PRODUCT DOWNSIZING, HIDDEN PRICE INCREASE, SHRINKFLATION: A POST-KEYNESIAN MACROECONOMIC PERSPECTIVE

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Abstract

This article examines, from a macroeconomic perspective, the industrial practice of reducing the size/weight of goods or the quantity of input incorporated into these goods at the margin, without passing the cost reduction on prices. Rarely examined at the academic level, this practice has received renewed attention with the recent return of inflation, as it makes it possible to limit price rises by reducing the quantity of finished product offered. Known as "product downsizing", "shrinkflation" or "hidden price increase", it is part of a microeconomic strategy that has macroeconomic effects in terms of income distribution and consumers'well-being.

JEL Codes E12 General aggregative models – Post-Keynesian
L16 Industrial Organization and macroeconomics: Industrial Structure and Structural Change
E37 Forecasting and Simulation: Models and Applications

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Introduction

Non-academic institutions such as the media and consumer associations regularly highlight industrial practices whereby producers reduce the quantity of finished product or input in this product at the margin, while continuing to present the product as the same as before, and without passing the lower cost on prices. This practice has recently been revived in the context of rising inflation, as it enables companies to limit price increases (or even reduce prices). The names used are many and varied: hidden price increase, product downsizing, shrinkflation, etc. The phenomenon has rarely received academic attention. Yet these practices, often documented as anecdotes (manufacturers marginally reducing the weight of their products, or mixing raw materials with inexpensive inputs such as water), have in fact been known and widespread for a very long time, and sometimes constitute fully assumed strategies on the part of companies. Beyond their anecdotal aspect, they raise issues in theoretical terms, as they play on price competition and therefore constitute a microeconomic competitive strategy: they reveal the possibility of a price reduction without an equivalent reduction in the profit margin (thus a potential modification in the firm's competitive position), which has consequences in distributive terms at the macroeconomic level. This is what this article proposes to explore. The article is divided into three parts: it first reviews this practice, its names and its apprehension by both the academic and non-academic worlds. In the second part, we articulate this practice with theoretical elements of the theory of the firm and theory of consumer. In the third section we examine the macroeconomic consequences in a post-Keynesian-inspired model that adopts the Stock Flow consistent methodology, following the Lavoie and Godley (2001, 2006) tradition, showing the macroeconomic consequences on growth, distribution and employment.

1. PRODUCT DOWNSIZING, SHRINKFLATION, HIDDEN PRICE INCREASES.

1.1. Overview of the practice

The practice we examine in this article consists, for firms, of reducing costs by reducing the quantity of finished product or quantity of input incorporated into finished goods, without reducing the price by the same proportion, thus allowing the product or service to appear to be (quite) the same as before, and enabling the producer to capture part of the cost reduction. In addition to simply reducing size and weight or quantity of inputs, this may also involve the substitution of inputs, with certain expensive raw materials being replaced by cheaper ones. This practice concerns product modifications "at the margin", and is therefore designed to ensure that the consumer, who is directly affected because he obtains less value for the same price, is hardly, if at all, aware of the modification. The phenomenon has received little academic attention, and is best described in surveys carried out by non-academic institutions (consumer associations, NGOs, government fraud control departments, etc.). This practice is called by various names, and refers to various methods, which we attempt to describe here.

A first practice that often attracts attention concerns the substitution of inputs with less expensive ones in order to reduce costs. This type of practice is regularly highlighted in the

food industry. Historically, this practice can be linked to the notion of adulteration, which is the substitution of worthless inputs to original ones in order to reduce unit costs while maintaining the same presentation of the product as before. At the origin, adulteration means the composition of goods is mixed with toxic products. This phenomenon was at the origin of the 1906 Food and Drug act in the US. However, the practice can also involve non-fraudulent and/or non-hazardous substitution, as it is possible to substitute the inputs of a good in order to make it cheaper, by replacing or mixing the inputs with others that are cheaper and/or of lower quality but not toxic/dangerous. One of the most common cases is water or air: in this case, manufacturers increase the quantity of water or air in the product or its packaging. Increasing the air content is known as "**slack fill**", and is regulated for some (but not all) products in the US, for example.

But the simplest case involves a downward, marginal change in product weight or total product quantity. This is sometimes called **shrinkflation** (a term that seems to have been brought to the fore by economist Pippa Malmgren)[1]/**product downsizing**. In Europe, this practice has become widespread after the deregulation of product packaging formats, which has allowed producers to freely choose the weight of their products since 2008/2009 (Directive 2007/45/EC, which now prohibits national regulations on pre-packaged products). Martin (2008) and Masters (2013) both list several examples of this type of practice in the grocery sector.

At this stage, one might think that this practice only concerns goods, and that it is more difficult to implement it in services. However, recent examples have clearly shown that services are also concerned. In the service sector, the term "**skimpflation**" is sometimes used. Various sources have recently documented the case of service companies cutting back on associated services for the same price. On their blog, economists Glen Hubbard and Tony O'Brien report various cases of quality reduction in certain services[2]. Especially in restaurants after the pandemic. They also mention Neil Irwin, who highlights the case of hotels in which services have become less frequent for the same price[3].

All these practices highlight the fact that producers seek to reduce the quantity of input and/or finished product in order to cut costs, without fully passing this cost reduction into prices, and in the hope of an absence of reaction from consumers. To quote Hubbard O'Brien (*ibid.*), in all cases we observe that "*customers were paying the same price, but receiving less*". The examples cited are attributed to recruitment difficulties after the pandemic, but Scott Mc Cartney, who highlights the disappearance of certain hotel amenities, notes that it is not always clear whether this is due to Covid-19 or cost-cutting reasons[4].

[1] https://drpippa.substack.com/p/sneakflation?utm_source=%2Fsearch%2Fshrinkflation&utm_medium=reader2
[2] More on Hidden Inflation, https://hubbardobrieneconomics.com/2022/07/07/more-on-hidden-inflation/
[3] "There Is Shadow Inflation Taking Place All Around Us," *New York Times*, October 14, 2021.
[4] Scott McCartney, "The Incredible Disappearing Hotel Breakfast—and Other Amenities Travelers Miss," *Wall Street Journal*, October 20, 2021.

1.2. A rare academic analysis

In general, most cases of product downsizing are reported in non-scientific media, newspapers and other mainstream media. Their consideration in academic economics work is much less frequent. However, it is possible to find works that examine this issue. Adulteration was analyzed by Donna Wood as soon as 1985. If adulteration initially refers to fraudulent and toxic substitutions, the author broadens the spectrum of analysis by emphasizing that the process can also be based on non-toxic and sometimes even non-fraudulent susbsitutions, for example by cutting raw materials with other non-dangerous materials such as water. She even claims that this seemed to be much more widespread than the fraudulent adulteration (Wood 1985). We can also find examples, fraudulent or not, reported in non-economic journals, for example D'amato, M. A., *et al*. (2013), or DeShazo, *et al*. (2013) in medicine.

Imai and Watanabe (2014) have proposed a statistical analysis of product downsizing for Japan during the deflationary period (showing that the phenomenon is not typical of inflationary times). Using price and quantity data from 200 Japanese supermarkets between 2000 and 2012, they identify 15,000 products affected by "replacement" (one new product succeeding another). Of these 15,000 replacements, over a third involved a reduction in size or weight. The main finding concerns price responsiveness: product reductions had a relatively low impact on prices. In 75% of cases, price reductions were smaller than the corresponding size or weight reductions. On the basis of the proposed regressions, Imai and Watanabe reject the hypothesis that companies reduce prices in proportion to the size and weight of a product.

Melmiès (2015) calls this practice of producing goods with a reduced quantity of inputs, or by mixing original inputs with cheaper inputs (while still presenting these goods as the same as before) "industrial seigniorage", echoing the practices of the Seigneurs who could mix gold with other metals in order to produce more coins. Melmiès (2015) notes examples of European directives or draft directives whose purpose was precisely to authorize firms to mix inputs in order to reduce the price of goods (use of vegetable fat which is cheaper than pure cocoa butter in chocolate production, production of rosé wine by mixing up white wine with red one, use of wood shavings in place of barrels in order to make the wine get a woody taste to reduce the cost of production -and so the price). Melmiès also lists numerous practices reported in the agri-food industry in France and Belgium (34% of samples tested concerned), both fraudulent and non-fraudulent, and links the phenomenon to a rogue but widespread form of price competition that affects product quality.

Snir and Levy (2011), for their part, examine the asymmetry of consumer reaction between a price adjustment or a quantity adjustment. Drawing on elements of cognitive psychology, they explain why some producers may prefer to adjust the quantity of goods rather than prices.

Academic analyses of this type of phenomenon are thus few in economics. To our knowledge, they have never been approached from the angle of their macroeconomic consequences. On the other hand, the fact that we find older references (here from the 2000s,

but the references cited above provide older ones) means that this phenomenon is actually deeper and older than a simple reaction to a period of inflation, and that it harbors more than just an anecdotal phenomenon but potentially a corporate strategy.

2. A (MICRO)ECONOMIC STRATEGY

2.1. A competitive strategy

It's important to understand that the practice of product downsizing actually goes far beyond the simple "trickery" as it is sometimes described by the media. We defend the idea that it is a practice that potentially responds to a real strategy on the part of the firms that practice it, which may or may not prove successful, and which is to be linked to a logic of competition between producers on a market. The point we are considering here is that the practice of product donwsizing is not specific to periods of inflation, and must be articulated within a broader analysis of competitive interactions between firms (which is why our macroeconomic model developed in section 3 incorporates 2 poles of firms competing to sell their goods to households).

Product downsizing represents an opportunity (with no guarantee of success) to try to improve the producer's situation and expected profitability, as it opens up a potential window of opportunity for three concomitant phenomena: price reduction, cost reduction, and higher profit margins if the cost reduction is not passed on in full.This practice has proved to be a viable and profitable business strategy on markets. For example, quoting Winter (2001), Gourville and Koehler (2004) recall that the brand PepsiCo reported a "*sixth consecutive quarter of double-digit earnings growth*" in 2001, which was partly attributed to the company's "weight-out" strategy of putting "fewer chips in bags of Lays, Doritos, and other Frito-Lay products" (PepsiCo 2001 first quarter press release, quoted by Winter 2001 and reprinted in Gourville and Koehler 2004). Gourville and Koehler (2004) further note that the coffee brand Chock Full o'Nuts first implemented this strategy in 1988, and that a host of other brands subsequently engaged in product downsizing practices (see Masters (2013) and Martin (2008) for additional examples).

At the purely theoretical level, product downsizing can potentially be interpreted from a wide range of theoretical perspectives. In the simplistic case of monopoly, we can already highlight the fact that a fall in marginal cost (whatever it may be) will lead to both a fall in price and an increase in the profit margin, and thus to an incomplete passing-on of the fall in cost to the consumer. The phenomenon can also be incorporated into analysis in terms of sticky prices, in which producers will prefer adjust product size or weight instead of prices, as done by some of the authors cited above, such as Snir and Levy (2011). In this paper, we highlight the interpretation of this practice into more heterodox analyses, such as the post-Keynesian theory of profit margins which we will mobilize below in macroeconomic modeling. This theoretical tradition places pricing and profit-margin decisions at the crossroads of two objectives pursued by firms: stimulating demand (a competitive constraint) by offering a better price than the competitors and thus increasing sales growth, and generating sufficient retained profit to partially internally-finance the investment needed to meet sales growth. Inspired by the works

of Eichner (1973, 1976) or Wood (1975) (see Lavoie (2015) for a presentation of these theories or Melmiès (2023) for a historical overview of post-keynesian profit margins theory) this theory emphasizes the role of profit margins as a source of self-financing for investment.

The post-Keynesian theory of the firm is a very interesting way of looking at product donwsizing: this practice enables firms to reduce prices (and thus to improve their relative position in the marketplace and increase their sales growth) without cutting profit margins, by manipulating the quantity of inputs. Their product can thus appear less expensive than its competitors, while presenting the good as the same as before, and at the same time increasing profit margins so as to finance investment necessary to meet this growth sales. This technique is, of course, risky, as several conditions must be met for it to succeed:

- The goods in question must remain not too different in terms of composition (size/weight);
- Consumers must be more or less inattentive and/or monetarily constrained;
- Consumers must be more or less price-sensitive.

2.2. Consumers'behaviour

These product downsizing strategies challenge consumer rationality because, unless we assume that firms engage in this type of practice collectively and in a coordinated fashion, consumers should be able to detect this type of practice and possibly compare it with non-involved firms. There are in fact a number of conditions that explain and are necessary for this type of strategy to prove viable.

First of all, consumers must not be fully attentive or rational. The success of a product downsizing strategy is more likely in the case of consumers whose rationality is limited in the sense of Simon (1955). A great deal of work has been done in this vein in the economic literature. In particular, the economics of attention has shown how individuals can display limited attention in the face of abundant information. Moreover, this strategy can be successful insofar as, even when faced with perfectly attentive and rational consumers, the income constraint directs consumers more or less strongly towards the cheapest goods.

3. THE MACROECONOMIC CONSEQUENCES OF PRODUCT DOWNSIZING

3.1. Need for a macroeconomic analysis

A preliminary question to examine is whether or not it is necessary to explore the macroeconomic consequences of such a phenomenon. The idea is that, at the aggregate level, this type of behavior induces effects that are difficult to apprehend simply by extrapolating the individual case. In particular, there is the question of the impact of this type of practice on the situation of consumers, on output, on income distribution (and employment). "Shrinkflation" has multiple effects on the situation of consumers. Firstly, it allows consumers to benefit from

lower prices, or lower inflation. In this sense, it improves the situation for consumers. At the same time, it reduces the quantity (or quality) of products, making consumers worse off. The question then arises as to which effect prevails, and what is the final impact on income distribution. Here, we conduct a post-Keynesian analysis based on a macroeconomic model that respects consistency between stocks and flows (simulations were carried out with E-views 12 software) in the tradition initiated by Godley (1996) and Godley and Lavoie (2001, 2006), but simplifying the financial side of the model and developing the "supply-side", which has not received much attention int the existing literature of SFC models.

3.2. The macroeconomic model

3.2.1. General structure

The model will follow the principles inspired by Lavoie and Godley's (2001, 2006) canonical approach. The model is composed of four productive entities. Two of them (A and B) produce consumption goods, the third one (M) produces an input that it sells to A and B, and the last one (I) produces investment goods for the whole economy (including for itself). For the sake of simplicity, banks are assumed to afford credit in a purely horizontalist way[5]. Assuming away interest rates and banks profits, banks are here only credit affording entities. Households work for the four productive entities, earn wages and receive distributed profits. At the initial stationary state, entities A and B are exactly identical, and have thus each 50% of the consumption good market. The transactions matrix derived from this model is given in Table 1. The stock matrix is very simple, as we assume away shares, so as to focus on the productive side. The stocks of the economy are presented in Table 2.

We list the identities, listed from (*a*) to (*p*) in Table 3[6], that come from the transaction matrix (all columns and the non-trivial rows (more than two variables rows) in table 1. Equation (*p*) is chosen as hidden equation that will check the stock-flow consistency. These identities are the general structure of the artificial economy. We are now to define behavioural equations.

3.2.1.1. Firms

We begin by defining the equations concerning the four productive entities, A, B, M and I[7]. The existing capital stock K_j evolve with the investment expense I_j of the period:

$$Kj = K_{j-1} + I_j \quad \forall j = a, b, m, i \tag{1}$$

Investment expenses I_j are given by the rate of accumulation g_j of each sector, itself represented by a kaleckian investment function of the traditional form, *i.e.* depending on a constant term

[5] We could have introduced some kind of discrimination between firms, as Melmiès and Dallery (2013) do, but preferred assuming it away as the model will already be quite heavy.
[6] When an equation is derived from an accounting identity (i.e. it is just an accounting identity rewritten in another form), its number will precise from which identity it is derived.
[7] We will use a capital letter for each of the four productive entities, but will use the corresponding small letter to write the equations.

γ_j^0, on the rate of capacity utilization and on the rate of undistributed profit of the previous period$u_{j(-1)}$ and $r_{(j-1)}^U$ [8].

$$I_j = g_j \cdot K_{j(-1)} \quad (2)$$

$$g_j = \gamma_j^0 + \gamma_j^u \cdot u_{j(-1)} + \gamma_j^r \cdot r_{(j-1)}^U \quad (3)$$

The rate of undistributed profit r_j^U is the ratio between undistributed profit of the period Π_j^U and the capital stock evaluated at its replacement cost $p_i K_j$:

$$r_j^U = \frac{\Pi_j^U}{p_i \cdot K_j} \quad (4)$$

The rate of profit before distribution r_j is the ratio between total profits Π_j and capital stock:

$$r_j = \frac{\Pi_j}{p_i \cdot K_j} \quad (5)$$

The rate of capacity utilization u_j is defined as the ratio of actual output q_j and the output of full capacity utilization or potential output q_j^{FC}:

$$u_j = \frac{q_j}{q_j^{FC}} \quad (6)$$

Full capacity output is the ratio between capital stock K_j and the capital coefficient σ_j:

$$q_j^{FC} = \frac{K_j}{\sigma_j} \quad (7)$$

Concerning the determination of sectoral actual outputs, we assume, in a simplified Post Keynesian way of Post Keyneysian Stock Flow consistent modelling, that they are determined by current corresponding demand. For the consumption goods entities (*A* and *B*), actual output q_a is equal to the amount of consumption of households in this good, C_a, divided by its price p_a (global consumption being defined in monetary terms and output in real terms):

$$q_a = \frac{C_a}{p_a} \quad (8)$$

We get the same thing for the consumption realized in the good produced by B:

$$q_b = \frac{C_b}{p_b} \quad (9)$$

Concerning the output of the intermediate entity (*M*), we assume that *A* and *B* buy a fixed share of their respective output to this entity, i.e. we assume fixed technical coefficients α^B and α^A :

$$q_m = q_m^A + q_m^B = \alpha^A \cdot q_a + \alpha^B \cdot q_b \quad (10)$$

The output of the investment good entity q_i is equal to investment goods sold to all sectors (including investment goods entity I produces for itself):

$$p_i \cdot q_i = p_i \cdot (I_a + I_b + I_m + I_i) \text{ or } q_i = (I_a + I_b + I_m + I_i) \quad (11)$$

[8] We only use net flows and do not explicitate capital depreciation.

We also have to define the total amount of profit Π_j realized by each sector by subtracting sectoral costs to sales turnovers. For the consumption sector, the profit is equal to the difference between sales (i.e. households' consumption) and wages plus intermediate expenses:

$$\Pi_a = p_a \cdot q_a - w_a \cdot N_a - \alpha^A \cdot p_m \cdot q_a \quad \text{(b-12)}$$

$$\Pi_b = p_b \cdot q_b - w_b \cdot N_b - \alpha^B \cdot p_m \cdot q_b \quad \text{(d-13)}$$

Other entities (M and I) only have wage costs:

$$\Pi_m = p_m \cdot q_m - w_m \cdot W_m \quad \text{(f-14)}$$

$$\Pi_i = p_i \cdot q_i - w_i \cdot W_i \quad \text{(h-15)}$$

We assume that firms save a fixed share sf_j of their profit, giving distributed profit Π_j^D:

$$\Pi_j^D = (1 - sf_j) \cdot \Pi_j \quad (16)$$

Undistributed profits Π_j^U are thus what remains of this process:

$$\Pi_j^U = \Pi_j - \Pi_j^D \quad (l, m, n, o\text{-}17)$$

Concerning the price of intermediate (*M*) and investment (*I*) goods, they are supposed to be determined by a usual *mark-up* over unit costs (the determination of the price of consumption goods is detailed below).

$$p_m = (1 + \theta_m) \cdot w_m/\mu_m \quad (18)$$

$$p_i = (1 + \theta_i) \cdot w_i/\mu_i \quad (19)$$

With w_j the sectoral wage rate and μ_j the sectoral labour productivity.

The number of workers actually employed in each sector N_j, is assumed to be equal to the ratio of actual output q_j and the actual average labour productivity μ_j:

$$N_j = \frac{q_j}{\mu_j} \quad (20)$$

We assume, for simplicity purpose, a unique constant sectoral wage rate w_j:

$$W_j = w_j \cdot N_j \quad (21)$$

Firms are assumed to transfer some of capacity utilization changes on labour productivity instead of hiring or firing immediately.

$$\mu_j = \mu_{(j-1)} + \phi(\mu_j - \mu_{(j-1)}) \quad (22)$$

with ϕ an exogenous parameter.

3.2.1.2. Banks

We adopt a simple horizontalist banking behaviour, so as not to complexify the model, and focus on developing the supply-side of the model, and underline as precisely as possible the macroeconomic consequences of product downsizing. We assume banks afford credit as demanded by firms for the external financing of investment projects. They thus afford a total

amount of credit ΔL_j, based on the difference between the total amount of (sectoral) investment in monetary terms ($p_i I_j$) and the amount of undistributed profits Π_j^U:

$$\Delta L_j = \left(p_i \cdot I_j\right) - \Pi_j^U \qquad (c, e, g, i\text{-}23)$$

For simplicity purpose, we assume banks don't apply interest rates. Outstanding credits are equal to money supply M^S:

$$L_a + L_b + L_m + L_i = M^S \qquad (j\text{-}24)$$

3.2.1.3. Households

In a traditional Post Keynesian SFC way, households are supposed to consume out of wages, distributed profits and money stock. The global monetary amount C^{tot} that households consume is determined as a share α^w of their wage revenue, a share α^m of their monetary wealth stock M^D and a share α^R of distributed profits:

$$C^{tot} = \sum_{j=a,b,m,i} \alpha^w \cdot W_j + \alpha^R \cdot \sum_{j=a,b,m,i} \Pi_j^D + \alpha^M \cdot M^D \qquad (25)$$

We have to define the sharing out of this global amount of consumption between two goods, A and B. At the beginning of simulations, households are assumed to spend one half of their total consumption expenditure in good A and another half in good B. We assume households first determine their consumption in good B, C^B, and then realize the rest of their buying in good A, C^A.

$$C^A = C^{tot} - C^B \qquad (k\text{-}26)$$

C^B is determined as a share of the global amount of households' consumption.

$$C^B = \Omega \cdot C^{tot} \qquad (27)$$

In this equation, Ω represents a consumption coefficient, described as:

$$\Omega = \left(\frac{1}{2}\right)\left(\frac{P_a}{P_b}\right)^{\rho}\left(\frac{\alpha_B}{\alpha_A}\right)^{(1-\rho)} \qquad (28)$$

Equation (28) states that a fall in the price of good B compared to the price of good A leads to a rise of this good in consumers' basket, and that a reduction in input quantity of a good compared to the other good leads to a fall of this good in consumers' basket. When prices and input coefficients are equal, we get $\Omega = 0{,}5$, which is the case at the beginning of simulations. Equation (28) is chosen to as to simulate the sensitivity of consumers to price differentials and to input quantity differentials.

We finally have to define saving behaviours of households, which is very simple in our model as we will assume for a purpose of simplicity that people save by holding money M^D :

$$\Delta M^D = Rev^H - C^{tot} \qquad (a\text{-}29)$$

With $Rev^H = \sum_{j=a,b,m,i}(w_j \cdot N_{j)} + \sum_{j=a,b,m,i} \Pi_j^D$ $(a\text{-}30)$

3.2.1.4. Prices and input coefficients adjustments

As we have already said, we mobilize here the Post Keynesian theory of the firm.

By emphasizing the importance of self-financing, the post-Keynesian tradition (found in other works such as Baumol (1962), or Marris (1964) (see Melmiès 2023) allows us to stress that a firm, when its self-financing rate is sufficient or higher than necessary, may seek to reduce its profit margin by lowering its price in order to attract new customers in the competitive struggle on the market to stimulate sales growth. On the other hand, insufficient self-financing forces the company to react in order to regain a viable long-term financial structure.

We'll assume that companies lower their prices when their financial structure (or, more precisely, their cash flow) is "in surplus" (i.e., when their profits enable them to post a cash flow rate higher than the target), and that they reduce the quantity of inputs when their financial structure is "in deficit" (i.e., when their cash flow rate is lower than that required to run the business over the long term). In other words, companies "use" part of their profits to reduce prices and thus try to win new customers. On the other hand, they cut costs when profits fall short of their targets, in an attempt to restore them.

It's interesting to note the similarity of this approach to that already highlighted by Hall and Hitch in 1937 in their seminal article on full cost pricing, who noted that for the business leaders they interviewed "In others it meant working from some traditional or convenient price, which had been proved accceptable to consumers, and adjusting the quality of the article until its full cost equalled the 'given' price".

In what follows, the initial stationary state is characterized by an equal repartition between firm A and firm B, since these firms are strictly identical at the beginning. Let's suppose now that firm B tries to increase its market share and reduces its price. This represents a decrease in its profit margin θ_b. However, in a Postkeynesian/woodian perspective, this is not endurable, since it will decrease its "required" or "necessary" self-financing rate. In order to meet a price decrease *and* a stable self-financing rate, firm B will adapt the composition of the good it produces, by decreasing the input coefficient α_b^m (the quantity of input incorporated in the productive process). It will do it so as to restore its self-financing rate TAF_b to its "required" or necessary" value $T\tilde{A}F_b$.

$$\alpha^b = \alpha^b_{(-1)} + \varphi \cdot (TAF_b - T\tilde{A}F_b) \tag{31}$$

This means that firm B will reduce the quality of products only when its effective self-financing rate is below the required value. Firm A is assumed to react exactly the same way to a deterioration of its self-financing rate:

$$\alpha^a = \alpha^a_{(-1)} + \varphi \cdot (TAF_a - T\tilde{A}F_a) \tag{32}$$

Both equations (31) et (32) are subject to the constraint:

$\varphi = c > 0$ if $TAF_{a,b} < T\tilde{A}F_{a,b}$

$\varphi = 0$ otherwise.

For simplicity, the sensibility of reaction in each firm φ will be the same everywhere. c will thus be an exogenous parameter.

Firms will decrease their price when their self-financing rate is above the target:

$$p_a = p_{a(-1)} + \lambda \cdot (T\tilde{A}F_a - TAF_a) \quad (33)$$

$$p_b = p_{b(-1)} + \lambda \cdot (T\tilde{A}F_b - TAF_b) \quad (34)$$

With the constraint:

$\lambda = c > 0$ if $T\tilde{A}F_{a;b} < TAF_{a;b}$

$\lambda = 0$ otherwise.

Figure 1 summarizes all the actors and relationships present in the model.

[Insert Figure 1]

3.3. Simulations

Table 4 shows chosen values for parameters, and values of main endogenous variables that come from these parameters. Firms A and B are strictly identical at the beginning: they pay the same wage rate, the same price for the input good, and the same unit price for their investment expenses. Finally, firms A and B also incorporate the same ratio of input in their production *at the initial stationary* state (goods A and B are identical). We run simulations of the model in its initial stationary state and simulate a shock under the form of a price cut of the good of firm B.

[Insert Table 4]

Figure 2 shows the hidden equation of the model (equation (p) rewritten under the form $(M^s - M_d^{tot})/M^s$). This equation is equal to zero, so we can deduce our model is coherent from a Stocks-Flows perspective.

[Insert figure 2]

3.3.1. Effects of an initial price cut

The simulation we run consists of an exogenous price cut of good B. Figure 3 shows the effect on the prices of the two consumption goods A and B. Both prices fall, but the price of good B falls more than that of good A. It is therefore firm B that pushes the price-cutting strategy further, while firm A is more of a follower in this respect.

[Insert figure 3]

Figure 4 shows the evolution of key variables for firms producing consumption goods. Profit rates, accumulation rates and utilization rates are increasing in both sectors, as falling prices increase the volume of goods consumed and produced by households. After a period of variation, self-financing rates return to their initial level. Thus, firms A and B have improved their production dynamics while maintaining their financial structure. From this point of view,

we can see that the product downsizing strategy improves the companies' situation. At the macroeconomic level, falls in prices stimulate quantities households consume and make the economy stabilize at higher rates of capacity utilization, profit and accumulation

[Insert figure 4]

As a result, we can see that the quantity of raw materials incorporated into goods is also decreasing for the two consumption goods A and B. Once again, the phenomenon is more marked for good B, which was the first company concerned in the simulations. As a result, the dynamics of the model now reveal two goods that are no longer exactly in their composition (Figure 5). The input coefficient of both goods A and B have thus been reduced. Our simulations seems to reproduce a stylized fact that appears in studies: the fact that product downsizing is not only a practice of "low-cost" firms. Even big brands are concerned.

[Insert figure 5]

Concerning the rate of growth of employment, after a peak due to price/quantities effect, it stabilizes at a slightly higher level than before: 6,15% instead of 6,13% (figure 7). The effect of the price-cut shock on the economy is thus quite weak if at the same time firms adapt the quality of their products so as to maintain the desired/required rate of self-financing. One interesting effect is that the share of wages in the economy has risen (Figure 6), driven by falling prices.

[Insert figure 6]

[Insert figure 7]

If we now have a look now at the evolution of unit profit margins[11], one can see first that profit margins of firm A, after small variations, end up by stabilizing at the same level as before: 16.543% instead of 16.539% (figure 8). However, the profit margin of firm B, after a huge decrease due to price cut, is progressively restored (*via* the decline in the percentage of input incorporated in the production of good B) and stabilizes at a higher level than initially: 17.63% against 16.539%. The final stationary state is characterized by ***lower prices and higher profit margins***. Firms have, so to say, transferred the constraint of "price competition" on consumers themselves. These consumers can now buy more goods, but the composition of these goods has been reduced. Price competition has here taken place at the expense of consumers themselves.

[Insert figure 8]

3.3.2. Broader comments

3.3.2.1. The value-for-money question

We finally get an ambiguous effect: a competitive shock allows the consumer to buy more goods, but the average composition of these goods has been reduced. It is difficult to say at this stage whether the situation of consumers has been improved or not. Without being really able to conclude definitely (as it is impossible to comment final absolute values of prices and input coefficients *in the model*), one can however notice one thing to get some elements of answers to this question. Prices decrease less than the "size/weight" of goods: the price of good A has decreases by 0.6%, and by 5.6% for good B. However, the "size/weight" (which could be linked to some criteria of quality) of goods produced by firm A (as – of course imperfectly – approached by coefficient α^A) has been reduced by 1.36% and the "size/weight/quality" of good B by 20.%. Whatever the value of parameters λ and β, the model always result in a decline of "value for money" **despite falling prices**. The conclusion could thus be advanced that the average "quality" of goods and services is more reduced than the buying power is increased.

[Insert figure 9]

3.3.2.2. Sensitivity of results to parameter values

An important question is to check the model's sensitivity to the parameter values. Here, we can easily identify that a significant part of the results depend on the parameter chosen for consumers' price sensitivity (and thus product composition) Ω. Depending on the value of this parameter, the initial shock on the price of good B and the ensuing consequences will have different effects on the market shares of firms A and B. Figure 10 shows that product downsizing is not necessarily a sucessfull strategy in commercial terms for a producer, as it can reduce the share of that producer's good in the consumer basket. Consumers need to be highly sensitive to price differentials for this to be a viable strategy. However, the more price-sensitive consumers are, the more viable this strategy is.

[Insert figure 10]

More or less the same can be said for the sensitivity of results as a function of the parameter Ω (Figures 11 and 12).

[Insert figure 11]

[Insert figure 12]

3.3.2.3. The issue of production volume

If we look closely, we can see that in the model, growth is stimulated very weakly by the practice of product downsizing. This can be analyzed from two angles: the first shows that lower prices stimulate the economy very little when they are offset by lower "quality". The second looks at things from a material footprint angle: product downsizing tends to push growth upwards (albeit very slightly), and therefore to increase the material footprint of the economy

in question. This raises important issues for the environmental transition, which requires economies to limit their material footprint.

Conclusion

Our model shows how price cuts can take place at the expense of consumers themselves, by transferring the constraint of price cuts upon the composition of goods and services, taking the form of reducing the quantity of inputs incorporated into the production process or mixing up original inputs with cheaper ones. The main conclusion of the paper is that it cannot be said that this process is however good for the entire society, as in our simulations the final goods and services has been downsized much more than the price of products.

References

BAUMOL, W.J. 1962. "On the Theory of Expansion of the Firm" *The American Economic Review*, Vol. 52, No. 5 (Dec., 1962), pp. 1078-1087

D'AMATO, M. A., et al. 2013. Where is the game? Wild meat products authentication in South Africa: A case study. *Investigative Genetics* 4: 6. http://www.investigativegenetics.com/content/pdf/2041-2223-4-6.pdf

DESHAZO, R. D., S. BIGLER, and L. B. SKIPWORTH. 2013. The autopsy of chicken nuggets reads "Chicken Little." *The American Journal of Medicine*. http://dx.doi.org/10.1016/j.amjmed.2013.05.005

EICHNER, A.S. (1973), « A Theory of the Determination of the Mark-Up Under Oligopoly » *The Economic Journal*, Vol. 83, No. 332(Dec.), 1184-1200.

EICHNER, A.S. (1976), The Megacorp and Oligopoly: Micro Foundations of Macro Dynamics, Cambridge University Press, New York.

GODLEY, W. (1996), « Money, Finance and National Income Distribution: an Integrated Approach », Levy Economics Institute, working paper n° 167. http://www.levyinstitute.org/pubs/wp167.pdf.

GODLEY, W. et LAVOIE, M. (2001), « Kaleckian Models of Growth in a Coherent Stock-Flow Monetary Framework: A Kaldorian View » *Journal of Post Keynesian Economics*, Vol. 24, No. 2 (Winter), 277-311.

GODLEY, W. et LAVOIE, M. (2006), *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*, Palgrave MacMillan.

GOURVILLE, J. T., and J. J. KOEHLER. 2004. Downsizing price increases: A greater sensitivity to price than quantity in consumer markets. Harvard Business School Working Paper, No. 04-042, March. http://www.hbs.edu/faculty/Pages/item.aspx?num=15756

IMAI, S. 2013. Product downsizing and hidden price increases: Evidence from Japan's deflationary period. Center for Advanced Research in Finance (CARF) working paper, F-320, June. http://www.carf.e.utokyo.ac.jp/workingpaper/index.html

LAVOIE, M. 1992. Foundations of Post-Keynesian economic analysis. Aldershot: Edward Elgar.

LAVOIE, M. 1994. A Post-Keynesian approach to consumer choice. Journal of Post Keynesian Economics 16 (4): 539-562.

MARRIS, R. 1964. *The Economic Theory of Managerial Capitalism*, MacMillan, London.

MARTIN, A. 2008. Ate a whole pint? Check again. *The New York Times*, September 14.

MASTERS, S. 2013. From Thorntons shortcake to Nestle chocolate and even Pledge polish: It's the incredible shrinking groceries rip-off. *The Independent*, March 21.

MELMIES, J. (2015). "Industrial Seigniorage, the Other Face of Competition", *Review of Radical Political Economics*, Vol. 49 (2).

MELMIES, J. (2023). "Unit profit margins along post-Keynesian lines: from Sraffa, Kalecki, Robinson to Eichner, Wood, Harcourt and Kenyon", *The European Journal of the History of Economic Thought*, Volume 30, 2023 - Issue 1, Pages 1-21

SIMON, H. (1955), « A behavioral model of rational choice », *The Quarterly Journal of Economics*, 69(1), p. 99-118.

MELMIÈS, J. and DALLERY, T. (2014), Price competition, inter-firms relationships, bank discrimination and wage inequalities: a post keynesian perspective », *Revue de la régulation*, 16 | 2e semestre / Autumn 2014.
http://journals.openedition.org/regulation/11003

SNIR, A., and D. LEVY. 2011. Shrinking goods and sticky prices: Theory and evidence. MPRA Working Paper n°29565, March. http://mpra.ub.uni-muenchen.de/29565/

WOOD, A. (1975), *A Theory of Profits*, Cambridge University Press, London.

WOOD, D.J. (1985), « The Strategic Use of Public Policy: Business Support for the 1906 Food and Drug Act » *The Business History Review*, Vol. 59, No. 3 (Autumn), 403-432.

WINTER, G. 2001. Pepsi earnings increase 18%, continuing growth streak. *The New York Times*, April 24.

TABLES

Table 1. Transactions matrix

		Ménages	Firm A		Firm B		Firm M		Firm I		Banks		$\sum$
			current	capital	current	capital	current	capital	current	capital	current	capital	
Wages		$+W_a + W_b + W_m + W_i$	$-W_a$		$-W_b$		$-W_m$		$-W_i$				0
Investment				$-p_i \cdot I_a$		$-p_i \cdot I_b$		$-p_i \cdot I_m$	$+p_i \cdot I_a + p_i \cdot I_b + p_i \cdot I_m + p_i \cdot I_i$	$-p_i \cdot I_i$			0
Input consumption			$-p_m \cdot q_{ma}$		$-p_m \cdot q_{mb}$		$+p_m \cdot q_{ma} + p_m \cdot q_{mb}$						0
Final goods consumption		$-C^{tot}$	$+C_a$		$+C_b$								0
Profits	a	$+\Pi_d^a$	$-\Pi_a$	$+\Pi_a^U$									0
	b	$+\Pi_d^b$			$-\Pi_b$	$+\Pi_b^U$							0
	m	$+\Pi_d^m$					$-\Pi_m$	$+\Pi_m^U$					0
	i	$+\Pi_d^i$							$-\Pi_i$	$+\Pi_i^U$			0
Loans				$+\Delta L_a$		$+\Delta L_b$		$+\Delta L_m$		$+\Delta L_i$		$-\Delta L_a - \Delta L_b - \Delta L_m - \Delta L_i$	0
Money		$-\Delta M_d^{tot}$										$+\Delta M^S$	0
$\sum$		0	0	0	0	0	0	0	0	0	0	0	0

Table 2. Stocks matrix

		Households	Firm A	Firm B	Firm M	Firm I	Banks	$\sum$
Capital	a		$+(p_i \cdot K_a)$					$+(p_i \cdot K_a)$
	b			$+(p_i \cdot K_b)$				$+(p_i \cdot K_b)$
	m				$+(p_i \cdot K_m)$			$+(p_i \cdot K_m)$
	i					$+(p_i \cdot K_i)$		$+(p_i \cdot K_i)$
Money		$+M_d^{tot}$					$-M^S$	0
Loans	a		$-L_a$				$+L_a$	0
	b			$-L_b$			$+L_b$	0
	m				$-L_m$		$+L_m$	0
	I					$-L_i$	$+L_i$	0
$\sum$		$+M_d^{tot}$	$(p_i \cdot K_a) - L_a$	$(p_i \cdot K_b) - L_b$	$(p_i \cdot K_m) - L_m$	$(p_i \cdot K_i) - L_i$	$-M^S + \sum_{j=a,b,m,i} L_j$	$\sum_{j=a,b,m,i} (p_i \cdot K_j)$

Table 3. List of accounting identities

$\Pi_a^D + \Pi_b^D + \Pi_m^D + \Pi_i^D + W_a + W_b + W_m + W_i + C^{tot} + \Delta M_d^{tot}$	(*a*)
$C_a = W_a + p_m \cdot q_{ma} + \Pi_a$	(*b*)
$\Delta L_a = p_i \cdot I_a - \Pi_a^U$	(*c*)
$C_b = W_b + p_m \cdot q_{mb} + \Pi_b$	(*d*)
$\Delta L_b = p_i \cdot I_b - \Pi_b^U$	(*e*)
$p_{ma} \cdot q_{ma} + p_m \cdot q_{mb} = W_m + \Pi_m$	(*f*)
$\Delta L_m = p_i \cdot I_m - \Pi_m^U$	(*g*)
$p_i \cdot I_a + p_i \cdot I_b + p_i \cdot I_m + p_i \cdot I_i = W_i + \Pi_i$	(*h*)
$\Delta L_i = p_i \cdot I_i - \Pi_i^U$	(*i*)
$\Delta M^S = \Delta L_a + \Delta L_b + \Delta L_m + \Delta L_i$	(*j*)
$C^{tot} = C_a + C_b$	(*k*)
$\Pi_a^U = \Pi_a - \Pi_a^D$	(*l*)
$\Pi_b^U = \Pi_b - \Pi_b^D$	(*m*)
$\Pi_m^U = \Pi_m - \Pi_m^D$	(*n*)
$\Pi_i^U = \Pi_i - \Pi_i^D$	(*o*)
$\Delta M^S = \Delta M_d^{tot}$	(*p*)

Table 4. Values of parameters and main endogenous variables

Values of main parameters

Investment functions	Capital/output coefficients	Firms' retention rates	Wage rates
$\gamma_j^0 = 0{,}0325$ $\gamma_j^u = 0{,}03$ $\gamma_j^{rcf} = 0{,}1$	$\sigma_j = 2{,}3$	$sf_a = sf_b = 0{,}55$ $sf_m = sf_i = 0{,}7$	$w_j = 8$

Households' sensitivity to price differentials	Targeted self-financing rates		Input coefficients[9]
	$T\tilde{A}F_a = 0{,}675$	$T\tilde{A}F_b = 0{,}675$	$\alpha^a = \alpha^b = 0{,}39$
σ=0,8			

Propensities to consume		
$\alpha_m = 0{,}04$	$\alpha_s = 0{,}95$	$\alpha^R = 0{,}6$

Values of endogenous variables (initial stationary state)

Initial prices	Utilization rates	Accumulation rates	Profit rates (after distribution)
$p_a = p_b = 6{,}9$ $p_m = p_i = 5$	$u_a = u_b = 0{,}83$ $u_m = 0{,}798$ $u_i = 0{,}798$	$g_j = 0{,}0613$	$r_a^{cf} = r_b^{cf} = 0{,}039$ $r_m^{cf} = r_i^{cf} = 0{,}049$

Self-financing rates	Rate of growth of employment	Real and monetary market shares
$TAF_a = TAF_b = 0{,}675$ $TAF_m = TAF_i = 0{,}841$	$\hat{e} = 0{,}0613$	$Rms_a = Rms_b = 0{,}5$ $Mms_a = Mms_b = 0{,}5$

[9] As these coefficients are in reality endogenous, 0.39 is in fact the initial value we introduce in the model.

FIGURES

Figure 1. Sectors and relations of the model

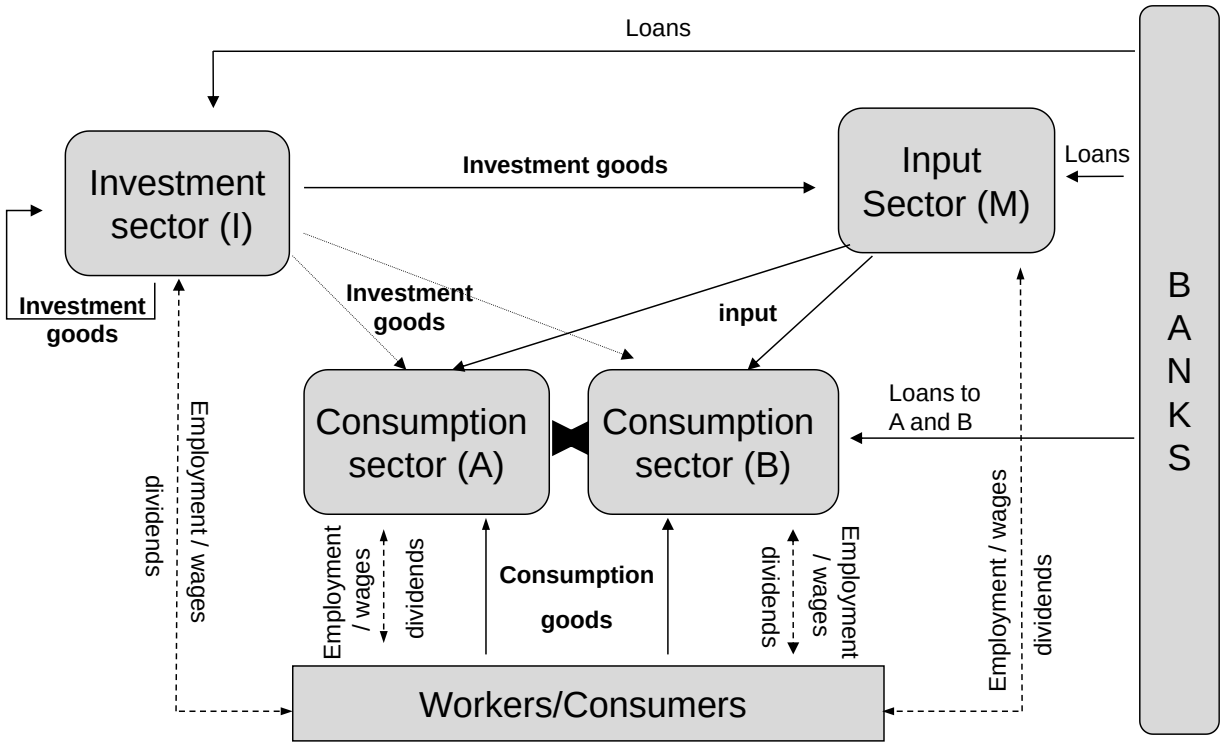


Figure 2. Hidden equation (check of stock-flow consistency)

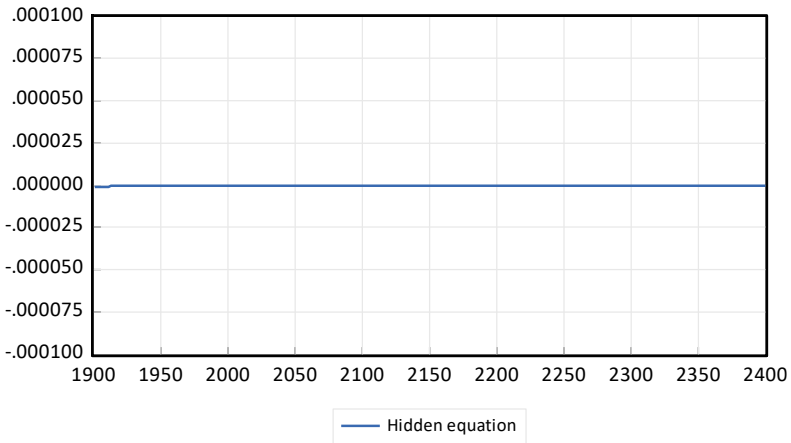


Figure 3. Prices of consumption goods

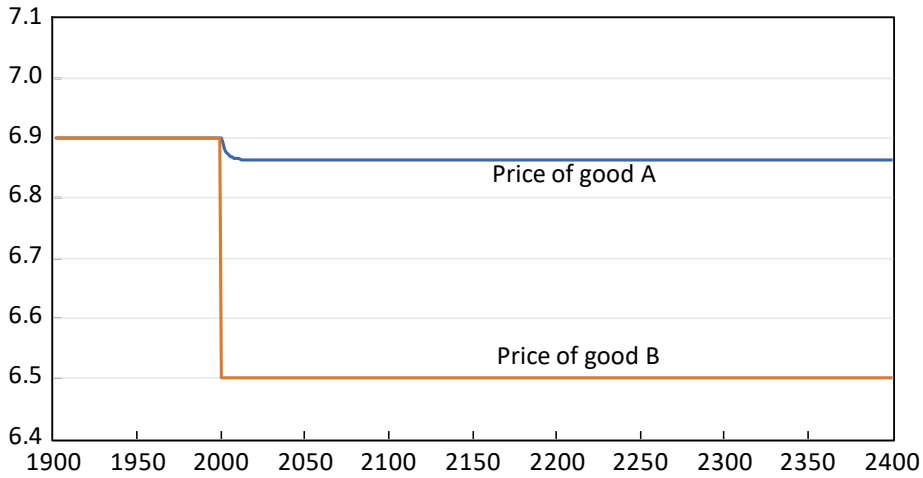


Figure 4. Evolution of productive and financial variables of firms A and B

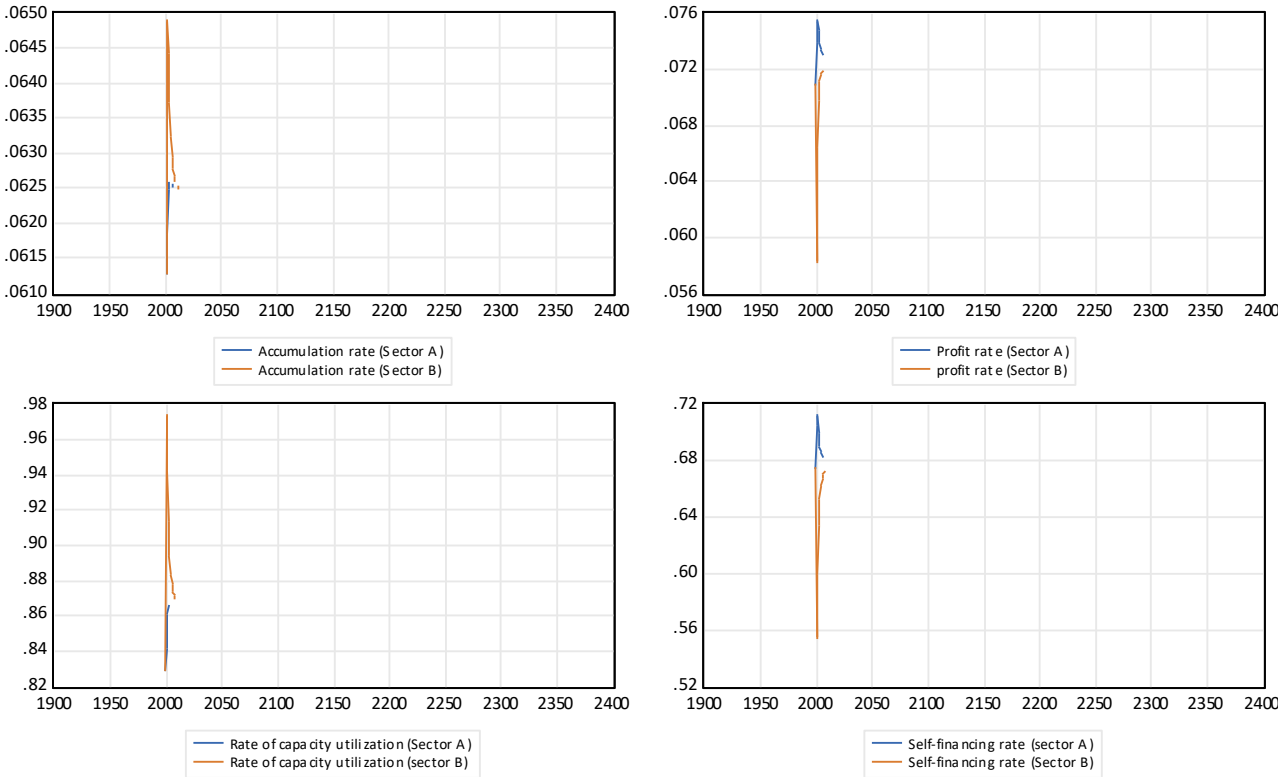


Figure 5. Input quantity incorporated into final goods

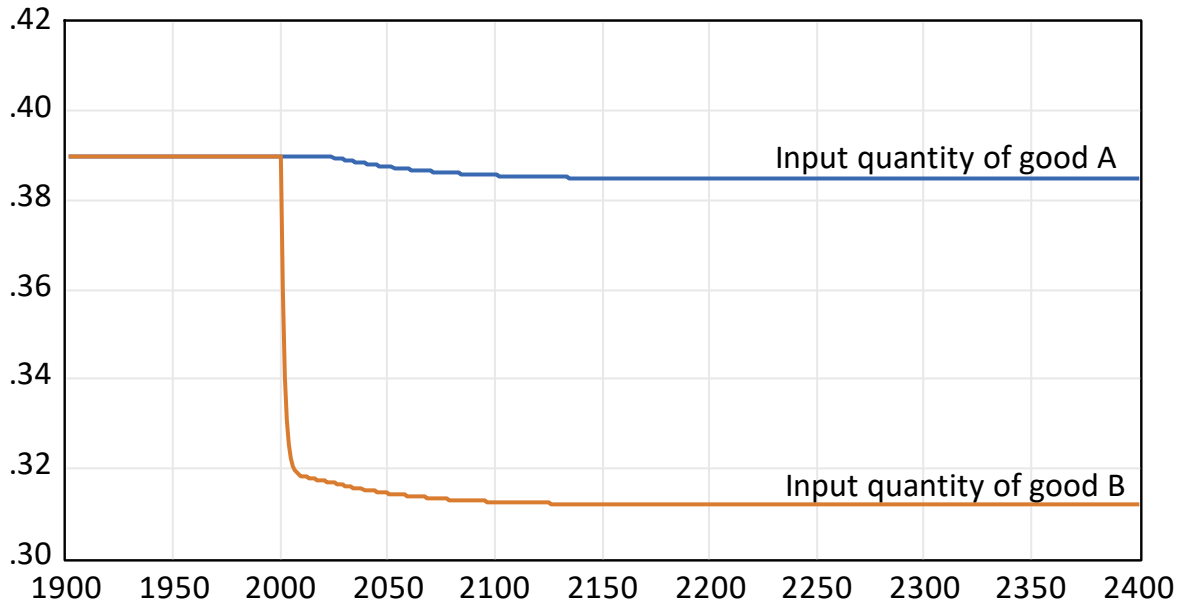


Figure 6. Effect on wage share

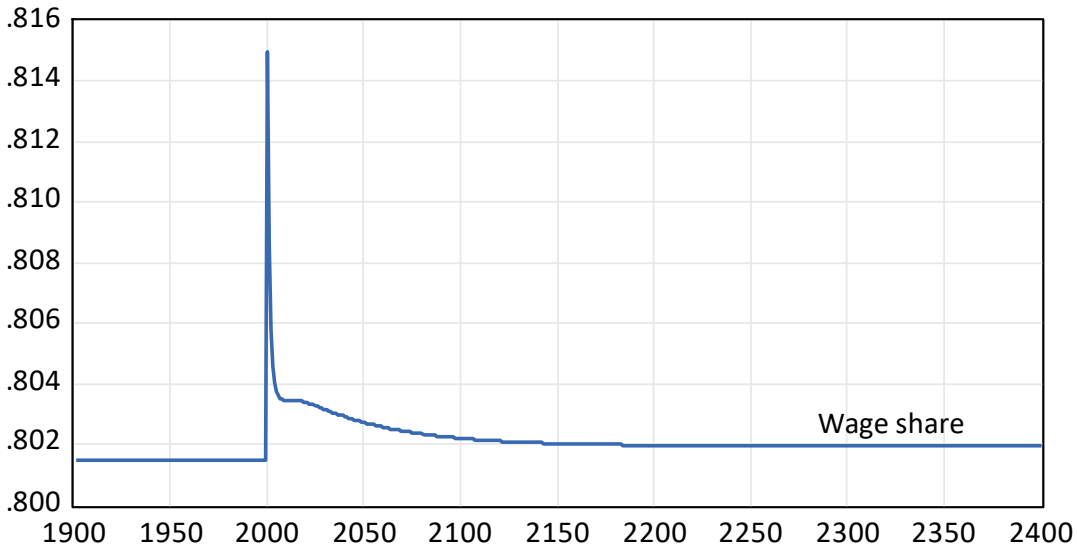


Figure 7. Effect on the rate of growth of employment

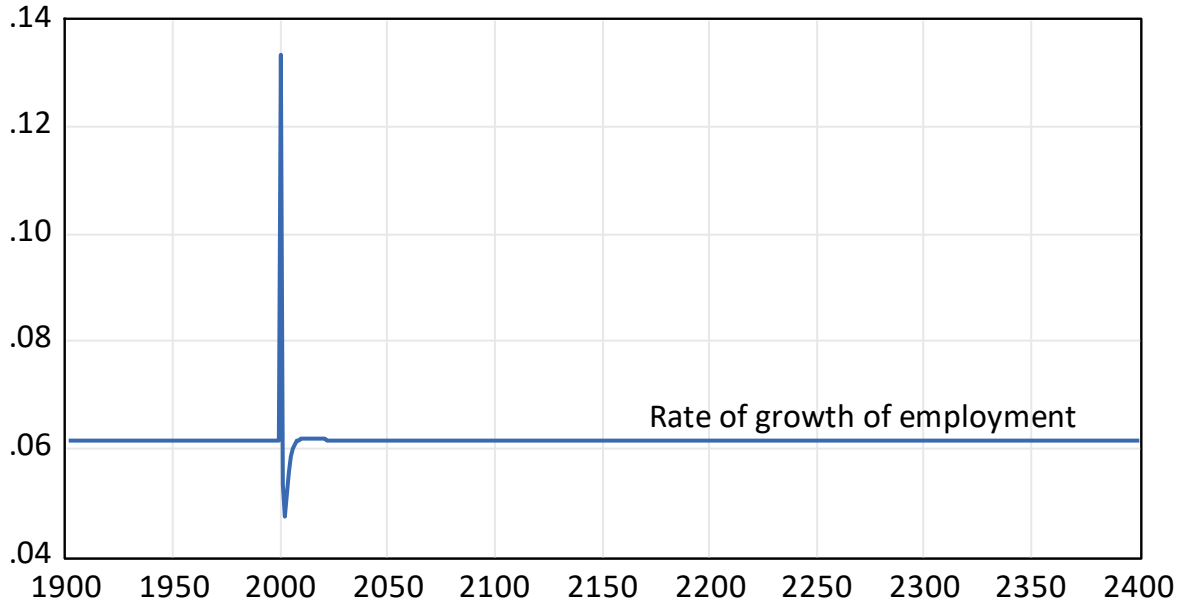


Figure 8. Effect on unit profit margins

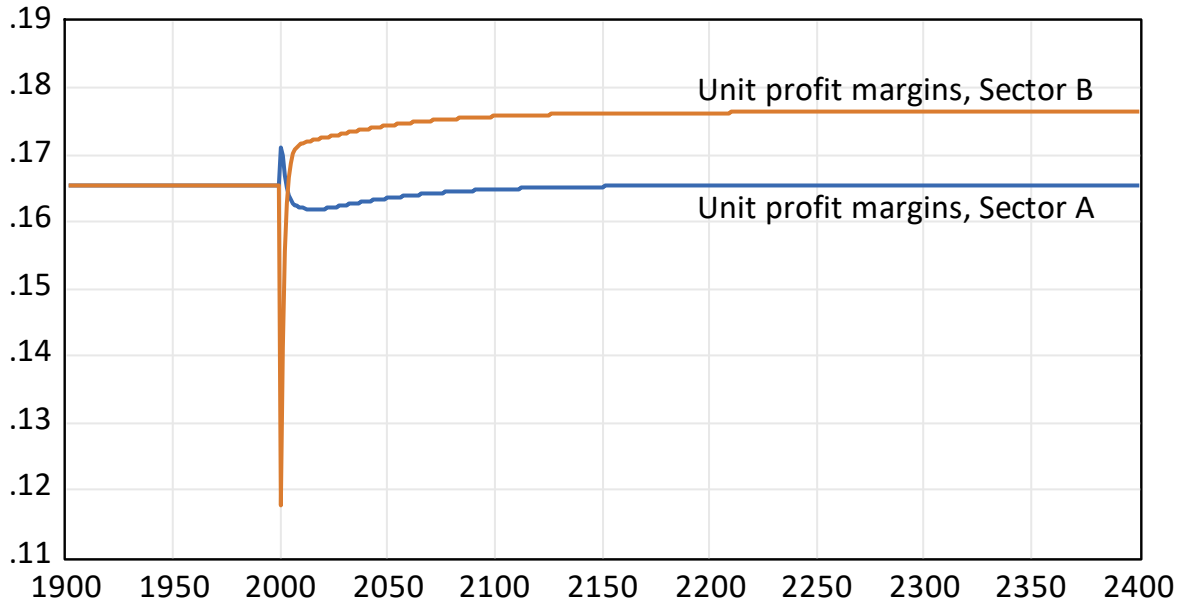
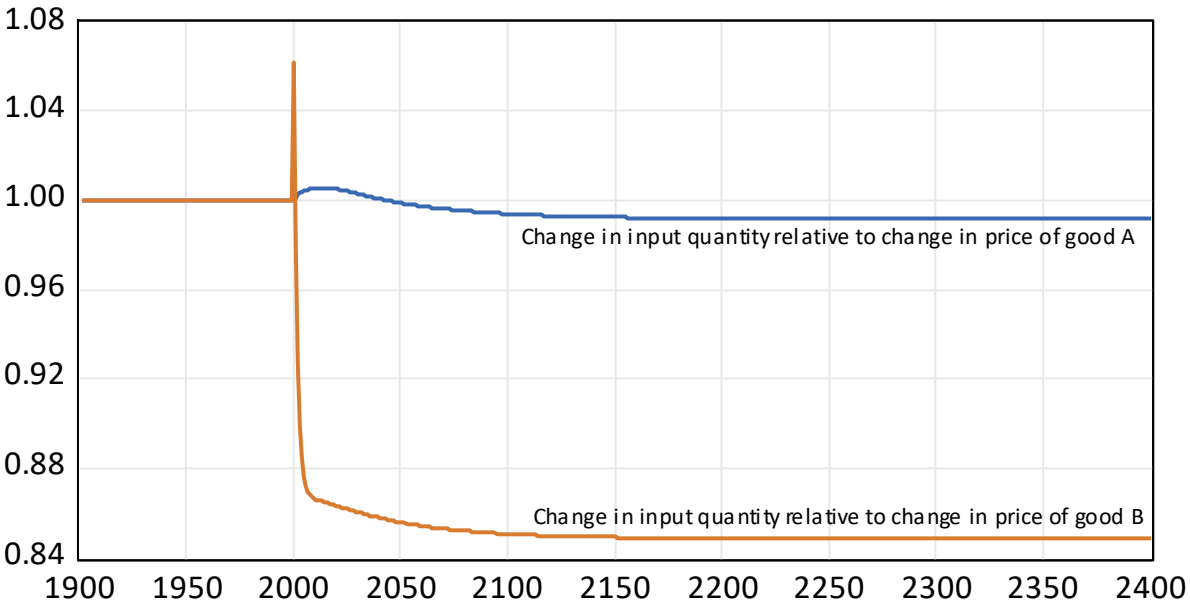


Figure 9. Effect on "price to quantity" ratio



NB: A fall of the ratio implies that prices decrease less than input quantity incorporated into goods.

Figure 10. Sensibility of Ω to ρ

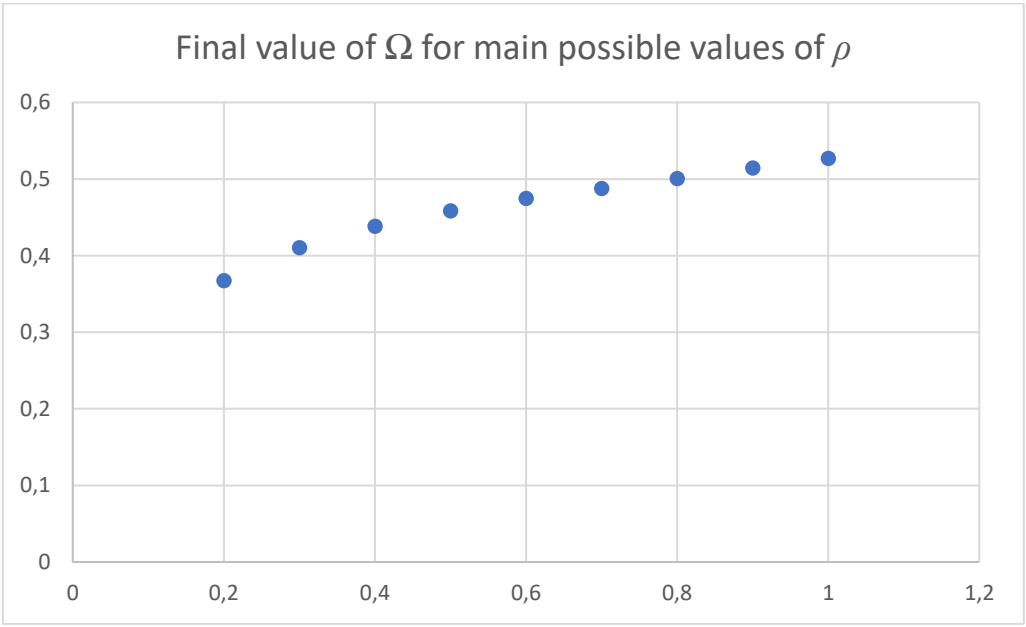


Figure 11. Sensibility of θ_B to ρ

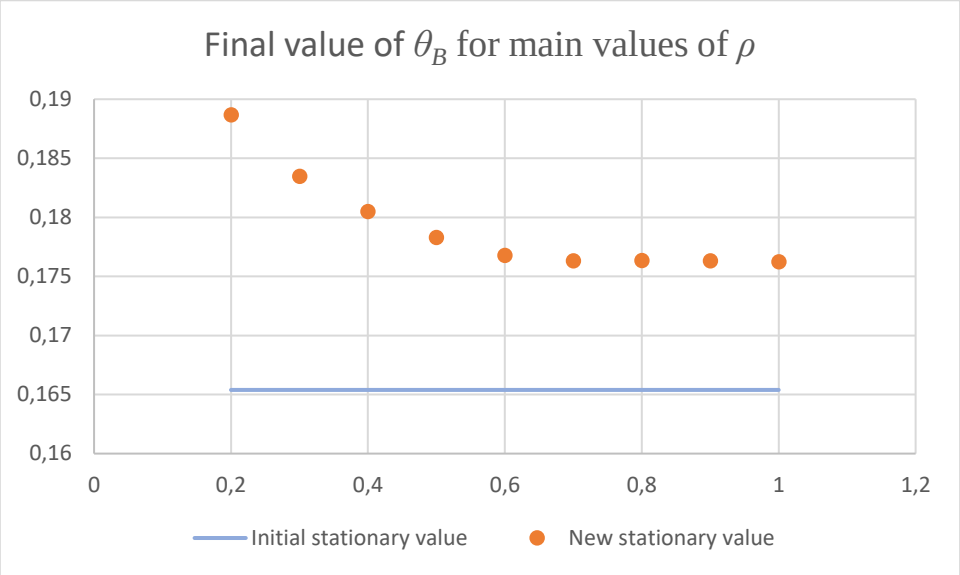


Figure 12. Sensibility of θ_A to ρ