Has the Globalisation really generated more competition in OECD economies

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Abstract

Globalisation have generated a more or less competetive market according to the kind of firms. The Great moderation has structural causes such as market power, which is possible to study through the reduced form of the NKPC obtained with the Calvo and Rotemberg price setting assumptions. The Calvo model fails to predict the increase of price volatility on Business to Business (BotB) product markets where competition has definitively increased. By using a model with upstream and downstream firms, according to the Theory of firm Literature, where both are constraint by the Rotemberg price setting assumption, the model predicts the Great Moderation in OECD economies only if the hypothesis of an increase in the global markup is kept. Simulations replicate NKPC slope empirical estimations. This unusual hypothesis is supported by the increasing share of profit in value added, by the development of credit market in OECD countries and by the american increasing revenues inequalities. The model produces endogeneous incentives to a more flexible labor market and the development of credit market. A global decreased competetive market gives an explanation of the barely growth of median wage, compare to the growth of global productivity during the period of the Great Moderation.

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1 Introduction

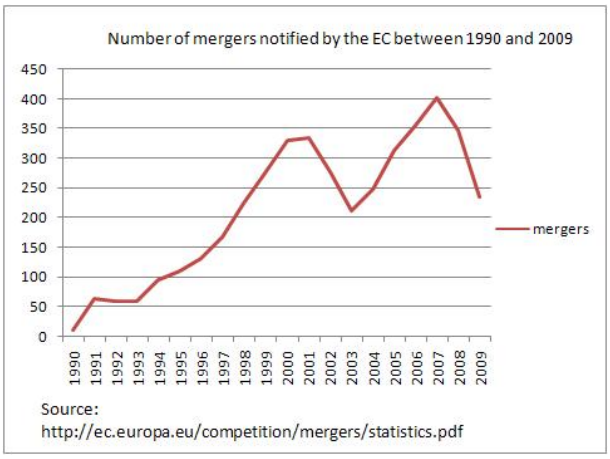
During the last four decades, OECD economies have experienced a steady increased openness usually called "'globalisation"'. Globalisation is said to have generated more competition among companies which has improve the welfare of consumers. The pure rents, i.e the monopoly power which enables the firm sector to determinate price above the marginal cost, should have decreased during this period,[25] Rogoff (2003). However those rents are unobservable. Some economists have analysed the evolution of different variables which likely affect them. For [5]Blanchard et Philippon (2003), globalisation has led to more competition. The Product Market deregulation seems to be the main cause. First of all, the index of barriers to entrepreneurship (a composite of product market regulation) has clearly decrease in all important OECD economies between 1975 and 1998. The deregulation began in the mid 1980's in Anglo-Saxon countries. Secondly the level of foreign trade has increased which could explain a greater competition. Thirdly the degree of state ownership of firms in the business sector has steadily declined. All this three variables enables the authors to assess for a decrease of pure rents in OECD economies.

Nevertheless the pure rents have not only fell because of the globalisation. According to [28]Sirëon (2001), the pure rents have risen in several sectors for some special companies. The globalisation enables consumers to have access to a greater range of products, but it also creates a bigger market for one company. Thanks to economy of scales, a multinational company can absorb greater fixed cost, like R&D expenditure, to produce more value added output. A national monopoly (oligopoly) has incentives to become a global monopoly (oligopoly), as it is illustrated in the aeronautic sector by Boeing and Airbus. A lot of high technology sectors are indeed dominated by a large monopoly or oligopoly (Pharmacy, software, chain retailling...). Siroën (2001) added that globalisation could create less contestable market. Because of network externality, a multinational first entrant can impose its technology to all the market which create a private monopoly that could be reinforced by TRIPS, the WTO's intellectual property rights agreements. [28]Siroën (2001) pinpointed the incentives for multinational company to rise private barriers and to shape negative market discrimination.

Moreover some variables assess a rise in pure rents during this last 3 decades. On the one hand the marketing expenditures which aim at diffrentiating the market and to develop loyal consumption, have skyrocketed since the beginning of the 1980's. On the other hand, the number of european and american mergers have largelly increased. On Figure 1, we see the evolution

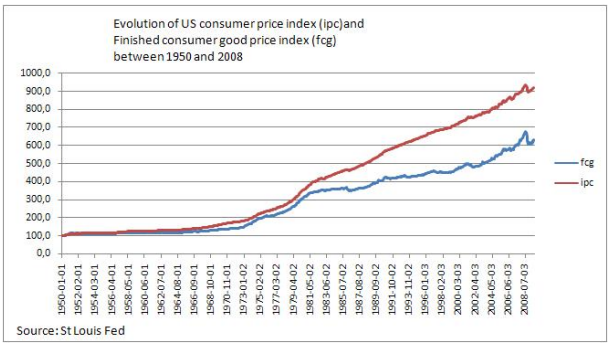
of number of the largest european mergers notified at the European Commission. In the United states, the numbers of mergers is at least ten times bigger, [28]Siroën (2001).

FIG. 1 – Numbers of Largest European Mergers between 1990 and 2009



In the Figure 2, we compare the evolution of the american consumer price index with the one of the american finished consumer good price index. We clearly see that the beginning of the product market deregulation coincides with a larger growth in consumer price than in finished consumer good price. This is not a proof but a clue for assessing a bigger rent for company between producers and consumers. The evolution of the consumer price index is indeed biaised by the development of services during the period.

FIG. 2 – Evolution of american cpi and american fcgpi



We can reasonably suppose that there is two different kinds of firms which are affected in different way by the globalisation since the 1980's : the ones whose rent was decreased, the ones whose rent was increased. The problem is to find a model which could explain whether the global rent in OCDE countries really fell.

2 The Great Moderation and other stylised facts

2.1 Explaining the Great Moderation

In the macroeconomic Litterature we generally suppose that 1984 is a breaking year for the american economy. A lot of empirical studies have showed a large decrease in the volatility of GDP and the volatility of inflation. This is called the Great Moderation. It spread to Canda, France, Germany, Italy, Japan and United Kingdom during the late 1970's and the 1980's, [29] Summers (2005), [19]Maher Khaznaji and Louis Phaneuf (2008).

FIG. 3 – The beginning of Great Moderation by country

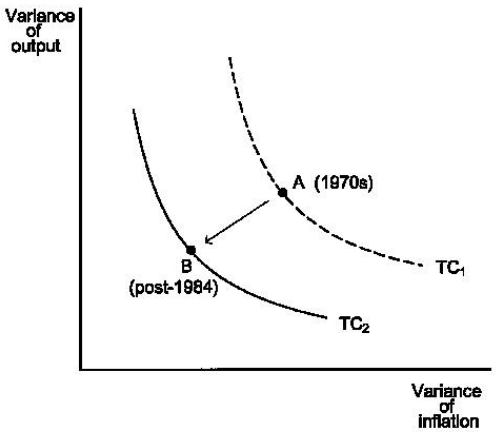
The Great Moderation: magnitude and dates of GDP volatility reduction

	Ratio of low to high volatility	Date of switch to low volatility
Australia	45,8	1984 Q3
Canada	58	1988Q1
France	54,2	1976Q3
Germany	48,3	1971Q3
Italy	50,8	1980Q2
Japan	62,9	1975Q2
United Kingdom	51,5	1982Q2
United States	50,8	1984Q4

Source: "What Caused the Great Moderation: Somme Cross-Country Evidence" P.Summers (2005)

Like explained in the remarks Governor Bernanke (2004)[6], the Great Moderation can be interpreted like a decreasing trade-off between output volatitlity and inflation volatility of the Monetary Authority : the New Keynesian Philips Curve moves from the right to the left since the late 1970.

FIG. 4 – Evolution of the New Keynesian Philips during the last three decades



A lot of papers have followed to determine the causes of the Great Moderation. The "Good Luck Theory" about the smaller shocks in OECD economies convice less and less economists

like [10]Domenico Giannone , Michele Lenza, Lucrezia Reichlin (2008) or [15] Gali and Gambetti (2008) whose empirical studies led to support explanations about structural changes. We have to notice that their article shows an increase in the volatitlity of hours worked relative to output between before and after 1984.

Most of the authors claim for a more trusted monetary policy in the United States. Unfortunately this cause is not sufficient for explaining the English Great Moderation, like showed in [2]Benati (2007).[8] Khan and Davis (2008) claim for a better stock management thanks to a better use of technology and Just In Time. A more flexible labor market would have generate the great moderation according to [20]LIU Waggoner Tao Zha(2009), [19]Maher Khaznaji and Louis Phaneuf (2008). The less energy dependancy would explain why the rise in oil price since 2002 didn't create stagflation, [22]Blanchard et Gali (2007), [24]Dhawan Jeske Silos (2008). To finish, better credit accessibility could be one of the causes, [4]Bezemer (2009). But none of them could explain the increased volatility of producer price index.

2.2 The producer price volatility puzzle

Dealing with the volatility of prices of the BtoC sector and the BtoB sector is very interesting because we can show a puzzle : after the mid 1980's the volatility of the consumer price index has decreased or remained quite the same, whereas the volatility of different price index from the industrial BtoB sector has suffered from a very large increase. This last sector is very important because it was the most affected by the globalisation, contrary to the service sector whose output is less internationally tradable.

FIG. 5 – American Standard Deviation of intermediate product price index, industrial producer price index, final consumer good price index, consumer price index

standard deviation	ippi	inppi	fgpi	ipc
1954-1984	2,892	2,795	2,474	1,706
1984-2005	3,666	3,863	2,810	1,350

Using mensual data from St Louis Fed between 1950 and 2009, we see that the volatility of the three BtoB prices have increased. The volatility of the american intermediate product price index was about 2.892 between 1954 and 1984, whereas it increased to 3.666 between 1984 and 2005. The volatility of industrial producer price was 2.795 and became 3.863. The volatility of finished consumer good price index was 2.474 during the first period and rised to 2.810 during

the second period. The volatility of consumer price index decreased from 1.706 to 1.350.

FIG. 6 – Canadian Standard Deviation of manufactured product price index and consumer price index

std deviation	mppi	cpi
1956-1984	0,642016067	0,380577289
1985-2007	1,289593058	0,490005254

Using canadian trimestrial data from the OECD database between 1956 and 2009, we show that the volatility of the canadian manufactured product price index has doubled, from 0.64 to 1.28, to between the period 1958-1984 and the period 1985-2007. The consumer price index grew a little bit from 0.38 to 0.49 during the same period, which can be considered like a stagnation of this volatility.

FIG. 7 – Australian Standard Deviation of manufactured product price index and consumer price index

standard deviation	mppi	cpi
1969-1987	0,3210021	0,29305781
1988-2008	1,30214205	0,52601314

Using australian trimestial data from the OECD database between 1968 and 2009, we show that the volatility of the australian manufactured product price index has largely increased, from 0.32 to 1.30, between the period 1968-1984 and the period 1985-2008. The consumer price index only grew from 0.29 to 0.51 during the same periods.

In theorical words, we can therefore assert that the New Keynesian Philips Curve using producer price index remained quite the same or moved to the right, whereas the New Keynesian Philips Curve using consumer price index moved to the left. In this paper, we are interesting in the moves of NKPC, not in the initial locus of price index varaibilities. A new explanation of the Great Moderation according to the Teory of Firm Litterature will enable us to create the model explaining this puzzle.

2.3 The spread vertical network : the "'network firm"'model

Research in Theory of Firm brings a very interesting information about the commun mutation of the structure of big companies in the OECD economies. During the late 1970's and the 1980's their governance have changed a lot. During the decades before, the "'Ford Shape"' was most spread structure of big firms. They were very vertically integrated and the strategy

oriented to quantity and price priority. But at the end of the 1960's, consumers asked for better quality and differentiation. In addition competition arised because of the product market deregulation.

[23]Porter (1980) described how companies began to externalize all the activities which not belonged to their core activites to keep the most profitable ones. The horizontal and vertical networks of firms was imposed in all activities and sectors were the value added to output was high, [1]El Herelli Afef (2007). But the horizontal network is not so long lasting than the vertical network. The most famous model of vertical network is the model of the "'network firm"' : a leader firm driving a range of smaller ones. Generally, the driven firms are juridically and financially independant. They work with the leader firm to gather their special abilities by contractualizing their relationship, [13]Fréry (2001),[11] Paché and Bacus-Montfort (2003), [14]Fulconis(2003). This kind of structure, called the "'network firm"' fits both flexibility and innovation constraints that the market laid down. Almost every sectors of OECD economies were affected by this mutation during the 1980's. Running a "'network firm"' became more and more easier with more and more efficient ICT,[11] Paché, Bacus and Montfort(2003). In the "'network firm"' model, the leader firm runs all the supply chain, by organising logistics between smaller firms. Generally, the leader firm is in charge of the R&D, the sailling activities, marketing activities, big financial activities (like mergers) and quality control activities of the "'network firm"'. We have to add that high skilled labor is generally employed in the leader firm. The average skill of employees in smaller firms is lower.

To sum up, the leader firm aims at improve the productivity of the whole "'network firm"' by improving the output between the smaller firms and final consumers. Firms which enjoyed a increase of their mark-up, discribed by [28]Siroën (2001), have commun features with leader firms driven smaller ones in the network firm model. Keeping this hypothesis, we develop a NKPC model where the leader firms will refer to the downstream firms and the smaller firms to the upstream firms.

3 The New Keynesian Model

3.1 The failure of the Calvo model

[18] Khan(2004) studied the effect of market structure on the slope of the New keynesian Philips Curve. The reduced-forms obtained by the Calvo,[7] Calvo(1983), and the Rotemberg,[26]Rotemberg(19

price setting assumptions are the same, [27]Rotemberg(1987). But, for the former, an increased competition among firms implies a decrease of the slope, whereas for the latter an increased competition generate an increase of the slope. Supposing a greater competition because of the globalisation, like in [5]Blanchard and Philippon (2003), and assessing for the decrease of the slope of the New keynesian Philips Curve using consumer price indexes from different OECD economies, the author concluded that the predictions of the Calvo model was consistent with the Great Moderation.
however the globalisation increased competition mostly among industrial and manufactured firms, because services are far less tradable. But the variability of industrial and manufactured product price index increased a lot during the period of the Great Moderation. Because of this evidence, the Rotemberg model seems to be more suitable. That's why we use in a simple New Keynesian Model, with Rotemberg price setting assumptions, which differentiates upstream firm and downstream firm.

3.2 Households

We assume a continuum of infinitely-lived and identical households. The representative household maximises a discounted sum of expected utilities :

$$\Omega_t(j) = \sum_{s=t}^{\infty} \beta^{s-t} E_t \left\{ \frac{1}{1-\sigma} C_s^{1-\sigma} - \frac{1}{1+\psi} L_s^{1+\psi} \right\}$$

where β is the subjective discount factor, $C_t = \left[\int_0^1 C_t(i)^{\frac{\theta-1}{\theta}} di\right]^{\frac{\theta}{\theta-1}}$, the Dixit-Stiglitz constant elasticity-of-substitution-compsumtion index, $C_t(i)$ represents consumption of the ith good, L_t is the supply of labour. $\sigma > 0$, is the intertemporal elasticity of substitution of aggregate expenditure. ψ is the desutility of labour, or the inverse of Frish elasticity.

The households are limited by the standard budjet contraint :

$$P_t C_t + \frac{B_{t+1}}{(1+r_t)} = (1-\tau) W_t L_t + (1-\tau) L_{hs} + B_t + (1-\tau) \Pi_t^u + (1-\tau) \Pi_t^d + T_t + G$$

$P_t = \left[\int_0^1 P_t(i)^{1-\theta} di\right]^{\frac{1}{1-\theta}}$ is the price consumer index, B_t is a bond which enable to save between to periods. W_t is the nominal wage. L_{hs} is a constant cost faced by downstream firms. Π_t^u denotes the profit of the total profit of the upstream company, and Π_t^d is the same for the downstream company. T_t is the cost of changing price for all the companies.τ is the average tax

rate for all the economy. Taxes fund exactly the public expenditure $G_(t)$. The utility maximising conditions are

$$\lambda_t = \frac{C_t^{-\sigma}}{P_t}$$

$$L_t^{\psi} = \frac{W_t}{P_t} C_t^{-\sigma}$$

$$E_t \left[\beta \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} (1 + r_t) \right] = 1$$

3.3 The Firms

3.4 The upstream sector

Each firm produces a differentiated intermediate good indexed by i. They are uniformly distributed on the interval $[0; 1]$. They operate in a monopolistically competitive market with the same production function.

$$Y_t^u(j) = A_t L_t^{\alpha}(i)$$

Each firm faces a demand curve from the downstream sector :

$$Y_t^u(j) = \int_0^1 \left(\frac{P_t^u(j)}{P_t^u} \right)^{\theta^u} Y_t^d(i) di$$

with $Y_t^d(i) = \left[\int_0^1 Y_t^u(i,j)^{\frac{\theta^u - 1}{\theta^u}} dj \right]^{\frac{\theta^u}{\theta^u - 1}}$ the demand from the downstream firm i to all the differentiated upstream firms j, and $Y_t^u(j) = \int_1^0 Y_t^u(i,j)\, di$ the total output of the downstream firm j. $P_t^u(j)$ is the price of the upstream firm j and $P_t^d(i)$ the price of the downtream firm i. $0 < \alpha < 1$ is the elasticity of upstream output with respect to labour. θ^u is elasticity of demand for downstream firm j. We implicitely assume that the capital stock is firm specific and constant over time.

3.5 The downstream sector

Each upstream firm produces a differentiated final good indexed by i. They are uniformly distributed on the interval $[0;1]$. They operate in a monopolistically competitive market with the same production function.

$$Y_t(i) = A^d Y_t^d(i)$$

As presented before, the activity of the downstream firm consists in improving the output of the upstream sector by organising the whole organistion thanks to the development of marketing, logistics, financial and R&D services.

Each firm faces a demand curve from the final consumer :

$$Y_t(i) = \left(\frac{P_t(i)}{P_t}\right)^{-\theta} Y_t$$

with $Y_t = \left[\int_0^1 Y_t(i)^{\frac{\theta-1}{\theta}} di\right]^{\frac{\theta}{\theta-1}}$ for the aggregate demand. $P_t(i)$ is the price of the downstream firm i.

3.6 The Rotemberg model

Following [26]Rotemberg (1982), each firm of both sectors faces a quadratic cost of nominal price adjustement, measured in terms of the final good. For uptstream firms, the cost adjustement is

$$\frac{c}{2}\left(\frac{P_t^u(j)}{\pi P_{t-1}^u(j)} - 1\right)^2 \frac{Y_t}{A^d}$$

and for the downstream firms, it is

$$\frac{c}{2}\left(\frac{P_t^d(i)}{\pi P_{t-1}^d(i)} - 1\right)^2 Y_t$$

where $c \geq 0$ determines the magnitude of the price adjustement cost and $\pi \geq 1$ is the gross steady-state inflation rate. In a symetric equilibrium the optimal price $P_t^{u*}(j)$ is the same for all firms, $P_t^{u*}(j) = P_t^u$. In addition $P_t^{d*}(i) = P_t$, $Y_t^d(i) = Y_t^d$, $Y_t(i) = Y_t$, $W_t(j) = W_t$.The

aggregate resource contraint becomes

$$(1-\tau)\,Y_t = C_t + \left(\left(\frac{P_t^u(j)}{\pi P_{t-1}^u(j)} - 1\right)^2 \frac{1}{A^d} + \left(\frac{P_t^d(i)}{\pi P_{t-1}^d(i)} - 1\right)^2\right)\frac{c}{2}Y_t$$

3.7 The Rotemberg model for the upstream firms

The representative upstream firm chooses $P_t^u(j)$ at each period to maximise the profit. We assume that upstream firms cannot forsee the optimal $P_t^u(j)$, because in a small firm the financial and accounting departement is less developed and because the downstream firms could change bargaining price conditions by using their potential greater market power induced by the "'network firm"' model.

$$P_t^u(j)\max\Pi_t^u = \left(\frac{P_t^u(j)}{P_t^u}\right)\int_0^1 \left(\frac{P_t^u(j)}{P_t^u}\right)^{-\theta^u} \frac{\left(\frac{P_t^d(i)}{P_t}\right)^{-\theta} Y_t}{A^d} di - \left[\int_0^1 \left(\frac{P_t^u(j)}{P_t^u}\right)^{-\theta^u} \frac{\left(\frac{P_t(i)}{P_t}\right)^{-\theta} Y_t}{A^d} di\right]^{\frac{1}{\alpha}} \frac{W_t(j)}{P_t}$$
$$-\frac{c}{2}\left(\frac{P_t^u(j)}{\pi P_{t-1}^u(j)} - 1\right)^2 \frac{Y_t}{A^d}$$

The first order condition can be written as :

$$(1-\theta^u)\frac{\left(P_t^{u*}(j)\right)^{-\theta^u}}{\left(P_t^u\right)^{1-\theta^u}}\frac{Y_t}{A^d} - \left(\frac{Y_t}{A^d A_t}\right)^{\frac{1}{\alpha}}\left(-\frac{\theta^u}{\alpha}\right)\frac{\left(P_t^{u*}(j)\right)^{-\frac{\theta^u}{\alpha}-1}}{\left(P_t^u\right)^{\frac{-\theta^u}{\alpha}}}\frac{W_t}{P_t} - c\left(\frac{P_t^{u*}(j)}{\pi P_{t-1}^{u*}(j)}\right)\frac{Y_t}{A^d}\frac{1}{\pi P_{t-1}^{u*}(j)} = 0$$

At the symetric equilibrium, we can log-linearised this equation as

$$p_t^{u*} = \frac{\theta^u - 1}{c}\frac{1-\alpha+\psi+\sigma\alpha}{\alpha}\tilde{y}_t + p_{t-1}^{u*}$$

with

$$\tilde{y}_t = y_t - y_t^n$$

$\tilde{y}_t$ denotes the global output gap betwenn the final output y_t and the natural output y_t^n.

We will assume that the log-linearised inflation rate of downstream prices is

$$\pi_t^u = p_t^{u*} - p_{t-1}^{u*}$$

3.8 The Rotemberg model for the downstream firms

The core functions of the downstream firm (leader firm or strategic center) is the conception, coordination and the monitoring of the supply chain„ [12]Fréry (1997). There is no direct link betwenn these three tasks and the quantity of output. We will then suppose that the cost of labor in dowstream firms is constant. In addition, the downstream firms have developed their accounting and financial departements very well. That's why we consider they can use more information than upstream firms to determine the next period optimal prices. Given $P_t^{u*}(j)$ a downstream firm chooses a sequence of $P_t^d(i)$ to maximize the expected sum of future discounted profits.

$$E_t \sum_{s=t}^{\infty} R_{t+s} \left[\left(\frac{P_{t+s}^d(i)}{P_{t+s}} \right)^{1-\theta} Y_{t+s} - \left(\frac{P_{t+s}^d(i)}{P_{t+s}} \right)^{-\theta} \frac{1}{A^d} \frac{P_{t+s}^{u*}}{P_{t+s}} Y_{t+s} - \frac{c}{2} \left(\frac{P_{t+s}^d(i)}{\pi P_{t+s-1}^d(i)} - 1 \right)^2 Y_{t+s} - L_{hs} \right]$$

where $R_{t+s} = \beta^s \left(\frac{C_{t+s}}{C_t} \right)^{-\sigma} \left(\frac{P_t}{P_{t+s}} \right)$ is the stochastic discount factor. L_{hs} is the constant cost of high skilled labor employed by the downstream firm whose value makes $\Pi_t^d > 0$ since big firms have given stock dividends to shareholders in average during the Great Moderation.

The first order condition can be written as :

$$P_t = \left[\frac{1}{\frac{\theta}{\theta-1} + \frac{c}{\theta\pi} \left[\left(\frac{\pi_t}{\pi} - 1 \right) \pi_t - \beta \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} \frac{Y_{t+1}}{Y_t} \left(\frac{\pi_{t+1}}{\pi} - 1 \right) \pi_{t+1} \right]} \right] \frac{P_t^{u*}}{A^d} = \mu_t \frac{P_t^{u*}}{A^d}$$

where μ_t is the mark-up over the marginal cost $\frac{W_t}{\alpha} Y_t^{\frac{1}{\alpha}-1}$. There are two terms in the denominator of the mark-up. The first term,$\frac{\theta}{\theta-1}$ represents the standard mark-up and the second term

$$\frac{c}{\theta\pi} \left[\left(\frac{\pi_t}{\pi} - 1 \right) \pi_t - \beta \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} \frac{Y_{t+1}}{Y_t} \left(\frac{\pi_{t+1}}{\pi} - 1 \right) \pi_{t+1} \right]$$

represents the net cost associated with price adjusment. When there is no stickiness ($c = 0$), the mark-up is the same as the desired mark-up, $\frac{\theta}{\theta-1}$. Log-linearise this last equation gives

$$\pi_t = \frac{\theta - 1}{c} p_t^{u*} + E_t \beta \pi_{t+1}$$

then the final new keynesian Philips curve obtain is :

$$\pi_t = \frac{\theta - 1}{c} \frac{\theta^u - 1}{c} \frac{1 - \alpha + \psi + \sigma\alpha}{\alpha} \tilde{y}_t + \frac{\theta - 1}{c} p_{t-1}^{u*} + E_t \beta \pi_{t+1}$$

3.9 Market structure and the Slope of NKPC

The steady state elasticity of demand for the representative downtream firm θ^u, and an upstream firm θ , capture the degree of substituability betwenn their own goods and those of thier competitors. These elasticities are inversely related to the desired mark-up over cost that firms want to charge for their output. A higher substituability between goods implies a higher degree of competition among firms, and a lower desired mark-up (a reduction in firm's price power). A structral increase in competition among firms is interpreted in terms of a one off increase in the (steady state) elasticity.

In a NKPC with Rotemberg price setting assumption, a higher competition among firms increases the slope of the Phillips curve and tends to magnify inflationnary pressures. Actually higher competition makes changing prices relatively cheaper (the second term in denominator). For a given magnitude of price adjustement cost, c, a higher θ or θ^u, lowers the net cost associated with adjusting prices. The size of the optimal price adjustement falls with the increase of competition (as θ or θ^u increase), which makes price adjustement relatively cheaper for a firm when facing quadratic adjustment cost. This effect promotes price flexibility and increases the slope of the Phillips Curve.

3.10 The Monetary Policy Rule

We will close the model by assuming a simple monetary policy rule :

$$r_t = \phi \pi_t$$

3.11 The Equilibrium

For sequence of productivity shocks $\{A_t\}_{t=0}^{\infty}$ a symetric equilibrium is a sequence of quantities :

$$\{\mathcal{Q}_t\}_{t=0}^{\infty} = \left\{Y_t, Y_t^n, \tilde{Y}_t, C_t, L_t, \Pi_t^d, \Pi_t^u, T_t\right\}_{t=0}^{\infty}$$

that satisfy households and firm optimality conditions for a given set of prices,

$$\{\mathcal{P}_t\}_{t=0}^{\infty} = \{W_t, P_t^u, P_t, r_t\}_{t=0}^{\infty}$$

3.12 The log linearised model around the steady state

$$y_t = E_t y_{t+1} - \frac{1}{\sigma}\left(r_t - E_t \pi_{t+1}\right)$$

$$\psi l_t = w_t - \sigma y_t$$

$$y_t = a_t + \alpha l_t$$

$$p_t^{u*} = \frac{\theta^u - 1}{c}\frac{1-\alpha+\psi+\sigma\alpha}{\alpha}\tilde{y}_t + p_{t-1}^{u*}$$

$$\pi_t^u = p_t^{u*} - p_{t-1}^{u*}$$

$$\tilde{y}_t = y_t - y_t^n$$

$$y_t^n = \frac{\psi+1}{1-\alpha+\alpha\sigma+\psi}a_t$$

$$\pi_t = \frac{\theta-1}{c}\frac{\theta^u-1}{c}\frac{1-\alpha+\psi+\sigma\alpha}{\alpha}\tilde{y}_t + \frac{\theta-1}{c}p_{t-1}^{u*} + E_t\beta\pi_{t+1}$$

$$r_t = \phi\pi_t$$

$$a_{t+1} = \rho a_t + \epsilon_t$$

avec

$$0 < \rho < 1$$

where ϵ_t is a white noise.

4 Simulations

4.1 Calibration

The model is calibrated using values that are close to calibrations of [**?**]Khan (2004), [21] Lombardo and Vestin(2007). The discount facor $\beta = 0.99$. $\alpha = 0.7$ denotes the average share of labour in the total output. $\psi = 2$ and $\sigma = 2$. ϕ will move from 1,1 to 2,1. $c = 2000.\rho$ is calibrated to 0.9 .

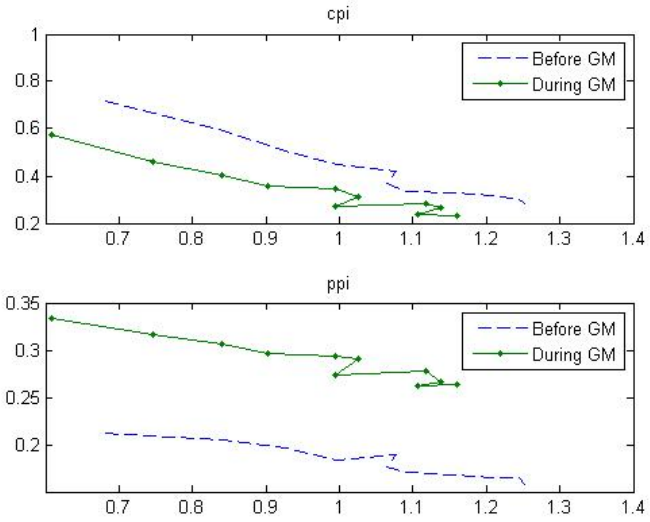
4.2 Results

As explained before, the market structure of the upstream firms and the downstream firms depends on the value of θ^u and θ. By using the Rotemberg model and assuming that competition among industrial and manufactured firms has increased, we have to decrease the value of θ^u between before and after 1984. To recreate a move from the right to the left of NKPC for consumer price index (i.e optimal price of the downstream sector), we must keep the hypothesis that the global markup has increased :

$$|\triangle\theta^u| < |\triangle\theta|$$

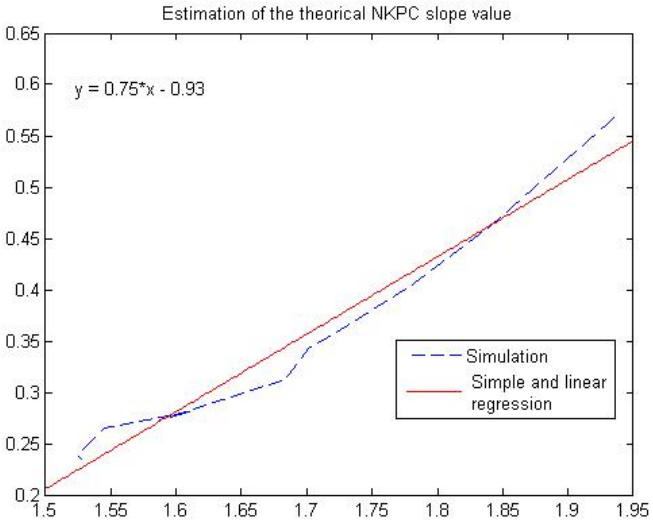
To illustrate the market structure of the upstream firm we will choose $\theta^u = 7$, before the Great Moderation and $\theta^u = 10$ during the Great Moderation. Concerning the downstream sector, $\theta = 10$ will decrease to $\theta = 5$ during the same periods. The first simulation illustrates moves of the trade-off between output and inflation volatilities. In [22]Blanchard and Gali (2007), this kind of curves doesn't fit the empirical volatilities too. For this paper the ecplanation is the same : the model is too simple. In [22] Blanchard and Gali (2007), the range of volatilities values belong to a interval between 0 and 0.9, our model gives a interval between 0 and 1.25 which is quite close to the empirical values.

FIG. 8 – Evolution of the NKPC for upstream (ppi) and downstream firms (cpi) before and during the Great Moderation



More interesting results are obtained when we represent the NKPC with the volatility of inflation and the volatility of the output gap for the downstream firm during the Great Moderation. For this calibration, the theorical value of the slope of NKPC varies around 0.75. [18]Kahn(2004) used a GMM method to estimate the empirical value of this slope for major OECD countries. He found values from 0 to 0.3 but he added lagged inflation and expected inflation in his regression. Unsing a simple linear regression, we consider that our result is quite consitent whith [18]Kahn (2004) results .

FIG. 9 – NKPC illustration and equation for downstream firms during the Great Moderation



The next simulation shows a increase of the wage volatility, which is hightlighted in the empirical studies of [16]Gervais (2009) but not really explained by structural changes, and payroll. According to the theory of Permanent Revenue, incentives to smooth consumption by enjoying credit services should have increased. This theory is consistent with the credit market development in all OECD countries since the begenning of the 1980's.

FIG. 10 – Standard deviation of wage for different monetary policies

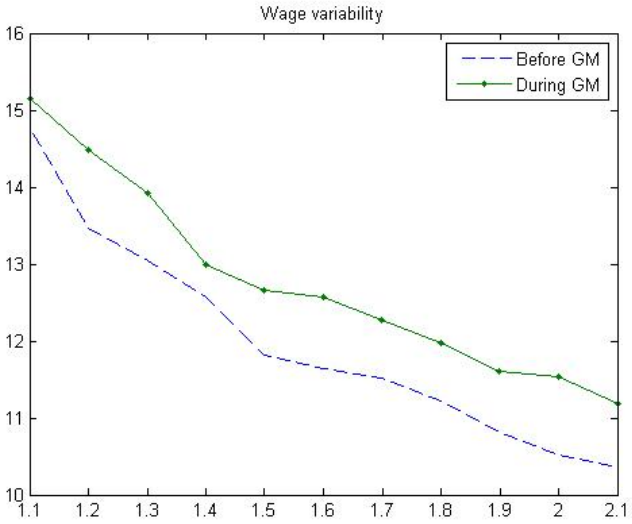
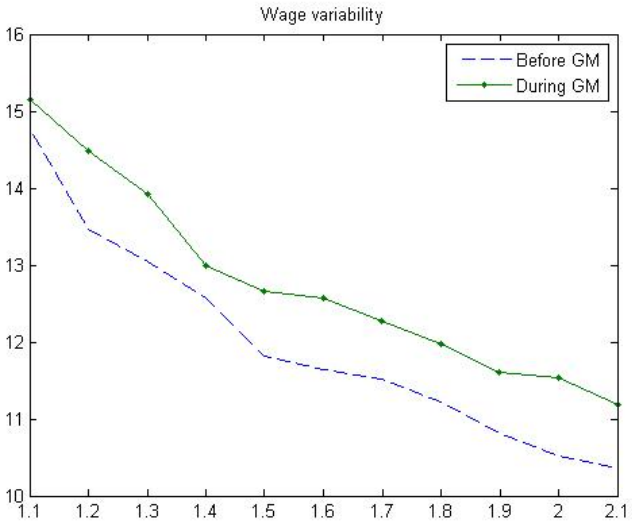


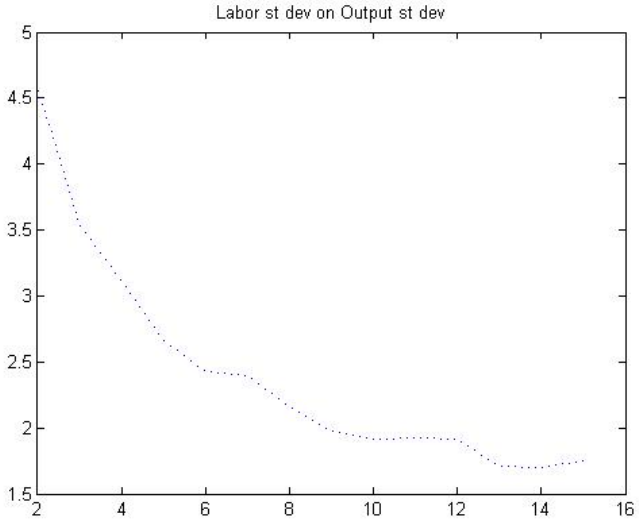
FIG. 11 – Standard deviation of payroll for different monetary policies



Finally the model predicts shows that the volatility of employment relative to ouput increases when the mark-up of the downstream firm decreases. To illustrate this fact, $\phi = 1.5$,

and θ decrease from 15 to 2. In [15]Gali and Gambetti (2008), the standard deviation of worked hours relative to the output one increases too, but from 0.65 in 1965 to 0.84 in 2005. The simulation generate standard deviations between 2 and 4.5. However the labor market is here totally flexible. We can conclude that more the mark-up of the dowstream firm is high, higher are the endogeneous incentives to promote a more flexible labor market.

FIG. 12 – Standard deviation of labor relative to the output



However the model is weak because it predicts an increase in hours worked volatility, whereas [15] Gali and Gambetti (2008), [16]Gervais (2009) found a decrease. But two explanations arise about the limits of this model. First the mutation of big companies structure does not affect the whole OECD economy but a large part of it. In the unaffected sectors the volatility of worked hours should lead the drecreased volatility of the global output. Secondly the nature of jobs have changed a lot since the late 1970's. The changing accounting methods towards Activity Based Costing, since 1988 [3], show that costs are more and more indirect, generated less and less hours worked volatilities relative to output. The present model just helps to understand why the decrease volatility of worked hours is less important than the decrease of output volatility.

5 What concequences for an increase of global rent in OECD economies during the Great Moderation

Companies where employees are more than 500 hire a minority of the total labor force. These large company can be associated with downstream firms in the model. Moreover households who benefits from the profit generated by these big companies thanks to stocks holding are a minority too in all OECD countries. From the model and the increased rent of dowstream firms, we can firstly conclude that both minorities has benefit from globalisation during the Great Moderation, whereas the global welfare has falled. The profit share in value added should increase as revenues inequalities should grow.

Two consistent empirical facts are that we find empirically that revenues inequalities grows in the United States and the wage share have steadily decreased in OECD economies during the Great moderation period, Ellis and Smith (2007). If we add to the profit share the wage of the best paid employees, that to say the top managers, the decrease would be more important, [17]Harrisson (2009) and [9]Dew Becker Gordon (2005).

FIG. 13 – Growing revenues inequalities in the United States

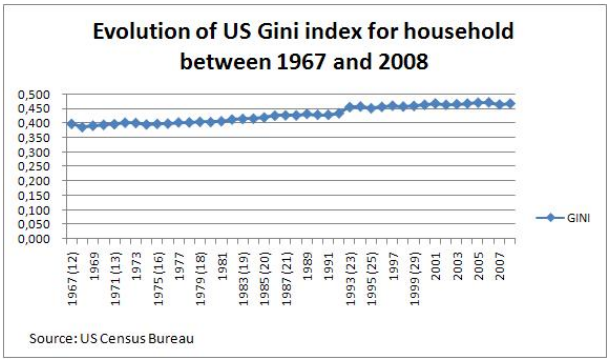
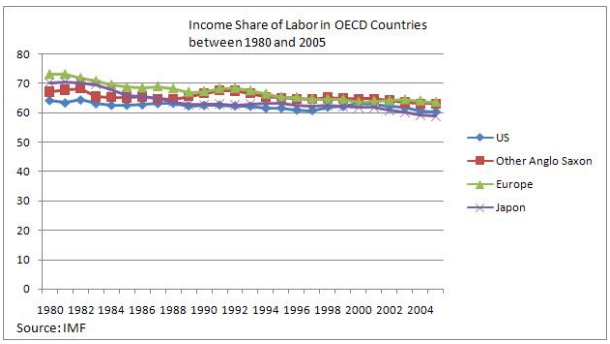


FIG. 14 – Profit and wage share in value added in major OECD economies

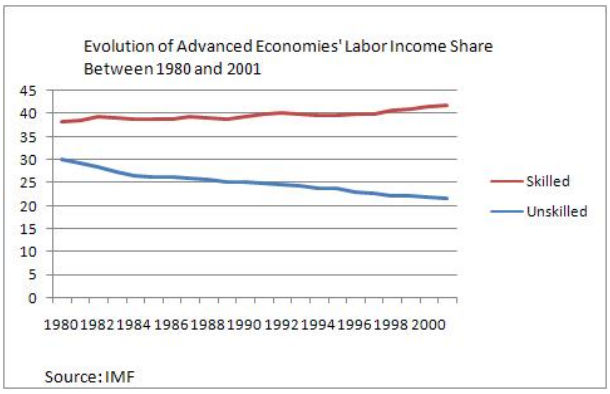


In addition these papers show that the growth of the real median wages grew barely and less than the growth of the average productivity during the period of the Great Moderation. One first reason could be that high-skilled employees enjoy a productivity growth higher than the others. Doubts can be easily raised because activities of high-skilled employees are more or less directed to service like R&D and Management, which aim at increase the productivity of the other employees but are not affected by a own large productivity growth. A more suitable reason could lay in the model. With the increase of the market power of downstream firms, a rise in upstream firms productivity cannot generate a proportionnal decrease of consumer price index : they have less intencives to drop their prices close to the marginal cost which has decreased. Real wages of upsteam employees don't rise as much as they ought to in a more competetive economy. The positive productivity shock generates more profit for the downstream firm.

Thanks to the conclusion of the model, we understand why the wage of the 10% of the best paid employees have raised, if we add the top managers wage to the profit share [9]Dew Becker Gordon (2005). We also understand why the median wage barely grew, less than the productivity growth, during the Great Moderation in the United States and Canada, [17] Harrisson (2009).

Thirdly the payroll of the smaller companies, which employ the majority of the workforce and the poorest part of it, should have been dampened according to the model. This prediction is consitent with the evolution of the income shares of low-skilled and high-skilled labor in OECD countries since the early 1980's.

FIG. 15 – High-skilled and low-skilled income share in value added



The income of low-skill employees have decreased in average, whereas its volatility increa-

sed. The development of the credit market have then endogeneous causes in this model, which is consistent with the empirical development of this market in all major OECD economies since the late 1970's.

To finish we can add two remarks. Almost every OECD countries have suffered from public imbalances since the begenning of the 1980's. The model gives is own explanation. For the same relative public expenditure, OECD governments need a higher growth of productivity to keep their public budget balanced during the Great Moderation. Because an increase in the global mark-up (i.e "'pure rent"') lower tax revenues if the productivity growth is constant. Now, it is generally accepted that the modern economies, productivity growth is relatively lower because of the weak productivity growth in services.
The last remark is about the timing of the evolution of the two mark-up studied in the model, which is definitively unsure. But if the market power of downstream firms have increased (protection against increased competition) before the fall of upstream firm markup (trade-off from downstream firm between traditionnal or new suppliers), unemployment should have risen before falling. That's what empirically happened in Europe according to [5]Blanchard and Phillipon (2003).

6 Conclusion

Globalisation have generated a more or less competetive market according to the kind of firm. If firms use high technology and very costly input, they may have increased their mark-up. More traditionnal firm, often smaller firms, they may have decrease their mark-up. Since [18]Kahn (2004), the Great moderation has structural causes such as market power, which is possible to study through the reduced form of the NKPC obtained with the Calvo and Rotemberg price setting assumptions. The Calvo model highlighted in [18]Kahn (2004) fails to predict the increase of price volatility on business to business markets where competition has definitively increased, notably in the manufactured sector.
Therefore, we have used a simple New Keynesian model with upstream and downstream firms, where both are constraint by the Rotemberg price setting assumption. The only way to replicate the Great moderation is to assume an increase of the global markup. By our calibration, we replicate a theorical value of the NKPC close to the ones estimated by [18]Kahn (2004) for

major OECD economies.

Incentives for supporting a more flexible labor market become endogeneous. The hypothesis of a rise of the global "'pure rent"' is consitent with increasing share of profit in value added in OECD economies and the revenues inequalities evolution in the United States. A less competetive market gives an explanation of the barely growth of median wage, compare to the growth of global productivity during the period of the Great Moderation.

future research : increasing profit of downstream firms as a cause of the no stagflation during the recent oil price shock by absorbing the negative shock.

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Derivation of the NKPC under R model

When there is no price stickiness (c=0), both kind of firms charge its own mark-up over its current marginal cost

$$P_t = \frac{\theta}{\theta-1}\frac{P_t^{u*}}{A^d} = \frac{\theta}{\theta-1}\frac{1}{A^d}\frac{\theta^u}{\theta^u-1}\frac{1}{\alpha}W_t\left(\frac{1}{A_t}\right)^{\frac{1}{\alpha}}\left(Y_t^d\right)^{\frac{1}{\alpha}-1}$$

$$P_t = \frac{\theta}{\theta-1}\frac{\theta^u}{\theta^u-1}\frac{1}{\alpha}\left(\frac{1}{A^d}\right)^{\frac{1}{\alpha}+1}\left(\frac{1}{A_t}\right)^{\frac{1}{\alpha}}W_t Y_t^{\frac{1}{\alpha}-1}$$

In the flexible price equilibrium ($c = 0$), the equilibrium output, Y_t^n, is given by

$$1 = \frac{\theta}{\theta-1}\frac{\theta^u}{\theta^u-1}\frac{1}{\alpha}\left(\frac{1}{A^d}\right)^{\frac{1+\psi}{\alpha}+1}\left(\frac{1}{A_t}\right)^{\frac{1+\psi}{\alpha}}Y_t^{\frac{1+\psi}{\alpha}+\sigma-1}$$

because the aggregate resource contraint is

$$C_t = Y_t$$

Finally we can write

$$Y_t^n = \left[\frac{\theta-1}{\theta}\frac{\theta^u-1}{\theta^u}\alpha\left(A^d\right)^{\frac{1+\psi}{\alpha}+1}\right]^{\frac{1}{\frac{1+\psi}{\alpha}+\sigma-1}}(A_t)^{\frac{\psi+1}{1-\alpha+\alpha\sigma+\psi}}$$

The log-linearised equation of the natural output is :

$$y_t^n = \frac{\psi+1}{1-\alpha+\alpha\sigma+\psi}a_t$$

The efficient level of output, in the absence of technology shocks is

$$Y_t^e = 1$$

Because $T = 0$ at the steady state, The log-linearised aggregate resource constraint with adjustment price cost is

$$y_t = c_t$$

at the symetric equilibrium the log-linearised marginal cost of upstream firms is

$$mct_t^u = w_t - \frac{a_t}{\alpha} + \left(\frac{1}{\alpha} - 1\right) y_t$$

which becomes

$$mct_t^u = \left(\frac{1+\psi}{\alpha}\right) a_t + \left(\frac{1}{\alpha} - 1 + \frac{\psi}{\alpha} + \sigma\right) y_t$$

Then we easily obtain marginal cost of upstream firms according to the global output gap :

$$mct_t^u = \frac{1-\alpha+\psi+\sigma\alpha}{\alpha}\left(y_t - y_t^n\right)$$

.1 The upstream firms

When there is no price stickiness (c=0), all firms charge a mark-up over current marginal cost

A firm chooses $P_t^{u*}(j)$ to maximise the profit at each period t.

$$\left(\frac{P_t^u(j)}{P_t^u}\right) \int_0^1 \left(\frac{P_t^u(j)}{P_t^u}\right)^{-\theta^u} \frac{\left(\frac{P_t^d(i)}{P_t}\right)^{-\theta} Y_t}{A^d A_t} di - \left[\int_0^1 \left(\frac{P_t^u(j)}{P_t^u}\right)^{-\theta^u} \frac{\left(\frac{P_t(i)}{P_t}\right)^{-\theta} Y_t}{A^d} di\right]^{\frac{1}{\alpha}} \frac{W_t(j)}{P_t} - \frac{c}{2}\left(\frac{P_t^u(j)}{\pi P_{t-1}^u(j)} - 1\right)^2$$

The first order condition is

$$(1-\theta^u)\frac{\left(P_t^{u*}(j)\right)^{-\theta^u}}{\left(P_t^u\right)^{1-\theta^u}}\frac{Y_t}{A^d} - \left(\frac{Y_t}{A^d A_t}\right)^{\frac{1}{\alpha}}\left(-\frac{\theta^u}{\alpha}\right)\frac{\left(P_t^{u*}(j)\right)^{-\frac{\theta^u}{\alpha}-1}}{\left(P_t^u\right)^{\frac{-\theta^u}{\alpha}}}\frac{W_t}{P_t} - c\left(\frac{P_t^{u*}(j)}{\pi P_{t-1}^{u*}(j)}\right)\frac{Y_t}{A^d}\frac{1}{\pi P_{t-1}^{u*}(j)} = 0$$

which becomes

$$\frac{c}{\theta^u}\left(\left(\frac{P_t^{u*}(j)}{\pi P_{t-1}^{u*}(j)}\right)^2 - \frac{P_t^{u*}(j)}{\pi P_{t-1}^{u*}(j)}\right) = \frac{(1-\theta^u)}{\theta^u} + \frac{1}{\alpha}\frac{W_t}{P_t}\left(\frac{1}{A^d A_t}\right)^{\frac{1}{\alpha}} Y_t^{\frac{1}{\alpha}-1}$$

If we log-linearise this equation a the symetric equilibrium, we obtain :

$$p_t^{u*} = \frac{\theta^u}{c}\frac{1-\alpha+\psi+\sigma\alpha}{\alpha}\tilde{y}_t + p_{t-1}^{u*}$$

with

$$\tilde{y}_t = y_t - y_t^n$$

where $\tilde{y}_t = log\left(\frac{Y_t}{Y_e}\right) - log\left(\frac{Y_t^n}{Y_e}\right)$