around a steady state and study the impulse responses of the endogenous variables in the linearized model.

## 2.2 Dynamic Amplification

Bernanke, Gertler, and Gilchrist (1999) (hereafter BGG) make several changes to the model of CF to put it in a complete dynamic new-Keynesian framework. In particular, BGG introduce nonlinear costs in the adjustment of capital which lead to variations in Tobin's $q$. These are the driving force behind the additional amplification effects that are not present in the models of BG and CF. As in the models of BG and CF, shocks to entrepreneurs' net worth are persistent. In addition, there is an amplification effect: The decrease in aggregate capital implied by a negative shock to net worth reduces the price of capital because of the convex adjustment costs. This lower price further decreases net worth, amplifying the original shock.

As before, households are risk-averse and entrepreneurs are risk-neutral. However, in BGG the role of entrepreneurs is that they are the only ones who can hold the capital used in the production of consumption goods. Investment, i.e. the creation of new capital is delegated to a separate investment sector described by the law of motion for aggregate capital

$$K_{t+1} - K_t = \left(\Phi\left(I_t/K_t\right) - \delta\right) K_t.$$

The function $\Phi(\cdot)$ is increasing and concave, with $\Phi(0) = 0$ and represents convex costs in adjustments to the capital stock. This is the key difference of this model to BG and CF where there are no physical adjustment costs when increasing or decreasing the capital stock. We refer to $\Phi(\cdot) - \delta$ as technological illiquidity, since it captures the difficulty (in aggregate) to scale up or undo investment. As a result of this illiquidity, the price of capital $q_t$ in BGG is given by the first-order condition of the investment sector

$$q_t = \Phi'\left(\frac{I_t}{K_t}\right)^{-1},$$

and Tobin's $Q$ is different from one. BGG assume this separate investment sector to ensure that the adjustment costs are separate from the entrepreneurs' decision how much capital to hold.

At time $t$ each entrepreneur purchases capital used for production at time $t+1$. If the entrepreneur with net worth $n_t$ buys $k_{t+1}$ units of capital at price $q_t$, he must borrow $q_t k_{t+1} - n_t$. At time $t+1$ the gross return to an entrepreneur's capital is assumed to