$.

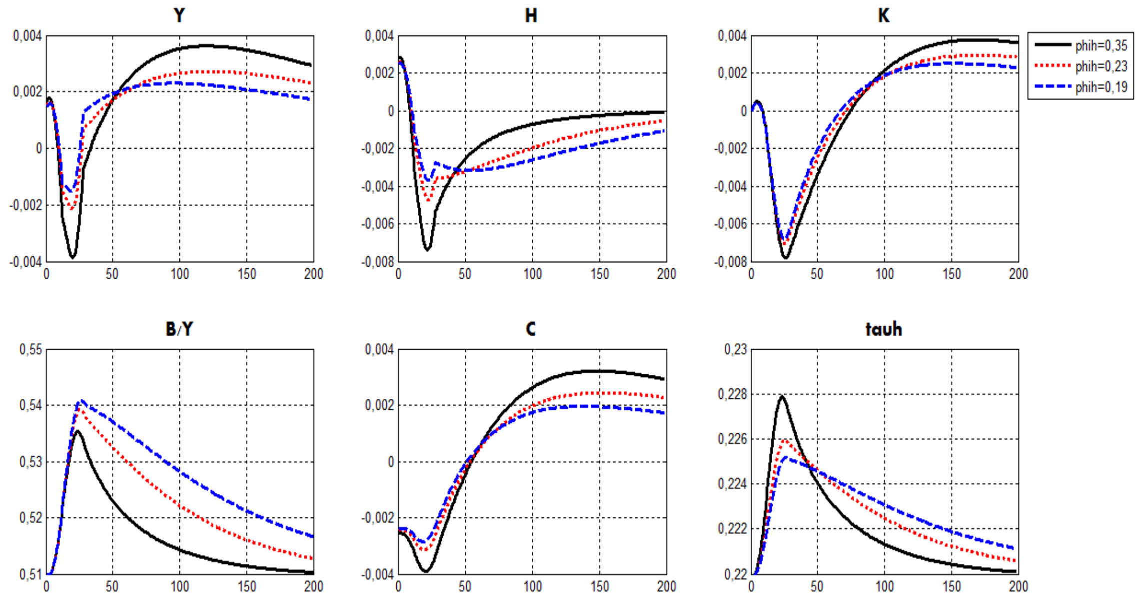
Figure 11 – Responses for the shock on public investment: Consumption taxes (τ^c)



The effect of more aggressive fiscal adjustments is not very important in the short run, unless the higher taxation is on hours worked. In fact, in the most aggressive scenario (of five years), the fall in the output may achieve almost 0.4% in the short run, doubling the decline associated to the intermediate scenario (of ten years). In the other financing schemes, the short run effect is very similar between distinct degrees of adjustment. In fact, when the public debt is financed through the taxation on consumption or capital, the fall in the output stays around 0.2% and 0.3%, respectively, for any fiscal adjustment scenario. Nevertheless, for any financing scheme, more flexible adjustments induce to a lower growth path in the long run.

This effect is due to the prolonged distortions imposed on the economy by the tax rates. To the extent the dynamics of debt is loosed over time, the tax rates remain higher for a larger period, in order to guarantee the sustainability of the public debt. In effect, in the three financing schemes, the gap between the output paths for different scenarios stays around 0.1 and 0.2 percentage points for more than ten years. And again, in the case of higher taxation over hours worked, the GDP growth rate in the fiver-year scenario is almost twice times higher than the rate corresponding to the fifteen-year scenario. Another important point is that the GAP is recessive in the short run in all simulations, to the extent that the implementation delays of government spending are large (of three years).

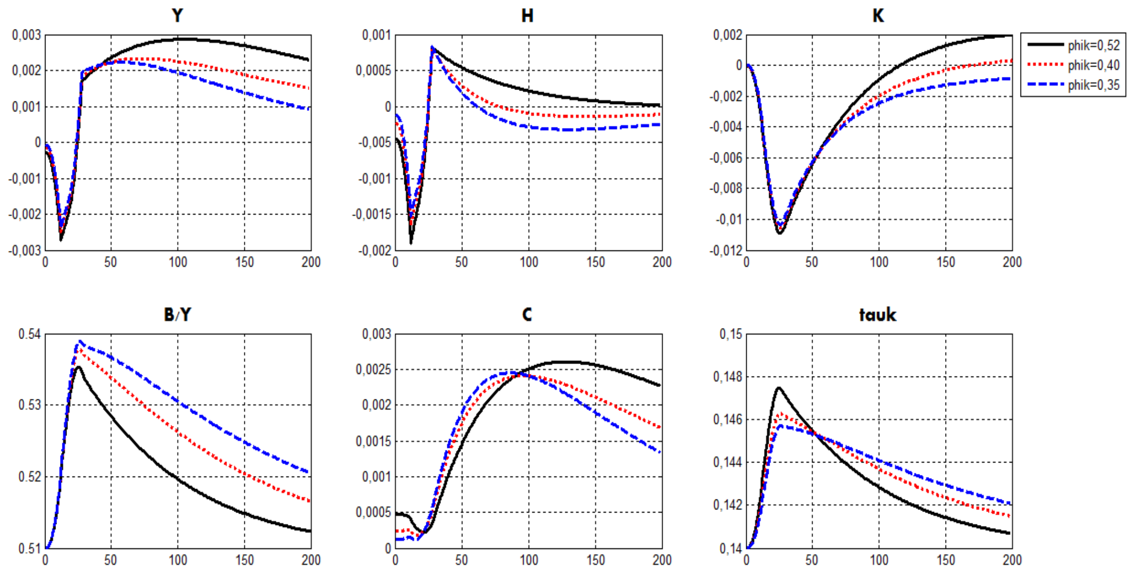
Figure 12 – Responses for the shock on public investment: Labor taxes (τ^h)



With respect to the capital stock path, the variable does not present significant differences between alternative degrees of adjustment in a shorter term. Yet, in the medium to long run, the more aggressive adjustment induces a stronger capital accumulation by agents. In fact, when government expenditures are financed by higher taxes on capital, the long run discrepancies are significant. In the more flexible scenario, the capital stock remains 0.15% under the steady state level, even twenty years after the initial shock. On the other hand, if the debt is addressed in only five years, the same variable shows a growth path of more than 0.2% in long run. In this last case, it is clear that prolonged distortions can induce very distinct paths for the variables.

Concerning the dynamics of consumption and hours worked, the quantitative differences in the short run are more expressive. In fact, when the government finances its expenditures through taxes on consumption, the fall in the variable achieves almost 0.5% in the five-year scenario, whereas in the fifteen-year scenario, the fall reaches a little more than 0.25%. In the same way, when the taxation is on hours worked, the decline in the variable stays around 0.4% and 0.7% in the short run depending on how aggressive the fiscal adjustment is.

Figure 13 – Responses for the shock on public investment: Capital taxes (τ^k)



Therefore, for the adopted calibration, the trade-off between the tight and loose adjustments tends to favor the first one, except for the case of higher taxation over hours worked. Although tighter fiscal adjustments may provoke more significant distortions in the short run, they also induce greater growth paths in the medium and long run, to the extent that the government does not need to impose a too prolonged higher tax burden. This effect is evident by the comparison of different tax rate paths for each financing scheme. As the fiscal adjustment becomes more flexible, the peak achieved by the tax rates is lower, but the return to the steady state level is more sluggish. As a consequence, the debt to GDP ratio reaches a higher level, both in the short and the long run.

In the Appendix B, we report the impulse response functions generated by alternative calibrations for the weight of public consumption in the household's utility: $\theta = 0$ (public consumption is pure waste) and $\theta = 1$ (public consumption and private consumption are perfect substitutes). The qualitative results associated to the time-to-build process and to the different degrees for the fiscal adjustment do not vary, and, quantitatively, the change in the output growth is negligible.

The more relevant impacts on variables are found in the impulse response functions for the private consumption and the hours worked in the short run, since the relative importance of public consumption in preferences induces distinct wealth-effects. According to Barro (1981), in response to a public spending shock, when $\theta = 0$, the rise in hours worked is higher, as well as the fall in consumption is attenuated in comparison to the case of $\theta > 0$. These different results are due to the negative wealth-effect over the household's income: it is amplified when the government spending does not generate any positive externality on households. In fact, these effects can be observed for the cases of higher taxation over consumption or hours worked. On the other hand, if the government finances its expenditures through taxes on capital, the consumption growth over the transition dynamics is lower for $\theta = 0$.