Economics

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Preface

This website is a guide for economics, macroeconomics and especially heterodox macroeconomics. Most of the content and macro models presented here are summaries of Blecker and Setterfield (2019) manual on heterodox macroeconomics. I created this website simply because I need a platform to put all my notes and summaries from my economics classes during my studies, so that I can have a quick access to it and also make it accessible to anyone interested in the topic.

Part I

Introduction

1 Introduction: Market Equilibrium

This website is a guide to mainstream and heterodox economics constructed from my personal notes from a variety of bachelor and master level economics courses. goal is to provide summaries of the main topics and models of neoclassical and heterodox economics. Since having some background in mainstream economics is crucial to understand the heterodox and Post-Keynesian economics, mainly because the latter are constructed partly as a response and critic of mainstream-neoclassical economics, the present introduction will summarize the basics of neoclassical production theory, consumer theory and market equilibrium.

Let's first recall what market equilibrium is, because it is one of the most important concept in economics.

1.1 Market equilibrium

1.1.1 What is a market?

Market equilibrium is perhaps the most important element of neoclassical theory. Every introductory mainstream textbooks start with market equilibrium. Acemoglu, Laibson, and List (2017) defines a market as:

"A group of economic agents who are trading a good or service plus the rules and arrangements for trading" (Acemoglu, Laibson, and List 2017, 59).

The definition given by Pindyck and Rubinfeld (2013) is more precise:

"**Market**: Collection of buyers and sellers that, through their actual or potential interactions, determine the price of a product or set of products" (Pindyck and Rubinfeld 2013, 8).

Stated simply, market equilibrium tells what will be the price of any object or service, as long as the latter are turned into commodities. Market equilibrium explains not only the equilibrium level of prices and commodities of any good or service, but also the change in prices resulting from exogenous shocks (change in income, confidence, technology…).

A market is thus a place (material or not) where an object or service turned into a commodity is offered by suppliers and demanded by consumers and thus traded when an agreement is reached over the price which will determine the value of the traded commodity.

1.1.2 Markets under perfect competition

But there are many types of markets. Microeconomics generally starts with an ideal-type market: the *perfectly competitive market*. The latter refers to any market in which there are a large number of suppliers as well as large number of consumers. An important characteristic of perfectly competitive markets is that *suppliers and consumers think that they cannot manipulate or have an influence over the market price*. Market price is thus considered as *given* and *fixed* by the market when demand equates supply, as we will see below.

1.1.3 Demand, Supply, Equilibrium

Consumers' total demand for a commodity constitutes the overall market demand for that commodity. Demand is considered to be negatively related to the price of that commodity: the higher the price, the lower the demand. On the other hand, firms' supply of the commodity is a positive function of price. The higher the price, the higher the profits for any level of production, hence higher incentive to increase production and supply more quantity.

Let's now take an example: suppose that the demand for grain follows a negative linear function.

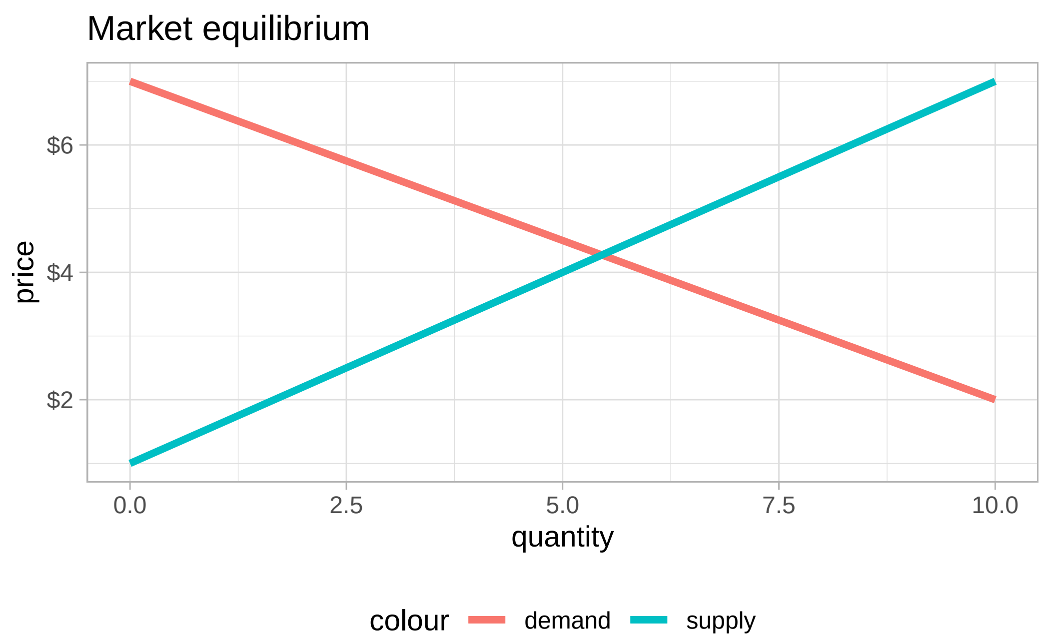
$Q_{demand} = 7 - 0.5p$

That means that the quantity demanded for grains decreases if the price for grain increases and vice and versa. The slope of the demand curve, -0.5, means that when the price increases by one, the quantity demanded decreases by 0.5.

Moreover, let's say that the quantity supplied for grains is a positive linear function of prices for grain: the higher the price, the more are firms willing to supply grains.

$Q_{supply} = 1 + 0.6p$

```
demand <- function(p) 7 - (0.5*p)
supply <- function(p) 1 + 0.6*p
```



To find the equilibrium price and quantity, we equate the demand and supply functions and solve for q:

$$q_{demand} = 7 - 0.5p$$
$$q_{supply} = 1 + 0.6p$$

$$q_{demand} = q_{supply}$$

$$7 - 0.5p = 1 + 0.6p$$

$$6 - 0.11p = 0$$

$$p^* = 6/1.1 = 5.45$$

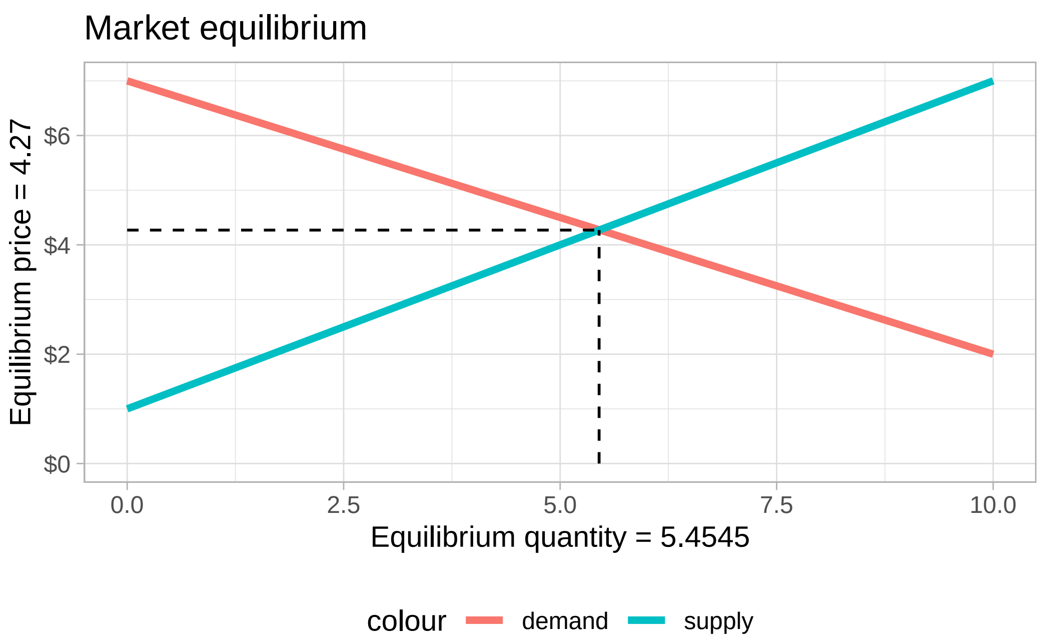
The equilibrium price level is thus $p^* = 5.45$. To find the equilibrium quantity, we simple put the value of the equilibrium price (5.45) into either the supply or demand function: $7 - 0.5 \times 5.45 = 4.275 = p^*$

It is easy to check directly if the computation is correct in r:

```r
equilibrium <- curve_intersect(demand, supply, empirical = FALSE, domain = c(1,10))
equilibrium
```

```
$x
[1] 5.454545

$y
[1] 4.272727
```



At equilibrium, economists say that "the market clears". In other words, when equilibrium is reached all commodities are sold, every suppliers have sold their commodities and every consumers have purchased one.

1.1.4 Deviations from market price

If the price was lower than the market price, for instance after a price control policy (think for example of all the debates about energy price since covid and the war), there would be excess demand. Every commodity would be sold, but there would still be consumers who want to consume the good, but cannot because suppliers do not want to increase production because the price is too low.

Conversely, if the price was above the market price, there would be a situation of excess supply. Firms supply a large quantity of commodities since the price is relatively very high, but not all commodities would be sold because some consumers would think that the price is too high for them.

1.1.5 Change in equilibrium prices

Finally, change in market price happens each time either the supply curve or the demand curve shift to the right (positive shock) or to the left (negative shock).

Regarding demand curve shifts, (Acemoglu, Laibson, and List 2017, 67) give five factors:

1. Tastes and preferences
2. Income and wealth
3. Availability and prices of related goods
4. Number and scale of buyers
5. Buyers' beliefs about the future

And four factors for shifts in supply curve (Acemoglu, Laibson, and List 2017, 73):

1. Prices of inputs used to produce the good
2. Technology used to produce the good
3. Number and scale of sellers
4. Sellers' beliefs about the future

But how did neoclassical theory arrive to this kind of model of equilibrium price and quantity determination? To understand better this model, we need to know why we have this positive supply curve and this negative demand curve. We will first investigate consumer choice theory, which is behind the negative demand curve, and then production theory, which is behind the positive supply curve.

2 Neoclassical-mainstream consumer choice theory

As explained in the previous chapter, demand curve represents a crucial element of equilibrium and neoclassical theory. What lies behind this famous negative demand curve is neoclassical consumer theory. Neoclassical consumer choice theory has for ambition to explain consumers' decision, that is to say, the choices consumers make between consuming one good or another. Consumer theory, along with production theory (see following chapter), constitutes an important branch of microeconomics.

Note that this chapter is overall a summary of consumer theory as presented in classical and famous micreconomics textbook. I here especially used Acemoglu, Laibson, and List (2017) and Pindyck and Rubinfeld (2013).

2.1 The three assumptions

Consumer theory makes important assumptions, which are the foundation of the theory:

1. **Completeness**:

   consumers have complete knowledge about the goods and services they can potentially consume, they have clear preferences about these goods and services and can rank all of them (like a descending list where we would have the most preferred goods and services at the top and utility associated with goods and services would decrease as we go down in the list)

2. **Transitivity**:

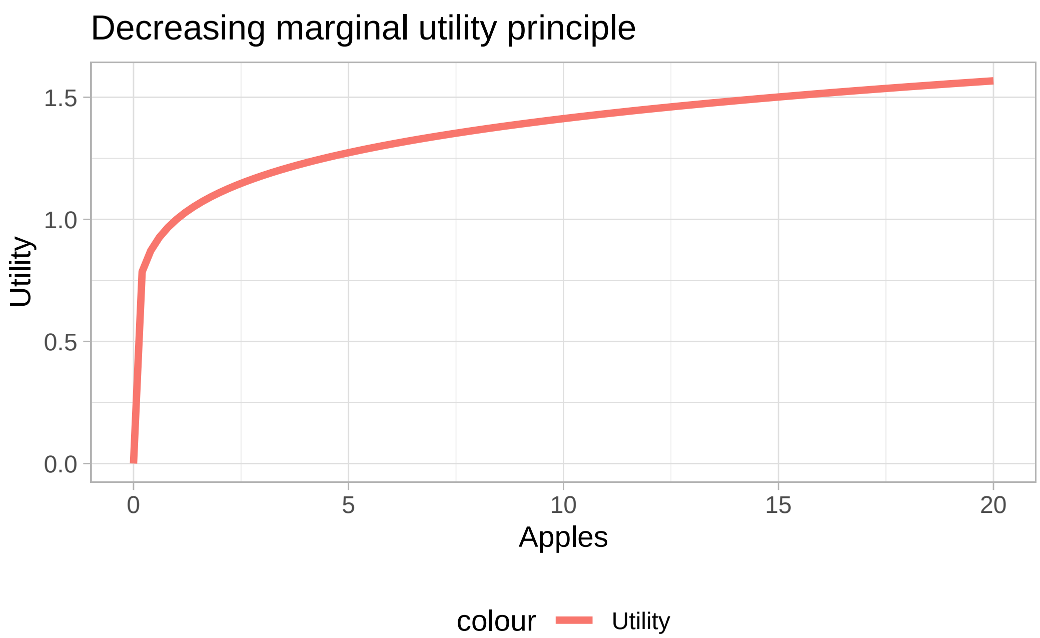
   Preferences regarding goods and services are transitive. That means that if a consumer prefers A to B and B to C, A is better than C.

3. **More is better than less**

   (non satiety assumption): Goods and services are always desirable. For example, if someone gives you one apple, then two, then three, then twenty, and then one thousands, you would always accept those apples, because you are still better off even if one gives you too many apples.

2.2 Utility function, marginal utility

Consumer theory then illustrates any choice between two goods with the help of the famous indifference curves , which show the relation between the demand for one good against the demand for another good (for example food and clothes, cars and bikes...). Indifference curves are based on **utility functions** whose really important property and assumption is the decreasing marginal utility principle. Decreasing marginal utility means that for every one additional unit of a given good a consumer get, the utility for this consumer increases less than the previous additional unit. Let's say, for instance, that you don't have food at the moment and you are hungry: if i give you one apple, you will be a lot better off and your utility will increase a lot when I give you this one apple. Then, if I give you another apple, your utility will still increase, but by less than when I gave you the first apple. Finally, after I give you an additional apple for the fifteenth time, your additional utility will still be positive, but by far more less than when I gave you the first apple.



Decreasing marginal utility is an important assumption which explains the shape of the indifference curves. The latter, if the two goods are substitutes (but not perfect substitute) and not perfect complements, are convex-shaped. If, for instance, we consider an indifference curve for the choice between units of apples and bikes, the line of the indifference curve represents all the possible combination of the two goods which give the same utility for the consumer.

2.2.1 Indifference curve

Indifference curves are based on utility functions. An utility function can be for example:

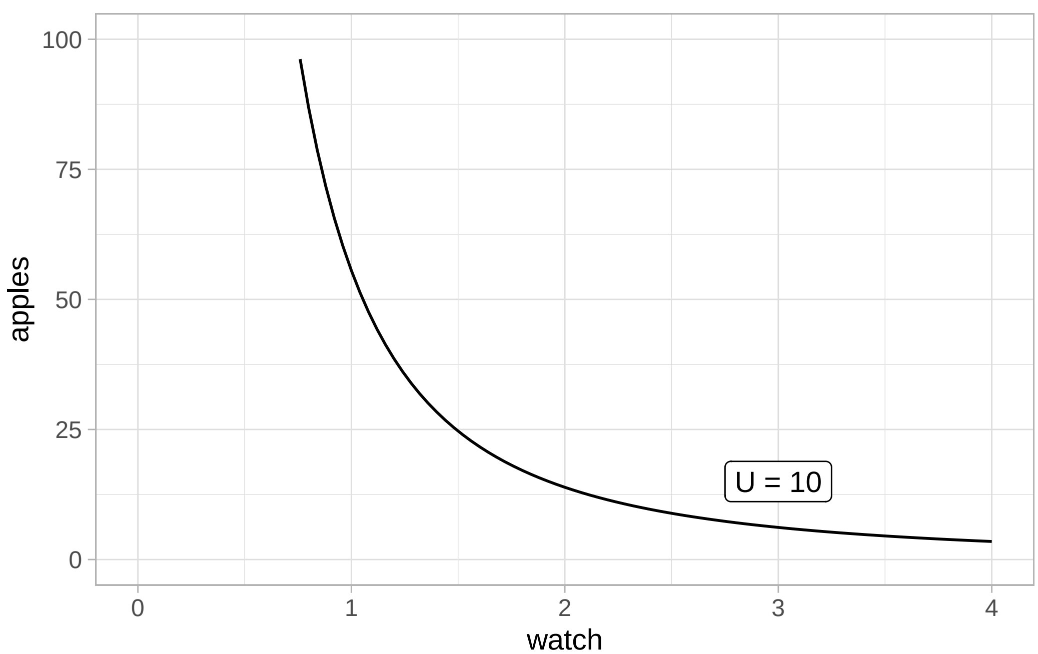
$$U(x, y) = x^2 0.18y$$

With x and y two different goods, apples and watches for example. To get the indifference curve function, we fix utility U at any positive value, and rearrange the function above to get y as a function of x and U:

$$U = x^2 0.18y$$

$$y = \frac{U}{0.18x^2}$$

```
Yacas vector:
[1] y == U/(0.18 * x^2)
```



2.3 Budget constraint

In the indifference curve graph above, the consumer can choose any combination of apples and watches on the line, and those combinations would bring the same utility U = 10. However, one important element was not taken into account yet. This element is the fact that consumers are limited in their consumption decisions by their income. Neoclassical theory calls this **budget constraint**. For instance, let's say that our consumer has an income of 600 francs. The price of one apple is 4 francs (one bag of apples to be more realistic) whereas the price of a watch is 200 francs. The budget constraint can be written as:

$$\begin{aligned} Income = P_{apple} * Q_{apple} + P_{watch} * Q_{watch} \\ 600 = 4apple + 200watch \end{aligned}$$

To include this budget constraint into the previous graph, we have to rearrange this equation to have the quantity of apples as a function of the quantity of books:

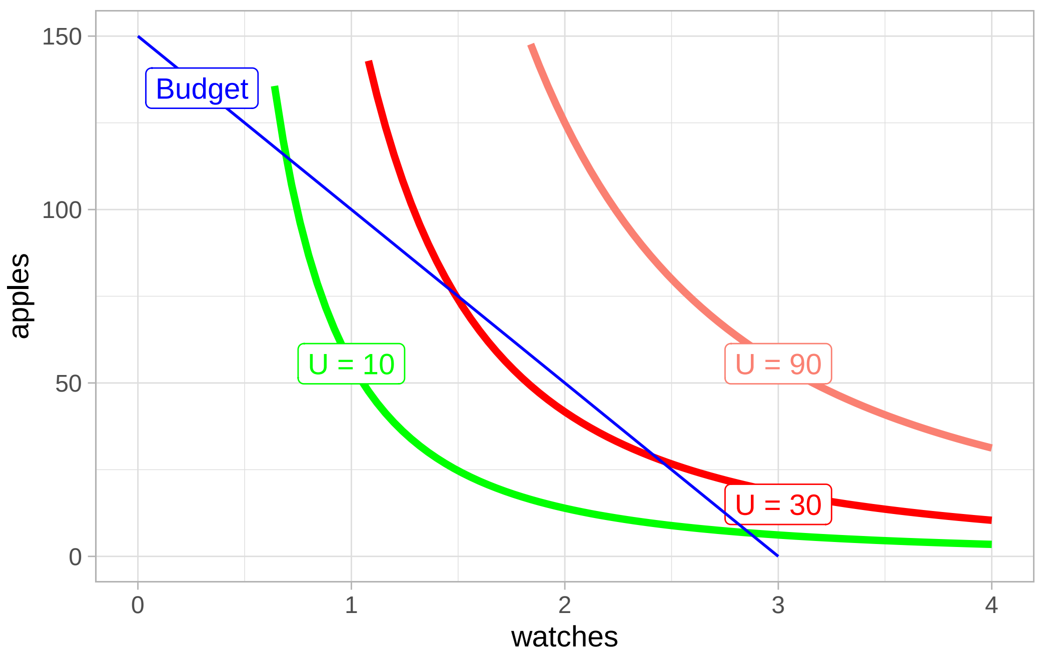
$$\begin{aligned} 600 &= 4apple + 200watch \\ 4apple &= 600 - 200watch \\ apple &= 600/4 - 200/4watch \\ apple &= 150 - 50watch \end{aligned}$$

More generally, the budget function can also be written as

$$Q_1 = \frac{Income}{P_1} - \frac{P_2}{P_1}Q_2$$

```
budget <- function(x) 150 - 50*x
```

Now we can plot both the indifference curves and the budget constraint:



The budget line represents all the combination of apples and watches that the consumer can afford with his income. This implies that is final choice has to be on this line. The consumer cannot afford to be on the U = 90 indifference curve because its income is not large enough. Also, he will not choose any point on U = 10 because the latter's majority of point are on the left of the budget line (the assumption of more is better than less would not be respected if the consumer for instance chooses 1 watch and 50 apples, because he can afford more of the two goods).

So what will be the consumer's final choice? He will choose the point at which the budget constraint line is tangent to one of his indifference curve.

Mathematically, this means that the quantity of apples and watches the consumer will choose is the point at which the slope of the budget line $\frac{P_{watch}}{P_{apples}}$ is equal to the slope of the indifference curve, which microeconomics call the **marginal rate of substitution**. Marginal rate of substitution shows how much of a good (here apples) the consumer can give up in exchange of one unit of the other good (here a watch). Using algebra, we can find the slope of the budget line and of the indifference curve by computing their derivatives.

$$apple = 150 - 50watch$$
$$\frac{\partial apple}{\partial watch} = -50$$

Note that finding the marginal rate of substitution is a bit trickier than for the budget line. To find the MRS, we have to compute the derivative with respect to the first good (x which are apples here) and then for the second one (y the watches). Then, the MRS is the ratio between the two marginal utilities

$\frac{\frac{\partial U}{\partial x}}{\frac{\partial U}{\partial y}}$

$$U = x^2 0.18y$$
$$\frac{\partial U}{\partial x} = 0.36xy$$
$$\frac{\partial U}{\partial y} = 0.18x^2$$

Thus

$$MRS = \frac{0.36xy}{0.18x^2} = 2\frac{y}{x}$$

Here is how to compute this in R

Then, we set the marginal rate of substitution equal to the slope of the budget line:

$$2\frac{y}{x} = 50$$
$$y = 25x$$

We can then substitute y with 25x in the budget equation

$$y = 150 - 50x$$
$$25x = 150 - 50x$$
$$x = 150/75 = 2$$
$$x = 2$$

The optimal solution for x (quantity of watch) is thus 2, the consumer will choose 2 watches. Now that know the quantity of watches, we can obtain the quantity of apples as well as how much utility this combination of apples and watches will bring to the consumer.

To get the number of apples, we simply replace x by 6 in the budget constraint equation $y = 150 - 50 \times 2 = 50$, $U = 2^2 \times 50 \times 0.18 = 36$

R can check the results

```
price_x = 200
price_y = 4
Solve(paste(Simplify(mu_x / mu_y), "==", price_x, "/", price_y), y)
```

```
Yacas vector:
[1] y == -(-9 * x/0.36)
```

```
optimal_x <- uniroot(function(x) budget(x) - marginal_utility(x), c(0, 100))$root
optimal_y <- budget(optimal_x)
optimal_u <- utility_u(optimal_x, optimal_y)


optimal_x
```

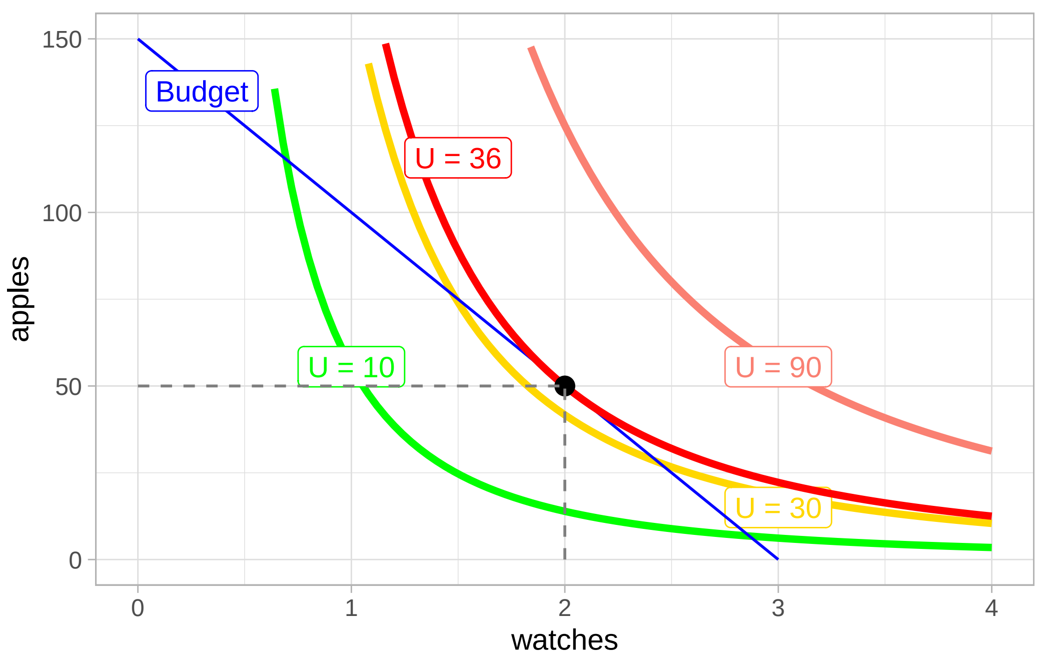
```
[1] 2
```

```
optimal_y
```

```
[1] 50
```

```
optimal_u
```

```
[1] 36
```



2.4 Deriving the downward slopping demand curve from indifference curve and budget constrain

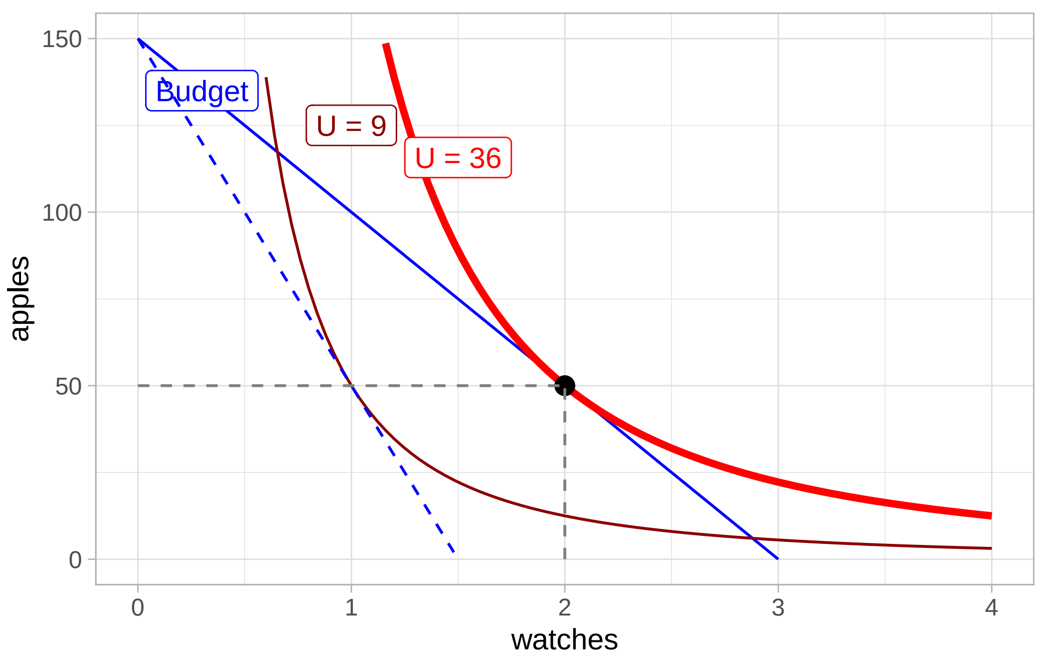
The final step to grasp why micro theory draws downwards slopping demand curve is to see how a change in relative prices $\frac{P_2}{P_1}$ changes the consumer's optimal choice for a good (the equilibrium point in the last graph). In our example, the optimal quantity choice of watch for the consumer was 2 (2 watches costing 200 francs each). What happends in the graph above if the price of watch increases?

The budget constraint will change. Initially we have

$apple = 150 - 50watch$

And now, the price of watch increases up to 400, income is unchanged (Income = 600) as well as the price of apples (4):

$$600 = 4apple + 400watch$$
$$4apple = 600 - 400watch$$
$$apple = 150 - 100watch$$



At the new equilibrium level, utility has decreased to 9, apple consumption remains unchanged and the quantity of watches has decreased to one. Note that there are two important mechanisms behind the graph above:

1. **Income effect** Income effect relates to how the demand for a good change when income changes. If the demand increases when income increases, micro talks about *positive income effect* (and conversely negative income effect). In our example, the consumer's income has not changed (600 francs), but the real income has decreased, because the price of one the good has increased. The consumer has thus a lower (real) income, which led to a decrease in the quantity demanded for the good whose price increased.
2. **Substitution effect** Substitution effect refers to how the demand for a good change when the relative price of the good changes.

Income and substitution effects depend on the type of the good. There are indeed different types of goods, depending on how demand changes when price changes:

1. **Normal good**

   A good is normal when demand increases when its price decreases vice and versa

2. **Inferior good**

   A good is inferior when the demand decreases as income increases or the price increases

3. **Giffen good**

   A Giffen good refers to goods whose demand increases when price increases. The logic behind this are the goods which are very essential to every day living (for example staple food): an increase in the price of very essential food can lead to the consumer's decision of reducing the consumption of other goods to still afford consuming the essential good.

This is how microeconomics derive the demand curve. We will see below that the supply curve is also derived with the same logic, the steps being almost the same as we saw here, but by replacing the utility function with a production function and replacing the two goods by capital and labour, which are the factors of production of any firm.

3 Mainstream/Neoclassical Production Theory

3.1 Intro

As I explained in the introduction, the most important element of mainstream neoclassical theory is the concept of market equilibrium under perfect competition. In the previous chapter, I gave a short summary on how mainstream economists derive the market equilibrium downwards slopping demand curve. Here, the objective is to understand how the other curve, the upward slopping supply curve, is derived. To understand why mainstream economics arrived to this result, one needs to understand mainstream production theory, which is the goal of this post.

As the previous chapter, what follows is mainly a summary of Acemoglu, Laibson, and List (2017) and Pindyck and Rubinfeld (2013), especially the parts on production.

3.2 How firms produce in neoclassical-mainstream theory

Neoclassical production theory has a very specific way to conceive production. In fact, the theory considers that production, how firms or productive units transform inputs (of labour, raw materials or other intermediary inputs/materials/services) into output (final goods or services produced), can be modeled as what is now famously known as the **neoclassical production function**. The latter is written as:

$Y = F(K, L)$

With Y the output, the quantity produced, K the quantity of capital used and L the quantity of labour employed. From now on, we will work with the following neoclassical production function as an example:

$Y = K^{1/2}L^{1/2}$

Here is how to write this function in R:

```r
neo_prod_fun <- function(l, k) (l^(1/2)) * (k^(1/2))
```

The neoclassical production function rests on important assumptions which illustrate how neoclassical theory conceive the production process:

1. **Constant returns to scale**

   Constant returns to scale means that quantities produced increase proportionally with the quantity of inputs. For instance, if the quantities of inputs (capital and labour) are doubled, output will double.

2. **Positive but diminishing marginal returns**

   Also called diminishing marginal products, or decreasing marginal productivity. This means that all factors of production (capital and labor) show positive but diminishing marginal returns: when we increase one of the inputs by one, with all the other inputs fixed, output will increase, but by less than the previous additional input. For example, the quantity of capital is often considered fixed in the short run, making labor the only variable input in the short run. Labor is assumed to have a decreasing marginal productivity (or marginal returns): with capital fixed, each time a firm employs an additional laborer, output will increase, but by less than when the previous additional laborer was employed. In our example, marginal product of labour is the first derivative with respect to labour:

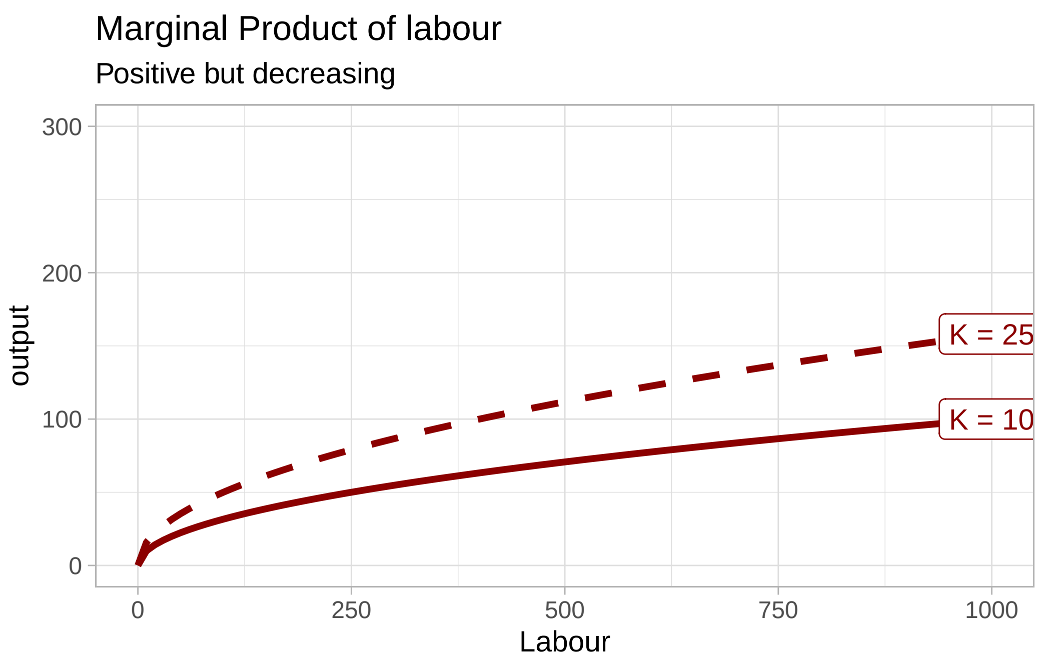
$$\begin{aligned}\frac{\partial Y}{\partial L} &= 0.5K^{0.5}L^{0.5-1}\\ &= 0.5K^{0.5}L^{-0.5}\end{aligned}$$

Here is how to find the marginal productivity of labor function of our example in R:

```
MPL <- Deriv(neo_prod_fun, "l")
MPL
```

```
function (l, k)
0.5 * (sqrt(k)/sqrt(l))
```

If we fix the amount of capital to any value, 10 and 25 for instance, we can plot the marginal productivity of labour to better illustrate the principle of diminishing marginal returns:



3. **Substitutability of factors/inputs**

   This third assumption implies that there is an infinite choice bewteen capital and labour for each level of output. For example, to produce 20 units of output, firms have an infinite choice to combine labour and capital. This is a strong assumption and as we will see the "rival" of the neoclassical production function is the Leontief production function, which is also called the "fixed-proportion" production function, because it assumes that for each level of output, there is only one possible combination of capital and labour.

Note that in the standard neoclassical production model makes the assumption that firm operate under perfect competition: perfect competition has three important characteristics:

1. **Price taking**

   Since there are a lot of consumers and firms in the market, firms have not impact on the price, they cannot manipulate the latter. Price is thus exogenous and given.

2. **Product homogeneity**

   The good produced in the market by the firms is the same, it is homogenous.

3. **Free entry and exit**

   There are no special costs associated with the entry in the market for any potential firm nor costs associated with exit (a firm that would want to exit the market).

3.3 Short run and long run

Neoclassical production theory makes an important distinction between the short run and the long run, with direct implication on how to manipulate the production function:

1. Short run

   We talk about short run when not all factors of production can be changed. Capital is typically considered as a fixed factor in the short run, whereas labour can still be changed. Thus, in the short run, capital is fixed and labour is variable.

2. Long run

   We talk about long run when all factors can be changed. This is the amount of time needed to make all inputs variable.

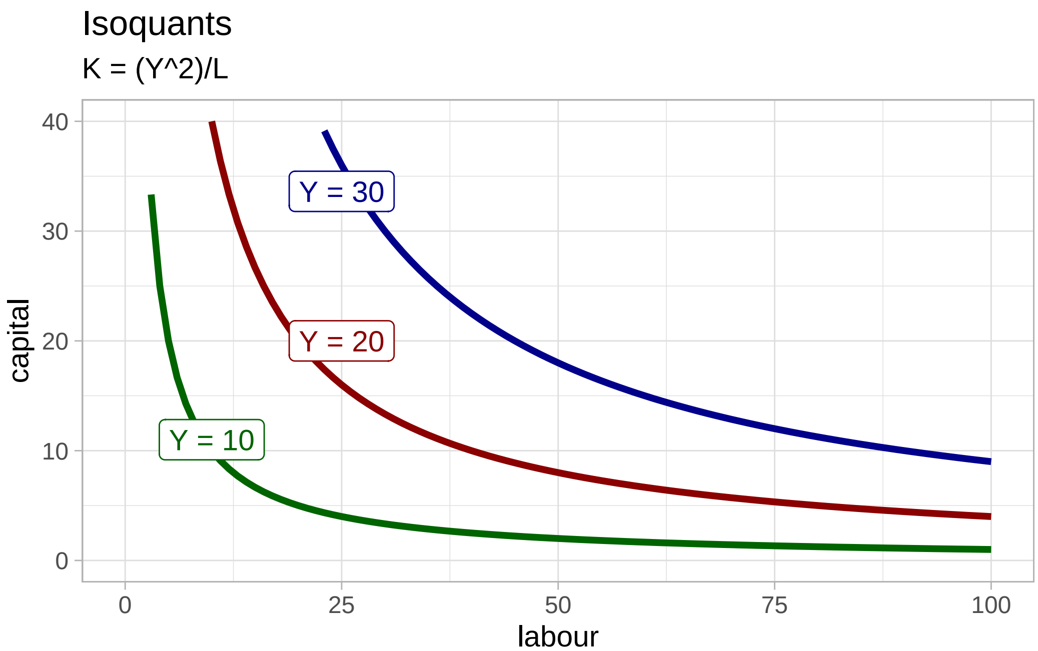
3.4 Optimal choice of output, capital and labour

In neoclassical production theory, there is an optimal choice of output, capital and labour, which implies that there is an ideal size for a firm. This is a strong assessment, because this implies that each firm has an optimal size at which they grow and then stop growing once they reach this optimal size.

3.5 Isoquant and Isocost

Isoquants are a way to represent graphically any combination of labour and capital for any level of ouput. Capital is typically plotted on the y axis and labour on the x axis and output is fixed along each curve. If we go back to our production function curve $Y = k^{0.5}L^{0.5}$, we have to isolate k to draw isoquants for this function, and then choose any value of output (Y):

$K = \frac{Y^2}{L}$



As in consumer theory, firms cannot choose any combination of capital and labour they want because, as consumers face a budget constraint, firms also face a constraint: their total cost. The isocost line, which shows all possible combinations of labour and capital that the firm can purchase with its current budget, hence total cost. Isocost is for the firm what the budget constraint line is to consumers.

The isocost function can be written as:

$TC = wl + rK$

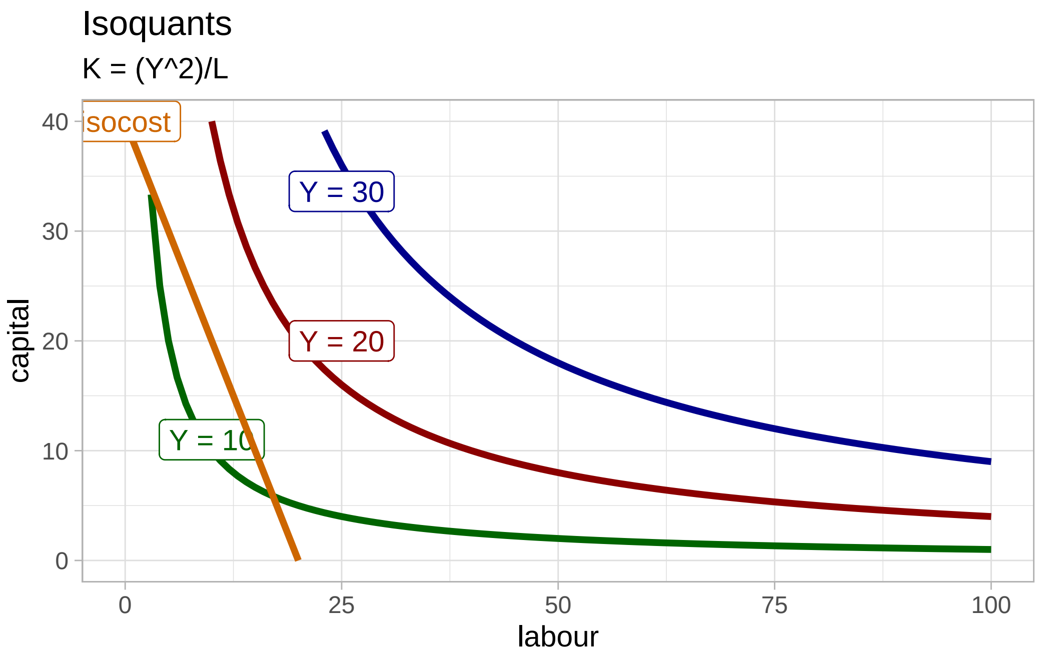
With TC the total cost being equal to the wage (rate) w times labour L and r the rental cost of capital K. r includes the depreciation cost of capital and the lost interest rate (if the capital was invested somewhere else).

Isocost can then be rearranged to:

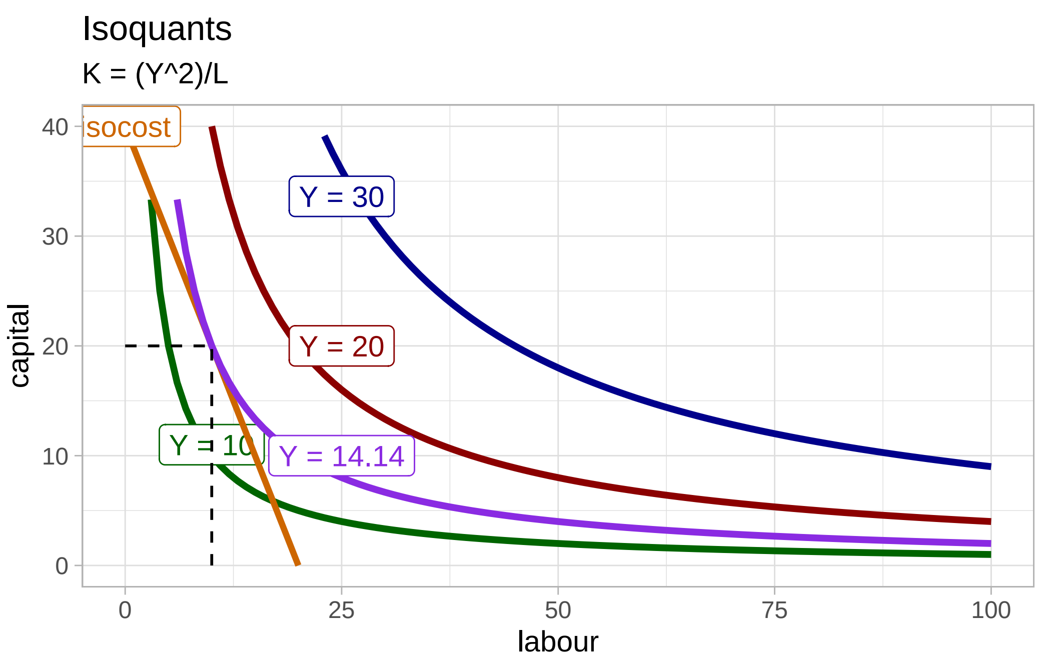
$K = TC/r - (w/r)/L$

For example, let's say that the total cost over rental cost of capital (TC/r) is equal to 40 and the wage rate - rental rate is equal to 2 (w/r = 2). The function becomes $K = 10 - 2L$

```
isocost <- function(l) 40 - 2*l
```



The steps to derive the optimal choice of output, capital and labor is the same than for consumer theory: here the slope of the isoquant is called the marginal rate of technical substitution (MRTS). Setting the latter equal to the slope of the isocost, which is w/r (1 in our example) and solving for K, Y and L. In our example, the equilibrium level of output is 14.14, with K = 20 and L = 10.



3.6 Profit equation and profit maximisation

The neoclassical production function we saw above is not only important because it models how neoclassical firms produce, but also because it is part of the profit equation that firms want to maximize (in neoclassical theory, firms maximize their profits as consumers maximize their utility). The profit equation is written as:

$\pi = PQ - TC$

or more generally

$\pi(q) = R(q) - TC(q)$

With π the profits of the firm, PQ the price P multiplied by the quantity produced Q, minus the total cost TC. We saw above that total cost was equal to $TC = wL - rK$, but micro manuals sometimes simplify this by just stating that total cost is equal to variable cost and fixed cost (in the short run, because in the long run all factors are variable).

Two important concepts are linked to this profit equation: marginal revenue and marginal cost.

- **Marginal revenue** is the change in revenue resulting from from a one-unit increase in output.
- **Marginal cost** is the change in cost associated with a one-unit increase in output

In perfect competition, marginal revenue is determined outside the firm, the latter having no influence on it because it has no power to manipulate the price. Marginal revenue is in fact the market price of the good produced by the firm and it is exogenous in a perfectly competitive market. On the other hand, marginal cost is inherent to the firm because it depends on the level of output chosen by the firm.

Mathematically, marginal revenue is the derivative of the total revenue of the firm $P * Q$ and is equal to the market price P. Marginal cost is the derivative of total cost, but marginal cost is not the same whether we are in the short of the long run. In the short run, only labour is variable, so the marginal cost is the additional increase in cost associated with a one-unit labour increase (an additional labourer)

$MC = \frac{\Delta VC}{\Delta Q} = \frac{w\Delta L}{\Delta Q}$

But in the long run, marginal cost is the additional cost resulting from an additional increase of any input $MC = \frac{\Delta TC}{\Delta Q}$. Algebraically, marginal cost is the derivative of total cost (long run) or variable cost (short run).

Then, neoclassical production theory explains that the profit equation $\pi = PQ - TC$ has a concave form. The logic behind this is the fact that the theory considers that firms have increasing economies of scale at low level of production and, as output increases, economies of scale will gradually decrease and become negative (economies of scale at the beginning and the diseconomies of scale at some point).

- **Economies of scales**

  When output can be increased for less than proportionnaly increasing the cost. For instance if output is doubled, cost less than double. Neoclassical theory typically considers that for low level of output (small firms), economies of scale are more likely because of productivity gains due to

  - specialization,
  - reorganization of the production process and
  - bargaining power for some intermediary inputs (advantage of buying in bulk).

- **Diseconomies of scales**

  When output is increased, cost more than proportionnaly increase. For instance, if output is doubled, cost more than double. Neoclassical theory considers that diseconomies of scale arrive at some point for high level of ouput because of:

  - Lack of space in the factory/working place ==> more difficult to do the job
  - Increasing number of tasks ==> management becomes more difficult due to increasing complexity of tasks
  - The advantage of buying in bulk disappears when certain quantity level is reached.

Those factors explain why the profit equation is concave. This has strong implications, because that means there is an optimal size for the firm associated with an optimal level of output which maximise profits.

Then, we can show that profit maximization under all of those conditions lead to the marginal cost being equal to marginal revenue

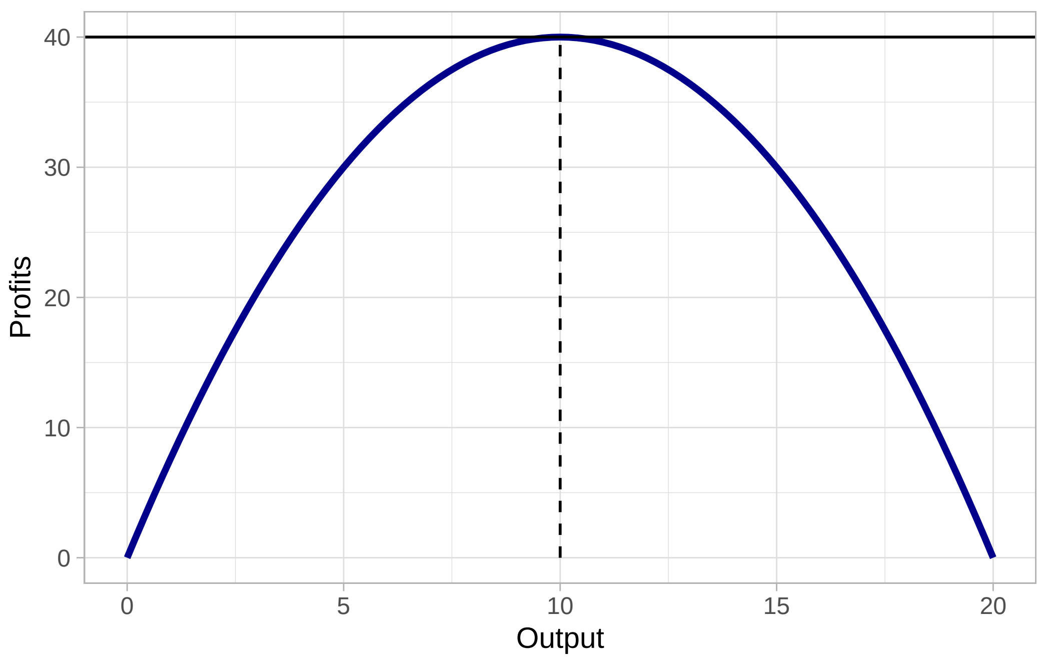
$(\pi)' = 0$ (()' meaning derivative)

$0 = (PQ)' - (TC)'$ the derivative of total revenue is the marginal revenue, and the derivative of the total cost is the marginal cost

$0 = MR - MC$

$MR = MC$

Graphically, the profit equation has a negative-concave shape, and optimal level of output is set where profits are at their maximum:



3.7 Deriving the supply curve

When will firms decide to supply a good at a given price? And why the quantities supplied increase with the price of the good?

Micro theory tells that the supply curve represents all the combinations of price and output (quantity of the good supplied) in which the price is higher than the average variable cost. If the market price is below the average variable cost (AVC), supplying the good would not be profitable. If the price is higher than AVC, it is profitable for the firm to produce (and the firm will supply the quantity at which its marginal revenue, the price, is equal to the marginal cost). Then, if price increases, marginal revenue increases, and firms can increase production and quantity supplied until marginal revenue is again equal to the marginal cost.

Part II

Neoclassical Macroeconomics

4 IS-LM model

4.1 Intro

The main objective of macroeconomics is to describe and explain the relationship between important economic variables such as unemployment, inflation, production and growth or the interest rate. Questions macroeconomics typically tries to answer are “how can long run growth be sustained?” “how can unemployment be reduced?”. Macroeconomics also takes into account economic policy and the role of the government: how can the government reduce unemployment, increase output and maintain low level of inflation?

Those are all questions most of macro models try to answer. In this chapter, I will explain one of the most famous and widespread macro model, which is the **Investment-Savings - Liquidity-Money** model (IS-LM model), as it is explained in one of the most famous macro textbook: Blanchard (2020).

4.2 Production as Gross National Product (GDP)

IS-LM can essentially we resumed in a graph, showing the relationship between output and the interest rate. But first, we have to define what is actually output (production) in macro theory.

4.2.1 The three approach to GDP

In economics, Production is defined as the sum of value added within an economy (can be a nation, a region, or the world taken as a whole) during a period of time (a year, month, semester, quarter…).

There are three equivalent ways to define and compute GDP:

1. **Production approach**

   GDP is equal to the value (measured in price) of all final goods and services sold minus the value of all intermediary inputs used in the production process

$GDP \equiv value\ output\ sold - cost\ intermediary\ inputs$

2. **Income approach**

   GDP is equal to the income of all agents in the economy

$GDP \equiv salaries\, of\, workers + profits\, of\, capital\, owners$

3. **Expenditure approach**

   Finally, and this is the most famous definition of GDP, GDP is equal to the total expenditure in the economy, which can be decomposed into the private expenditures of housholds on goods and services C, private expenditure of firms, investment I, and public expenditure G.

$GDP \equiv C + I + G$

If we take into account the fact that the economy is trading with the rest of the world, we must include the expenditure on imported goods M (imports) and expenditure from the rest of the world for national goods and services X (exports).

$GDP \equiv C + I + G + (X - I)$

Those three approaches are equivalent. Take for example the income and expenditure methods: it makes sense that any expenditure someone makes has to be a revenue for someone else.

4.2.2 Investment-savings curve (IS)

The objective of the IS curve is to describe the relationship between the interest rate and output, which is determined by demand in the short run.

The first step is to model demand and the equilibrium on the goods and services market. This can be done from the expenditure method to GDP, since expenditure is kind of the same way to say demand.

The total demand in a (closed) economy is thus

$Y \equiv GDP \equiv C + I + G$

4.2.2.1 Consumption C

But what determines private consumption C? IS-LM model considers that consumption as a positive function of income Y

$C = C_0 + C_1 Y$

With C_0 the minimum level of consumption if income is zero, C_1 the marginal propsentity to consume (the additional consumption resulting from one-unit increase in income Y) and Y the income. Note that income Y is the *disposable* income, that is, income after tax T: $Y_d = Y - T$.

Taxes T can be written as a proportion taken from income $T = tY$ with t the tax rate on income.

The consumption function can thus be rewritten:

$$C = C_0 + C_1 Y$$
$$C = C_0 + C_1(Y - tY)$$
$$C = C_0 + C_1 Y(1 - t)$$

4.2.2.2 Investment I

Regarding investment, the latter is considered as a decreasing function of the interest rate i:

$I = I_0 - iI_1$

The logic behind a negative relationship between investment and the interest rate is the following: the interest rate is the cost of borrowing. The higher the i, the higher it is to finance investment through borrowing. Conversely, at low i borrowing is cheaper, making firms more likely to borrow in order to invest.

4.2.2.3 Public spending G

Government spending is considered as exogenous in the is-lm model. This means that G is determined by government decisions which is determined outside the model.

4.2.2.4 Final output equation

The formula $Y \equiv GDP \equiv C + I + G$ can thus take its final IS form:

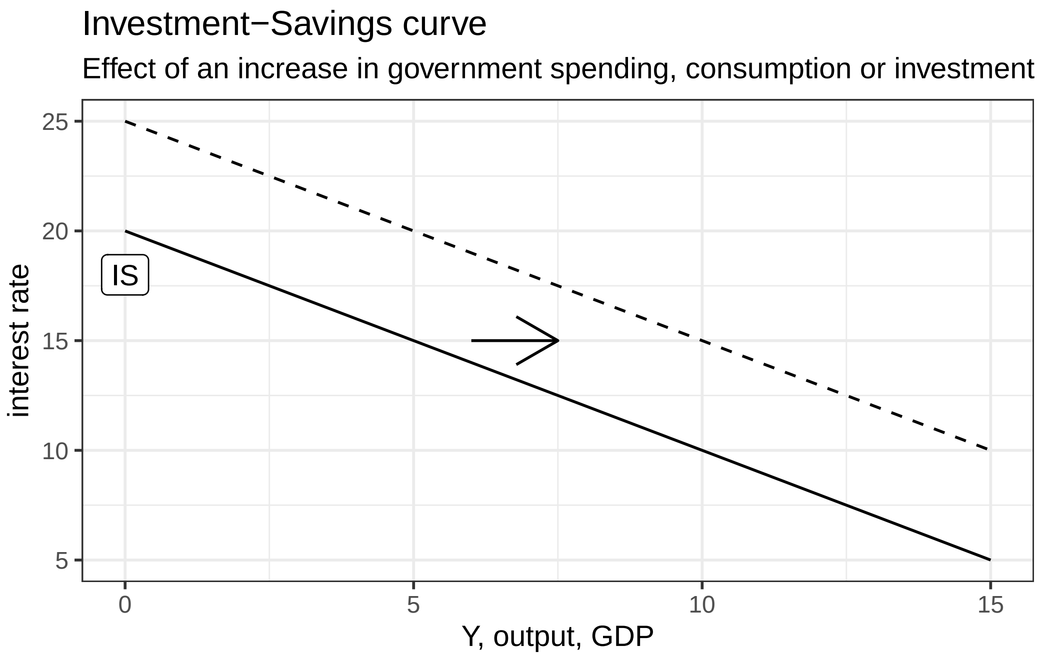
$Y = [C_0 + C_1 Y(1 - t)] + [I_0 - iI_1] + \bar{G}$

We can see in this equation that ouput Y is negatively related to the interest rate i: the IS curve as thus a negative linear shape.

To grasp the function in an easier way, we will just consider that the IS curve is a linear function of consumption (positive relation between output and consumption), Investment and government spending (also positive relation) and the interest rate (negative relation):

$IS = Y = F[C(Y_+, T_-), I(i_-), G_+]$

```
#example of a linear IS function
IS <- function(A, k, x) A - k*x #with A autonomous spending, k the mutliplier and x the in
```



As shown in the graph above, an increase in government spending or in consumption (but not due to an increase in income) or in investment (except due to a decline in interest rate) will induce a positive shift (upward) of the IS curve. A negative shock will make a shift downwards (negative shock).

Part III

Classical-Marxian Models

5 Classical-Marxian Models

What follows is extensively based on the second chapter of *Heterodox Macroeconomics: Models of of Demand, Distribution and Growth* (2019) by Robert A. Blecker and Mark Setterfield

5.0.1 Assumptions of the model

The classical-marxian model, named after Smith, Ricardo (who are considered as classics) and marx and based on their important work, comes its specific assumptions:

1. **Constant or full capacity rate of utilization**.

The latter, $u = \frac{Y}{Y_K}$, is ratio of the actual output (GDP) divided by the full capacity output Y_K, which is the level if output if all capital in the economy was used at its full capacity (no unused machines, raw materials…). If this ratio is equal to one, that means that the economy is at full capacity, the actual output is equal to its capacity level. If the ratio is for example 0.5, that means that actual output is half its level if all capital was fully used. But why does this model make such an assumption? This assumption stands in sharp contrast with the (neo)kaleckian model which typically reverses this assumption stating that capacity rate u is an important adjusting variable.

Before explaining the reason behind this assumption, it is necessary to understand the classical-marxian conception of the production process (how inputs, capital and labor, are combined to produce either goods or services), which rests on the **Leontieff production function**. The latter can be written as

$$Y = min(\frac{N}{a_0}, \frac{K}{a_1})$$

With N and K respectively labor and capital, $a_0 = L/Y$ the labour-output ratio (the quantity of labour required to produce one unit of ouput) and $a_1 = K/Y$ the quantity of capital required to produce one unit of output (capital-output ratio).

```
# how to write the leontief production function in R
leontief <- function(l, k, a0, a1) (min(c(l/a0, k/a1)))
```

$\frac{N}{a_0}$ is the maximum output that can be produced with available labour resources while $\frac{K}{a_1}$ represents maximum output when all capital resources are used.

For instance, if three units of labor are required to produce one unit of output and one unit of capital is required to produce one unit of output, what will be produced if we have N = 9 and K = 4 ?

In our example, $a_0 = 3/1$ (three units of labor required to produce Y = 1) and $a_1 = 1$ (one unit of capital to produce one unit). We compute $N/a_0 = 9/3$ and $K/a_1 = 4/1$. Since the former $9/3 = 3$ is bigger than 4, all 9 units of labor will be used to produce 3 units of output. Note that at Y = 3, one unit of capital will be leftover and be unused. In this example, output is "labor-constrained" because it is the amount of labor which is fully used and capital which is not. Output at full employment is $Y_N = N/a_0$.

```
leontief(l = 9, k = 4, a0 = 3, a1 = 1)
```

```
[1] 3
```

Considering labor as the constraint is what the (neo)kaleckian model does, while the classical-marxian model considers that capital is the binding constraint on potential output. In the classical-marxian model, all capital is used and thus output is output at full capital utilization $Y_K = K/a_1$.

While both classical-marxian and (neo)kaleckian models use Leontief production function (and are here different from neoclassical models which use cobb-douglas production function), they differ by what they consider as the constraining factor on output: labor for (neo)kaleckian model Y_N, capital for classical-marxian model Y_k.

Thus, considering that capital is the constraint implies the possibility to consider that the economy can reach a full capacity utilization $u = Y/Y_k$, this is what the classical-marxian model does thus why u is considered constant at full capacity $u = 1$.

2. **Constant and Given Technology**

There is no technological change in the classical-marxian model. However, the effects of exogenous technological change can still be analyzed.

5.0.2 Basis of the model

5.0.2.1 Wage-profit trade-off

The main equation is derived from the income approach to national income, which is an accounting identity showing that national income is the sum of all income sources in the economy. The model makes here other assumptions: no government, closed economy, only workers and capitalists, only one good produced, which are nessecary to write:

$$PY = WL + rPK$$

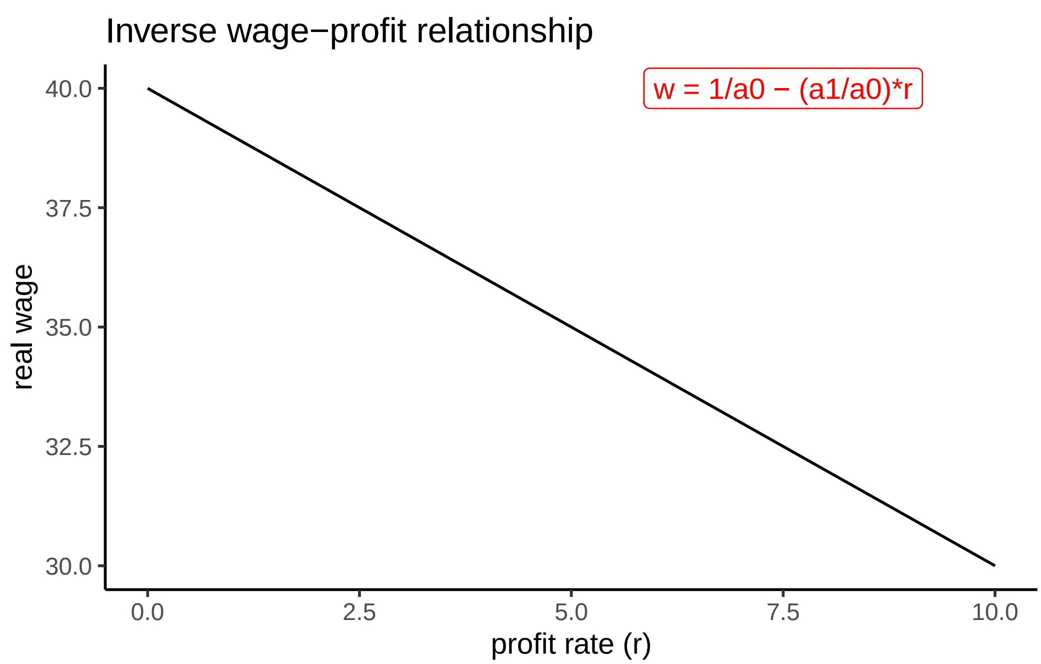
Which is the national income identity after those assumptions, with P the price, Y the output, W the nominal wage rate, L the amount of labor employed, r the profit rate and K the real stock of capital.

From this equation above is derived one the main equation of the model, the inverse wage-profit relationship:

$$w = \frac{1}{a_0} - \frac{a_1}{a_0} r$$

```
w <- function(r) 40 -1*r

ggplot(data = tibble(x = 0:10), aes(x = x))+
  geom_function(fun = w)+
  annotate(geom = "label", x = 7.5, y = 40, label = "w = 1/a0 - (a1/a0)*r", color = "red")
  theme_classic()+
  labs(title = "Inverse wage-profit relationship",
       x = "profit rate (r)", y = "real wage")
```



This equation also implies an inverse relationship between consumption and growth

$$c = \frac{1}{a_0} - \frac{a_1}{a_0} g$$

With c consumption of both workers and capitalist and g the rate of capital accumulation $g = \Delta K/K = I/K$

These two relationships and hence trade-off between wage and profit, and consumption and growth are the implications of the two main assumptions explained above: **constant rate of capacity utilization** and **given constant technology**. Technological change or rise in u can improve the wage-profit trade-off and thus make both profits and wage rate rise (same for consumption-growth trade-off). Graphically, the slope of the curve above would either shift upward or one of the intercept increase.

5.0.2.2 Saving function

The model makes here another important assumption: **all saving is done by the capitalist class**. All savings come out from of the profits received by the capitalists. Another important feature is the fact that the classics and Marx did not distinguish between savings and investment ("the purchase of newly produced capital goods, such as machinery, equipment or structures"(p.63)). In C-M terminology, "accumulation" means the mechanistic flow between savings, investment and thus growth. This leads to the "accumulation function":

$$g \equiv I/K \equiv S/K = s_r(r - r_{min})$$

$g \equiv I/K \equiv S/K$ (growth g is equal to the investment rate I/K which is the same as saving rate S/K) comes from this non-distinction between saving and investment. s_r is the proportion capitalists save out of their profits r. This equation means that growth can increase only with an increase in the saving rate of the capitalists.

5.0.3 The three equations and the alternative closures

5.0.3.1 3 Equations

The basic model is thus based on the three main equations

1. Profit-wage trade-off

$$w = \frac{1}{a_0} - \frac{a_1}{a_0} r$$

2. Consumption-growth trade-off

$$c = \frac{1}{a_0} - \frac{a_1}{a_0} g$$

3. Accumulation function

$$g \equiv I/K \equiv S/K = s_r(r - r_{min})$$

However, the model is not "closed" in the sense that all the main variables (w, r, s_r, g) are endogenous (they all are a function of one another). The model needs thus to be "closed" by adding an exogenous variable. Since the classics and Marx did not give a precise and consistent closure (exogenous variable), the textbook gives four "alternative closures" which come from different interpretation the classics and Marx.

5.0.3.2 4 alternative closures

1. An exogenously given real wage $\bar{w}$

Which represents an ordinary standard of living for a working-class family. This should not be confounded with the infamous "iron law" of wages (that wages will always tend to go to the subsistence level, this was made popular by Ferdinand Lassalle and Malthus but has nothing to do with Marx and the classics). This exogenous wage rate $\bar{w}$ is given, but socially and historically determined and varies across countries and time. This is not a natural/physical minium subsistence wage.

2. Exogenous given wage share of national income

This assumes that wages are determined through a bargaining process in which workers can bargain with capitalists to get wages such as a given wage share of national income is achieved. Note that the wage share can be written as $\psi = wa_0 = w * L/Y$ and the profit share $\pi = ra_1 = rK/Y$. The real wage w can be written as negatively related to the profit share π

$$w = (1 - \bar{\pi})/a_0 = (1 - \bar{\pi})Q$$

With $Q = Y/L$ labour productivity.

3. Full employment or constant employment

This closures explains that wage depends on the balance between labor demand and supply. Increase in labor demand tend to increase wages whereas the growth in labor supply will tend to decrease wages. A rapid growth of labor demand increase the bargaining power of workers, who can bargain higher wages and conversely when population and labor supply increase rapidly.

This closure states that the change in real wage $\hat{w}$ is a negative function of growth in labour supply n

$\hat{w} = \phi(g - n), \phi' > 0$

Thus, wage is constant when $g = n$

But then, the manual (on page 71) considers another function, which describes the growth of labor force n as a positive function of real rage w, the idea is that the higher wage leads to higher population growth and thus higher labor supply growth:

$n = n_0 + n_1 w$

4. A given rate of profit, determined by financial market forces

The profit rate is determined by the interest rate on loans to firms i and by a risk premium λ:

$r = i + \lambda$

5.0.4 Effects of exogenous change

5.0.4.1 Vizualization of the models

5.0.4.2 First and second closures

5.0.4.3 Third closure

Since the fourth closure is in my opinion not really important, I will mostly focus now of those closures above.

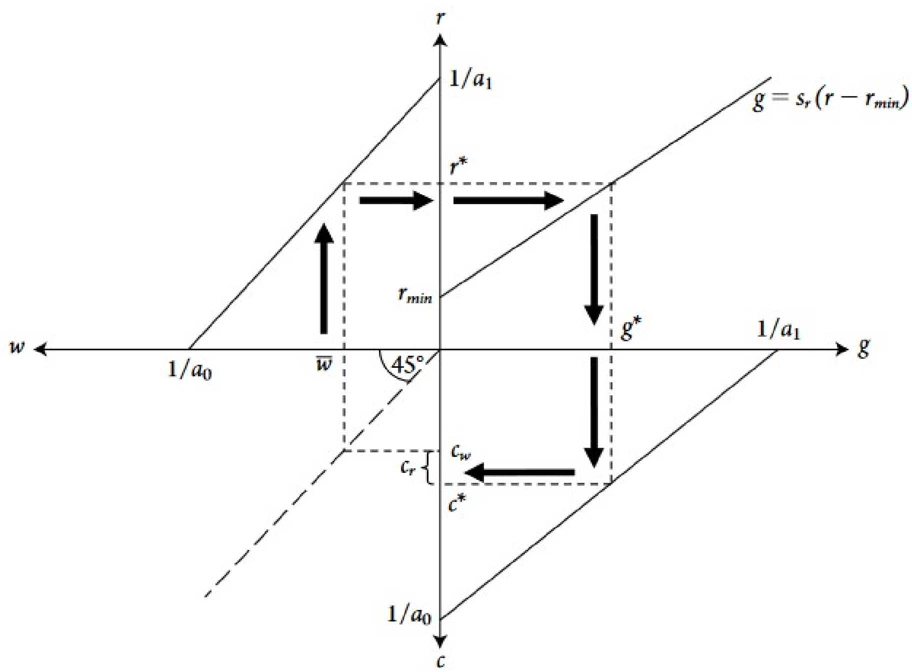


Figure 5.1: The model under first and second closures (exogenous real wage or wage share),Blecker and Setterfield (2019, 69)

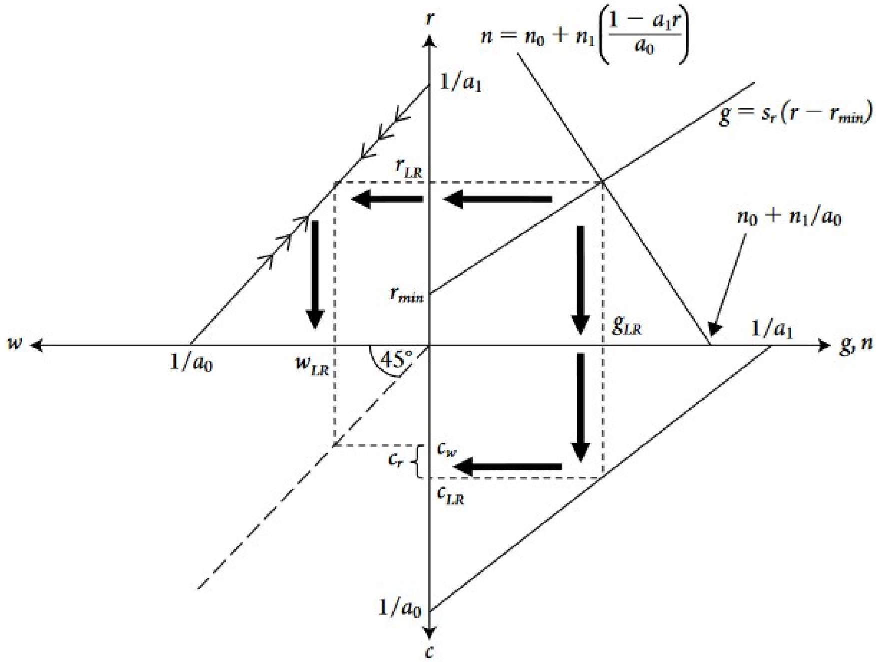


Figure 5.2: Third closure: constant of full employment rate, Blecker and Stterfield (2019, 72)

5.0.4.4 Effects of exogenous change in propensity to save

What happens if the saving propensity out of profits, s_r, rise or fall?

1. Closure 1 and 2

   If the propsensity to save increase, the accumulation function curve becomes flatter (attention: in the graph above, the y and x axis are inverted on the right quadrant, where the accumulation function is drawn. So a rise in the slope implies a flattening of the curve). Since the real wage (or wage change) is exgenously given, it does not change. What changes are the growth (accumulation) rate and consumption: accumulation and growth increase because more profits are saved and invested into new capital. Consumption decreases because since capitalists increase their saving propensity, less of their profits are dedicated to personal consumption. Conversely, if the saving propensity decreases, accumulations and growth decrease and consumption increase. The real wage and profit rate remain unchanged.

$\nearrow s_r \Rightarrow \nearrow I/K \Rightarrow \nearrow g, \searrow c$

2. Closure 3 (natural rate of growth closure)

An increase in the propensity to save will again make the accumulation curve rotate down to the right (the slope increase). The direct short run effect is a rise in growth rate g. Then, this increase in growth rate makes labor demand increase faster than labor supply, resulting in a rise in the real wage. The rise in real wage decreases the profit rate and thus the growth rate decreases until the growth of labor demand and labor supply are equal. Whereas the growth rate g ends up at the same level or higher depends if labor supply is considered as endogenous or exogenous. If it is endogenous, the increase in labor supply after the increase in real wage will be faster and the new equilibrium growth rate will be higher than the original level. If labor supply is exogenous (a vertical curve in the upper-right candrant), the equilibrium growth rate cannot rise in the long run and will return at its original level.

Endogenous labor supply: $\nearrow s_r \Rightarrow \nearrow\nearrow g, \Rightarrow \nearrow w, \searrow r \Rightarrow \nearrow n \Rightarrow \searrow g,$

but with final g > initial g. Note that under these conditions, both the growth rate and the real wage rise.

Exogenous labor supply: $\nearrow s_r \Rightarrow \nearrow\nearrow g \Rightarrow \nearrow w, \searrow r \Rightarrow \searrow\searrow g$

5.0.4.5 Effects of redistribution of income

1. Closure 1 and 2

   A rise in real wage or wage share would decrease the profit rate (recall the trade-off between wage and profit), which would decrease the growth rate (less is saved and invested since profits decrease). Consumption rises due to the increase in real wage/wage share

$\nearrow \bar{w} \Rightarrow \searrow r \Rightarrow \searrow g \Rightarrow \nearrow c$

`A decrease in real wage or wage share would have the opposite effects.`

2. Closure 3 natural rate of growth

   In this closure, a change in real wage or wage share would be the effect of an exognous change in population growth (and thus of labor supply). A rise in real wage would happen if there is a negative exogenous shock to population and labor supply (for instance a brutal epidemic like the black death, which decreased population a lot in the 14th century and made wages rise because of labor supply scarcity). The curve n = n0 + n1*w shifts to the left, real wages rise, profit rate decreases, growth rate decreases and concumption increases.

$\nearrow n_0 \Rightarrow \nearrow w, \nearrow c \Rightarrow \searrow r \Rightarrow \searrow g$

5.0.5 Effects of technological change

The manual presents four types of technological change:

1. **Harrod-neutral: pure labor saving technological change**

   Labor productivity rises, but capital productivity remains unchanged

$\nearrow Q = Y/L = 1/a_0$

2. **Hicks-neutral: factor-saving technological change**

   Both capital and labor productivity rise

$\nearrow Q = Y/L = 1/a_0, \nearrow Y/K = 1/a_1$

3. **Marx-biased: labor saving, capital using**

   Labor productivity increases, but capital productivity decreases

4. **Solow-neutral: pure capital saving technological change**

   Capital productivity rises, with labor productivity unchanged

All those patterns of technological change, with the exception of the marx-biased one, will improve the wage-profit trade-off, the curve of the latter shifting outward. Wage and profit as well as growth rise. Under the natural rate of growth closure (3) with exogenous labor supply, the long-run growth rate does not increase, however.

5.0.5.1 Marx-biased technological change the falling tendency of the rate of profit (FTRP)

The FTRP is perhaps one of the most famous claim/theory of Marx. In *Capital Volume III*, Marx exposes this theory, which claims that technological change, by increasing labor productivity while decreasing capital productivity, will lead to a fall in the profit rate. The manual claims that Marx makes one important but often forgotten assumption: a constant rate of exploitation $e = s/v$ with s the surplus value and v the value of labor power. Blecker and Setterfield argue that assuming a constant rate of exploitation is the same as assuming a constant wage share and profit share.

Recall that the profit share can be written as $r = \pi/a_1$, if π the profit share is constant and marx-biased technological change happens, a_1 will increase (a_1 is the inverse of capital productivity $a_1 = K/Y_k$). and thus decrease profit rate r. Thus, under the constant wage share closure, Marx-biased technological change does imply a fall in profit rate. However, it is unlikely that capitalists will let their profit rate fall without reacting and trying to suppress wages or slow down accumulation and growth, which would decrease labor demand, reduce workers bargaining power and thus lead to lower wages and to a recovery of the profit rate.

What about the third closure? Under this closure, the fall in profit rate does not happen, mainly because of the effect of the increase in labor supply resulting from the increase in real wage. If labor supply is considered as exogenous, the long run profit and growth rate cannot change: a_0 falls more than real wage increase, and thus $\pi = 1 - wa_0$ increases. Thus, the FTRP is false under this closure, but another of Marx prediction is true: the relative immiseration of the proletariat, since the profit share increases (and wage share decreases).

Part IV

Neo-Keynesian Models

6 Neo-Keynesian Models

What follows is extensively based on the third chapter of Heterodox Macroeconomics: Models of of Demand, Distribution and Growth (2019) by Robert A. Blecker and Mark Setterfield.

"Neo-keynesianism" refers in our context to economic models conceived by neo-keynesian economists, that is, economists who built their model from the important contributions of Keynes. It here refers mainly to :

- **Roy Forbes Harrod** (1900-1978), was a British economist who did his education and then was professor in Oxford and Cambridge, where he met Keynes.
- **Nicholar Kaldor** (1908-1986), born in Budapest, was a British economist (he completed his education in Britain). What will be presented here as the early Kaldorian model (EKM) is based on his early work, in which he attempted to derive the conditions at which the growth rate could grow at a rate consistent with full-employment in the long run.
- **Joan Robinson** (1903-1983), was also a British economist from Cambridge. She is known for her development of Keynesian theory.

6.1 Roy Harrod: a Model of Unstable Growth

Roy Forbes Harrod (1900-1978) is an important figure in economics. The British economist is first and foremost known for his formal description of the mechanisms of economic growth, which one of the first attempt to do so in the discipline. As we will see, the conclusion of Harrod's model is that growth under capitalism is fundamentally unstable.

6.1.1 Three Growth Rates, First and Second Harrod Problems

Harrod distiguished three growth rates:

1. The *actual* growth rate

   The rate of growth which is actually observed in the economy $y = \frac{Y_t - Y_{t-1}}{Y_t}$

2. Natural growth rate

   Which is defined as $y_N = q + n$, with n the rate of growth of labour and q the rate of growth of labor productivity.

This rate of growth comes from the definition of ouput at the full-employment level: $Y_N = \frac{N}{a_0}$ with $a_0 = \frac{N}{Y}$ the labour-output ratio (how much labour is required per unit of output). The rate of change of Y_N is $\widehat{Y_N} = n - \widehat{a_0}$. Since a_0 is also the inverse of labour productivity $\frac{1}{a_0} = Y/L$, $-\hat{a}$ is equivalent to labour productivity growth $\widehat{Q} = q$.

This natural rate of growth can be interpreted as an upper limit, the maximum rate of growth that can be achieved in the long run at full employment. The limit comes from the fact that production (output level) is limited by labour supply constraint (since Y_N is the maximum level of output at full-employment).

3. Warranted rate of growth

   Which is the rate of growth when investment is equal to savings $S = I$.

How can we found this third rate of growth? We must first define the investment function (how the model thinks investment decisions are made):

$$I_t = a_1(Y_t^e - Y_{t-1})$$

With I_t investment at period t, $a1$ the full-capacity capital–output ratio (quantity of capital required to produce any given level of output) $a_1 = \frac{K}{Y_K}$. This ratio can also be interpreted here as the additional quantity of capital needed to produce any additional output (the "at the margins" interpretation). This equation simply means that if agents at time $t-1$ expect output a the next period t to be higher, $Y_t^e > Y_{t-1}$, then investment at the next period t will be equal this this positive difference multiplied by the full-capacity capital–output ratio.

Why multiply by a_1 ? If we define the actual quantity of capital which is utilized in the economy as $K_u = uK$, u being the full capacity utilization rate $u = Y/Y_k$, we can rewrite the actual quantity of utilized capital as $K_u = uK = \frac{Y}{Y_k}K = a_1 Y$

The change of the amount of capital actually used in the production process is thus $\Delta K_u = a_1 \Delta Y$

Investment basically means that new capital is bought and added to the stock of capital available for production: $I = \Delta K$, so that when investment occurs, capital stock increases by ΔK. If we consider that expectations are realized, $\Delta Y = \Delta Y^e$, we can write

$$I = \Delta K = a_1 \Delta Y = \Delta K_u = a_1 \Delta Y$$

Thus, a_1 is not arbitrary, but conformed to the known quantity of capital required to expand production through investment.

We have thus the investment function:

$$I_t = a_1(Y_t^e - Y_{t-1})$$

The saving function, on the other hand, is equal to:

$$S_t = sY_t$$

With s the propensity to save. This saving function simply means that the total saving is a fixed proportion of total income (production).

The last steps to find the warranted rate of growth is to equate the savings and investment function, after making the assumption that expectations are realized:

$$\begin{aligned} Y_t &= Y_t^e \\ S_t &= I_t \\ s_t Y &= a_1(Y_t - Y_{t-1}) \\ \frac{s}{a_1} &= \frac{Y_t - Y_{t-1}}{Y_t} \end{aligned}$$

The warranted rate of growth is thus

$$y_w = \frac{s}{a_1}$$

To sum up, the three rates of growth are

1. **Actual Growth Rate**

$y = \frac{Y_t - Y_{t-1}}{Y_t}$

2. **Natural Growth Rate**

$y_n = q + n$

3. **Warranted Growth Rate**

$y_w = \frac{s}{a_1}$

6.1.2 The First Harrod Problem

The first Harrod problem states that there is no mechanisms that would ensure a persistent or non-accidental equality between the three growth rates, thus the equality

$$y = \frac{s}{a_1} = \bar{q} + \bar{n}$$

is possible, but as the manual puts it, *not likely.* The reason is that what influences the warranted rate of growth and the natural rate of growth are independent of each other.

6.1.3 The Second Harrod Problem

The second Harrod problem states that the warranted rate of growth $y_w = s/a_1$ is unstable. That means that any deviation of the rate of growth from the warranted rate will be self-reinforcing.

To see this, we start with the equality between savings and investment:

$$\begin{aligned} I &= S \\ I_t &= sY_t \\ Y_t &= \frac{I_t}{s} \end{aligned}$$

Then by substituting I_t by the investment function $I_t = a_1(Y_t^e - Y_{t-1})$:

$$Y_t = \frac{a_1(Y_t^e - Y_{t-1})}{s} = \frac{Y_t^e - Y_{t-1}}{y_w}$$

Note that here a_1/s is the inverse of the warranted rate of growth y_w, this is why y_w appears at the denominator. If we divide both sides of the equation above by the expected rate of growth Y_t^e, we get:

$$\frac{Y_t}{y_t^e} = \frac{y^e}{y_w}$$

y^e comes from the fact that we divided $Y_t^e - Y_{t-1}$ by Y_t^e, which is the rate of growth of expected growth rate. This equation above simply shows that, if expectations are realized ($Y_t = Y_t^e$, this is a condition for the warranted rate of growth), and $y^e = y_w$, then we have an equilibrium between the actual growth rate and warranted growth rate

$$y^e = y = y_w$$

The second Harrod problem explains that any deviation of y from y_w will be self-reinforcing. If $y < y_w$, there will be a downwards pressure on y, thus a persistent recession. Conversely, if $y > y_w$, there will be an upwards pressure on y, hence a self-reinforcing economic expansion.

These mechanisms are the results of how the model conceive the change of the expected growth rate y_t^e. If at period t the growth rate y_t is greater than the expected growth rate $y_t > y_t^e$, then at period $t+1$ agents will revise their expected growth rate upward $y_{t+1}^e > y_t^e$. This simple behavioral principle can be summarized as:

$$y_t > y_t^e \Rightarrow y_{t+1}^e > y_t^e$$

$$y_t < y_t^e \Rightarrow y_{t+1}^e < y_t^e$$

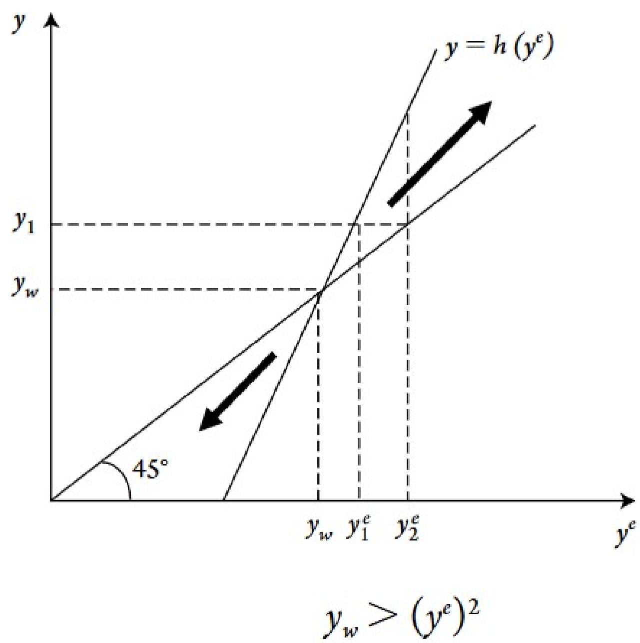


Figure 6.1: Instability of the Warranted rate of Growth

The graph above shows that any deviation from the equilibrium point, at which $y_w = y = y^e$ will lead either to permanent boom or bust. Note that the second Harrod problem depends on how expectations are revised: here we consider expectations as adaptive: expectations will be based on what happened at the previous period.

6.1.4 Interactions between actual, warranted and natural growth rates

Two scenarios can be considered.

First, when $y_w < y_N$, the economy will be prone to boom and bust behavior. If the actual growth rate is greater than the warranted growth rate, the former will be ever-increasing until the economy will "overheat" when the actual growth rate is superior to the natural rate (which is an upper limit above which there will be exhaustion of labor force and a likely wage-inflation spiral).

Second, if $y_w > y_N$, the economy is in a situation of chronic depression. Since the actual growth rate cannot be permanently equal to the warranted rate in this situation (because of the upper limit y_N), the actual rate of growth would tend to permanently fall until government policies would likely start to intervene.

Finally, this model has consequence for economic policy. Increasing the saving propensity s to boost growth is not a good idea if it is not accompanied by a rise in aggregate demand, in which case increased saving means reduced consumption demand and investment demand is not guaranteed to offset the fall in consumption.

6.2 The Early Kaldorian Model (EKM) of Growth and Distribution

6.2.1 A model very close to the Classical-Marxian model

This model is very close to the Classical-Marxian model I described here. The main difference is the fact that the early Kaldorian model (EKM) includes **the saving propensity out of wages** s_w whereas the classical-marxian model only includes savings out of profits.

Recall that the classical-marxian saving function was

$S/K = s_r(r - r_m in)$

The EKM introduces savings out of wages, with a propensity lower than savings out of profits. Total savings is thus a weighted average bewteen savings out of wages and profits:

$$S = [(1 - \pi)s_w + \pi s_r]Y$$

π is the profit share, $(1 - \pi)$ the wage share, with $0 < s_w < s_r < 1$.

6.2.2 EKM Assumptions

The model makes some assumptions, which are globally similar to the C-M model:

1. EKM assumes that labor productivity is constant $q = 0$, hence the natural rate of growth is simply $y_N = n$.
2. Like the Classical-Marxian model, growth rate is the rate of capital accumulation $g = \Delta K/K$.
3. Full or constant capacity rate of utilization u
4. Constancy and exogenous capital-output and labor-output ratios a_0, a_1

To maintain full employment, capital accumulate rate must grow the same as the investment rate and labor supply growth rate:

$g = \frac{I}{K} = n$

6.2.3 EKM Equilibrium

As usual, we equate $S = I$, to find the equilibrium:

$$g = n = \frac{I}{K} = \frac{S}{K} = \frac{[(1-\pi)s_w + \pi s_r]Y}{K} = \frac{(s_r - s_w)\pi + s_w}{a_1}$$

The equilibrium profit share is thus

$$\pi^* = \frac{a_1 n - s_w}{s_r - s_w}$$

And the equilibrium growth rate is

$$g^* = n = \frac{s^*}{a_1}$$

A major difference with the C-M model is that instead of considering an exogenous wage share or real wage and deriving the profit rate and growth rate from it, Kaldor set the growth rate equal to its natural rate and derive the profit/wage share and saving propensity necessary to reach this equilibrium. For the EKM to work, wage and profit shares must be flexible, there must be active government stabilization policies (fiscal & monetary).

EKM has the implications that for the economy to grow faster only with higher inequality.

6.3 Neo-Robinsonian Model

The major point of this model is to introduce a separation between investment and savings. All the models we saw until now did not distinguish between savings and investment (as the classical-marxian model).

6.3.1 Separating Savings from Investment

The main equations of the model are thus a saving function out of profits and a desired investment as a positive function of expected profits.

1. **Saving function**

$$\sigma = s_r r$$

With σ savings.

2. **Desired investment function**

$$g = f(r^e)$$

g being investment. This function is assumed to have positive but diminishing marginal impact of expected profits on desired investment ($f' > 0, f'' < 0$).

Point A on the graph above is a stable equilibrium whereas point B is an unstable one. The graph has to be read as follows: at r_0 the saving rate is smaller than the (desired) growth rate g_0. At g_0, the corresponding profit rate is r_1, which is above the profit rate related to actual saving rate (r_0). Firms have thus invested in way that will make profits rise and they will thus revise their profits expectations upwards: at r_1 they will invest at a level slighlty above g_0, which will again push up the profit rate until point A, at which $g = \sigma$ is reached.

On the other hand, if we start at any profit rate below point B, the desired rate of investment will lead to a growth rate that will lead in return to a lower profit rate, firms will revise their profit rate expectations downwards and thus reduce their desired rate of investment, which will then lead to an even lower growth and profit rates and so on. Below point B, this process does not end automatically, there must be for example government stabilization. Above point A, however, the process is the same as described above in this paragraph, but it stabilizes at point A. Note that what happens below point B is strongly similar to the second Harrod problem.

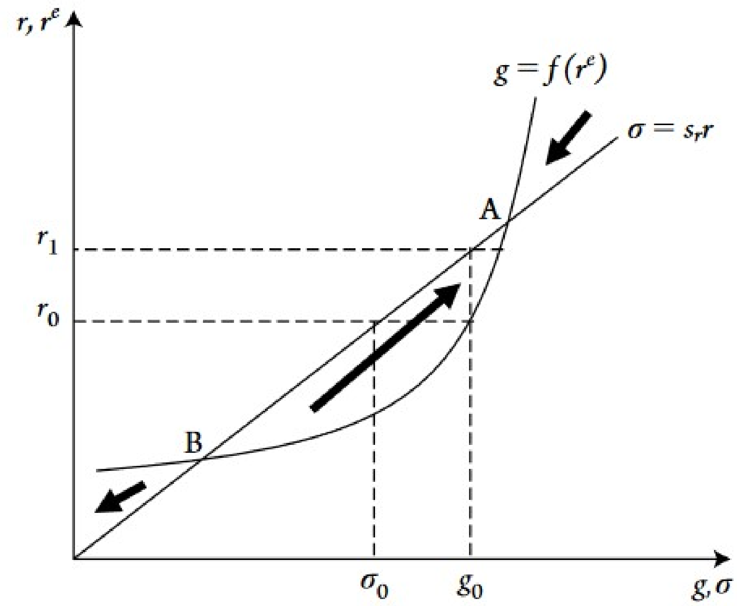


Figure 6.2: Robinson “banana diagram”

6.3.2 Connecting Neo-Robinsonian Model with Wage-Profit Relationship

The Neo-Robinsonian model combines the model above with the inverse wage-profit relationship we saw in the C-M model. The desired investment rate is simplified to

$g = f_0 + f_1 r^e$

With the same saving function $\sigma = s_r r$ and the inverse profit-wage relationship $w = \frac{1-a_1 r}{a_0}$

To find the equilibrium levels of growth, profit and wage rates, we set investment equals to savings $\sigma = g$ and solve for:

$$r^* = \frac{f_0}{s_r - f_1}$$

and

$$g^* = \frac{s_r f_0}{s_r - f_1}$$

and

$$w^* = \frac{1}{a_0} - \frac{a_1}{a_0}(\frac{f_0}{s_r - f_1})$$

Note that in this model the **real wage and wage share are flexible, but nominal wage is not**.

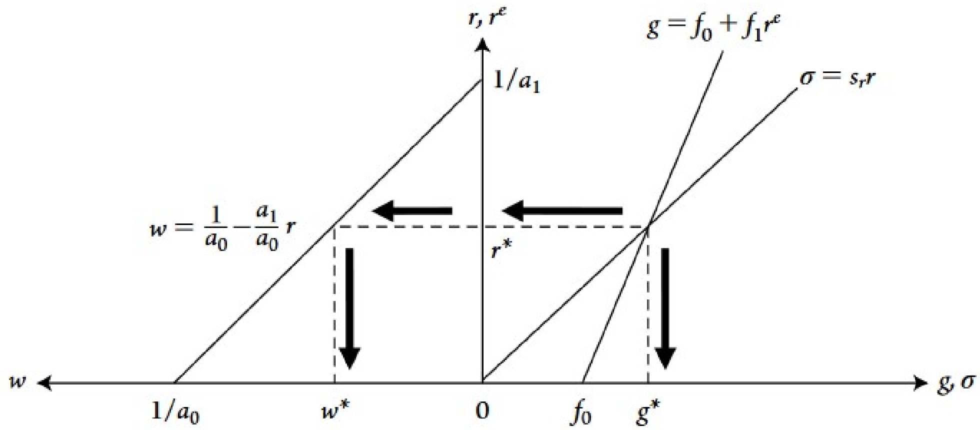


Figure 6.3: Neo-robinsonian model

In this model, an increase in the propensity to save leads to lower equilibrium level of growth and profit rates and a higher equilibrium real wage. The mechanism is that an increase in the propensity to save, with an unchanged desired investment curve (which means that saving propensity increases without changing firms' willingness to invest), reduces aggregate demand through a reduction in consumption demand. With falling demand, profits realized from actual investment expenditures also fall.

Graphically, the saving curve rotates down to the right. Why does the real wage increase? Recall that in this model, nominal wage is fixed. A change in real wage must then come from a change in the price level. In the case of higher propensity to save, the latter has depressed aggregate demand and growth, which reduces the price level $\searrow P$.

What if we consider a shift in the desired investment curve? An example would be a rise in f_0, which can be interpreted as the level of confidence of firms: the higher their confidence in the economy, the higher they will invest for every level of expected profit rates. A rise in f_0 would shift the desired investment curve $g = f_0 + f_1 r$ to the right, profit rate would rise, growth rate would rise, but real wage would decrease. Real wage decreases because inflation increases as a result of higher aggregate demand and thus excess demand in the goods market. Note that inflation in the neo-Robinsonian model is always "demand-pushed", that is, led by excess demand in the market for goods and services.

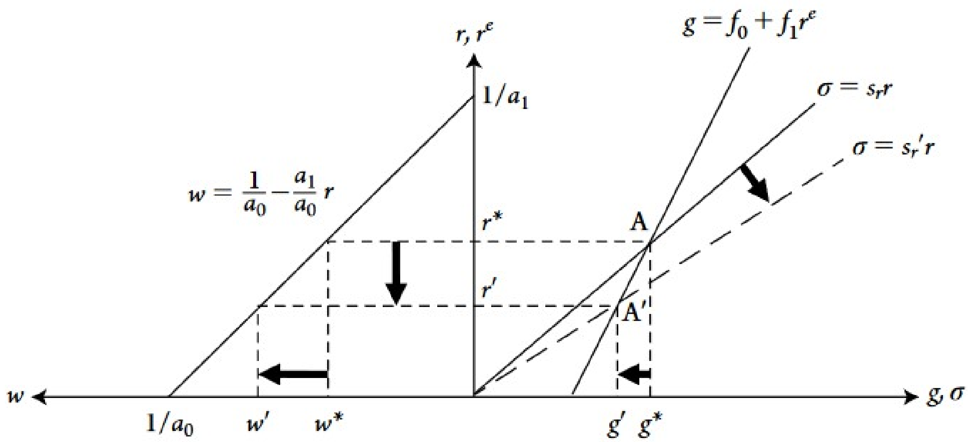


Figure 6.4: Effect of an increase in saving propensity

6.4 Marglin's neo-Marxian/neo-Keynesian synthesis

Since the assumption of fixed nominal was considered not very realistic, since it is very likely that workers would bargain for higher nominal wages in the case of higher inflation as described above, Marglin has constructed model which is a mix between the classical-marxian model and the neo-robinsonian model. Marglin's contribution was to consider that workers bargain for nominal wages rather than the real wage or wage share.

Marglin's synthesis adds two functions, which model the change in nominal wage and price level.

6.4.1 Change in nominal wage

$\hat{W} = \Omega(\bar{w} - w)$

With $\bar{w}$ the target real wage for workers and Ω a constant describing how fast change in nominal wage adjusts to the difference between the target real wage and the real wage $(\bar{w} - w)$. If the target real wage is greater than the actual real wage, workers are willing and are able to bargain for higher wages.

6.4.2 Change in price

$\hat{P} = \Phi(g^d - g)$

With

$g^d = f_0 + f_1 r$ (assuming $r^e = r$)

The desired investment function, which means that the desired investment rate (g^d) is a positive function of the profit rate (assumed to be equal to the expected rate).

And

$g = s_r r$

The saving function, which is also a positive function of profit rate.

Thus, $\hat{P} = \Phi(g^d - g)$, means that inflation (persistent change in price level: $\hat{P}$) is always the result of excess demand in the goods market, excess demand due to the fact that $g^d > g$, demand related to investment (demand for tools, machinery, equipment…).

This price level change equation captures an important assumption of the neo-keynesian models that inflation is always **"demand-led"**, that is, led by excessive demand in the goods market. Another assumption is the constancy of the capital to full capacity output ratio a_1 (constant technology).

6.4.3 Dynamics of the Model

The equilibrium condition of the model, which will determine growth, real wage and profit rate, is the equality between price change and nominal wage change:

$$\widehat{W} = \widehat{P}$$

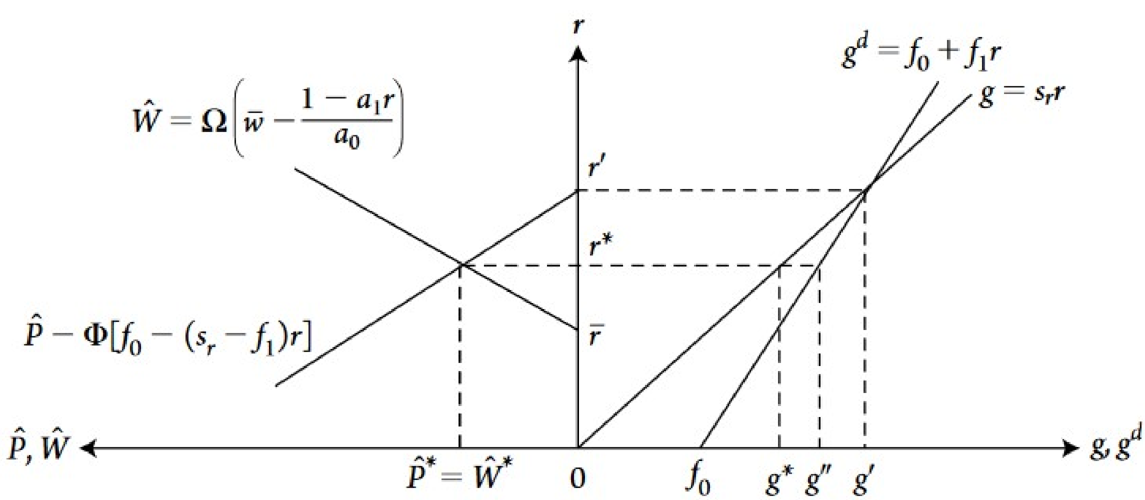


Figure 6.5: Marglin's Classical-Marxian - NeoRobinsonian synthesis

At this equilibrium, the real wage W/P is constant. The other variables behave as such:

- If the target real wage increase $\bar{w}$, equilibrium profit rate decreases, real wage increases, growth rate decreases and equilibrium inflation increases.
- If f_0, firms' confidence in the economy, increases, equilibrium inflation increases, equilibrium profit rate and growth rate also increase and equilibrium real wage decreases.
- If the propensity s_r to save increases, equilibrium profit rate and inflation decrease, but the impact on growth is ambiguous: on the one hand growth is constrained by available savings (and thus if savings increase growth can increase) but on the other hand, growth can also decrease because of the fall in profit rate.

An important contribution of this model is to make explicit the argument about **inflation**, which was only implicit in the previous neo-keynesian models (Robinson, Kaldor…). An crucial point is that the model assumes that **inflation is always driven by demand** (excess demand in the goods market). A critic adressed to this model is that inflation is not only "demand-pull" but can also be "cost-push", that is, driven positively by an increase in firms' markups due to an increase in costs.

Another critic concerns that inflation caused by the difference between $g^d > g$ is not very realistic because it implies that firms will always want to invest at a rate they cannot achieve.

Part V

Neo-Kaleckian Models

7 Kaleckian-Steindl Model

7.1 Preliminary Notes

7.1.1 Biographical notes, authors and sources

Michał Kalecki (1899-1970) was a Polish economist and major figure of heterodox and Post-Keynesian economics. He made important contributions in macroeconomics and political economy, and his work represents a crucial legacy for a lot of contemporary work done in heterodox economics.

The models that will be presented here are related to the macroeconomics of Kalecki. Kalecki (1954) is often considered as the work which laid out the foundations of Kalecki's macroeconomics that will be exposed here.

However, it is important to keep in mind that Kalecki also developed a theory of political business cycles (I talk shortly about this theory here) Kalecki (1943). What will be presented here (based on the manual Blecker and Setterfield (2019)) will be hence just a part of the (many) important contributions of Kalecki in political economy and macroeconomics.

Then, neo-Kaleckian models were developed by Kaleckian economists in the 70s and 80s based on Kalecki's work, but also on the work of Josef Steindl (1912-1993), an Austrian Post-Keynesian economist who was a close collegue of Kalecki. The first neo-Kaleckian model that will be presented here is called by Blecker and Setterfield (2019) the "Kaleckian-Steindl" model and is based on Post-Keynesian writings in the 70s and 80s, for instance Harris (1974) (Donald J. Harris who is by the way the father of Kemala Harris, current vice-president of the United-States) and Asimakopulos (1975).

Until now, almost all the heterodox models summarized until now, the classical-marxian models (CMMs) and the neo-Keynesian models (NKMs), explain that more rapid growth can only be achieve at the expense of a more unequal distribution of income. In other words, the CMMs and NKMs explain that increasing the rate of growth implies more inequality through either lower real wage or lower wage share. Nonetheless, there are two exceptions to this pattern, (1) the Marglin neo-Marxian/neo-Robinsonian synthesis and the classical-marxian model under the natural rate of growth closure.

One major flaw of the CMMs and NKMs is that they either don't incorporate the important role of aggregate demand in the analysis (in the case of the CMMs) or only partially incorporate it (for the NKMs). Why is it important to take aggregate demand into account when one wants to analyze the determinants of economic growth? Before answering this question, let's first remind ourselves what aggregate demand is. The latter can be defined as the **sum of all demand sources for final goods and services in the economy**.

7.1.2 Aggregate Demand

Aggregate demand is often summarized with the following accounting identity:

$$Y^d \equiv C + I + G + (X - M)$$

With Y^d aggregate demand, which depends positively:

- C, private consumption demand (by individuals, not firms nor the government, nor foreigners). C is the sum of all private consumption in a given economy.
- I, investment demand. The latter represents all purchases of capital goods by firms and all new residential investment. It includes mainly the purchase by firms of machinery, tools, raw materials and other equipment. However, residential investment (purchase of new houses) is also considered as an investment in national accounts.
- G, the demand coming from government purchases of goods and services.
- X, the demand coming from purchase by foreigners of national goods and services. It represents all exportation made by the economy. Subtracted by M, which is imported goods and services, we get the trade balance.

Note that in most of the models seen until now, there is no government an no foreign trade, and aggregate demand is thus just the sum of consumption and investment:

$$Y = C + I$$

Why is aggregate demand important? Because any increase in demand gives impetus to economic expansion: the higher the demand for goods and services, the more firms will want to respond by producing more. Demand does not mechanically accommodate to supply, as it is assumed in CMMs and NKMs. The idea that demand can never be a constraint to production is know as *Say's Law*: demand will always accommodate supply because supply creates demand by itself. For instance, if I produce coffee beans, I will either consume it or want to trade it for other goods or services: my production has thus create at the same time my demand. It may sound paradoxical to say that CMMs and NKMs implicitly accepted Say's Law or at least did not put it into question since Marx, Keynes and post/neo-Keynesian economists are famous for their critic of Say's law. Joan Robinson even acknowledged that Marx was in a way an important precursor of Keynes and Keynesian theory because of his critic of Say's law.

Nonetheless, the neo-Kaleckian models presented below and in the next chapter are considered by Blecker and Setterfield (2019) as the very first model to explicitly reject Say's Law and put aggregate demand at the center of the analysis. The (neo)-kaleckian models are thus very important among heterodox models of economic growth, because it the former incorporates the role of aggregate demand and its impact on growth, even in the long run.

7.2 Main characteristics of the model

7.2.1 Capacity rate of utilization

The main difference of the neo-Kaleckian models with the CMMs and NKMs is that the neo-Kaleckian models do not make the assumption that the capacity rate of utilization is fixed, constant, or constant at full level $u = 1$. But what is the rate of capacity utilization already?

The rate of capacity utilization u is the ratio of actual output Y to the full-capacity output Y_k, which is the output level when all capital is used in the economy. The capacity rate can be thus written as

$$u = \frac{Y}{Y_k}$$

If we consider, as the CMMs and NKMs, that $u = 1$, we simply say that $Y = Y_k$. In other words, $u = 1$ means that all capital is used in the production process in the economy. If, for instance, $u = 0.5$, that means that actual output is only half of what it could be if all capital was used in production.

A major characteristics of neo-Kaleckian models is they consider that capacity rate u is flexible and not equal to one: the level of output is thus never at its full capacity level, contrary to the previous models presented in the manual.

7.2.1.1 3 Reasons why u<1

Why do the neo-Kaleckian models have such a conception of the capacity rate? There are three main reasons for which firms do not operate at full capacity (full utilization of capital).

1. *Indivisibilities*

   Firms tend to purchase capital goods (machinery, raw materials, tools…) which can be obtained only in large and discontinuous units, and thus can be operated at less than 100 per cent of their potential.

2. *Building ahead of demand*

   Since firms do not know and cannot know what the demand for their products will be in the future (fundamental uncertainty of the future), they will hold excess capacity (excess capital not used in production) in case if demand rise in the future. If firms did not hold excess capacity and if demand suddenly happened to rise, they would not be able to respond by increasing production.

3. *Entry deterrence*

   Most large firms operate in a non-competitive (great number of competitive firms) framework, in which only a few large oligopolistic firms compete in the market. In this situation, these large firms will hold excess capacity as a weapon in case if new firms (new entrants) would want to enter the market as producers and compete with the established firms. Having excess capacity allows established firms to be able to rise production immediately and thus push price downwards to crush any potential new competitors.

7.2.2 Prices as markups over costs

In most models described until now, none of them had a precise model/equation describing how prices are set by firms. Neo-Kaleckian models have an explicit and precise definition of how prices are set. Recall that in the context of perfect competition, standard economic theory tells that prices are the result of the equilibrium between demand and supply. In the neo-Kaleckian framework, markets are not perfectly competitive and firms have what economics call "market power", that is, the power to influence prices and thus set the latter.

How will firms then set prices in the neo-Kaleckian world? The manual Blecker and Setterfield (2019) presents the following price equation:

$$P = (1 + \tau)Wa_0$$

Which means that a firm will increase price P if it decides to rise its markup rate τ, or if nominal wage increase W (since nominal wage is a cost for the firm, note that here other costs are ignored for simplicity and only labor costs are taken into account), or if $a_0 = \frac{L}{Y}$, the labor/output ratio increases. Here, Y refers to the output produced by the firm and L the amount of labor employed by the firm. The idea that prices are not determined by demand and supply equilibrium, but by markup over costs is called *markup pricing*.

Once the markup pricing equation is defined, it can be shown that the profit share π is a positive (monotonic) function of markup τ:

$$
\begin{aligned}
\pi &= \frac{P - Wa_0}{P} \\
&= \frac{(1+\tau)Wa_0 - Wa_0}{(1+\tau)Wa_0} \\
\pi &= \frac{\tau}{1+\tau}
\end{aligned}
$$

Thus,

$$\pi = \frac{\tau}{1+\tau}$$

The higher the markup τ, the higher the profit share.

What will influence change in the markup rate τ, and thus *increase profit share and inequality*? Kalecki and the manual give five main factors which will influence the markup (a + or - sign is added next to each factor to indicate whether it rises the markup or decreases it):

1. **Industrial concentration** (+)

   The fewer the firms are in competition with each other, the less the market is competitive and the more firms have market power to increase prices through an increase in their markup.

2. **'Overheads' or fixed costs** (+)

   By these overhead and fixed costs, we mean all the costs associated with machinery and equipment, management, maintenance (overhead labor), Research & Development expenses, intellectual property rights costs or debt service expenses. All these costs are taken into account by firms, which want to set price with a markup over these costs. If these costs increase, firms will also want to increase the markup to set a prices bringing enough revenues.

3. **Sales effort** (+)

   When firms operate under an oligopolistic framework (few firms, low competition between firms), adverstising is important to increase the number of consumers. Moreover, adverstising is also useful for 'product differentiation", that is, convincing consumers that the firm's products are different than the other products offered in the market. Consumers would then be more disposed to consume the differentiated product at a higher price. Advertising is thus both a way to increase the number of consumers and a way to increase oligopolistic market power.

4. **Strength of labour unions** (-)

   If workers within a firm have enough bargaining power, they may are able to capture parts of the firms's potential profits. The degree of power workers can have depend on the existence and strength of labor unions: the more labor unions there are and the stronger and more well-organized and powerful they are, they more firms will have to share their value added, and thus decrease their markups.

5. **External competition** (-)

   The more national firms are in competition with the rest of the world, the more competitive pressure they have to lower their price, and thus their markup.

7.2.3 New wage-profit relationship

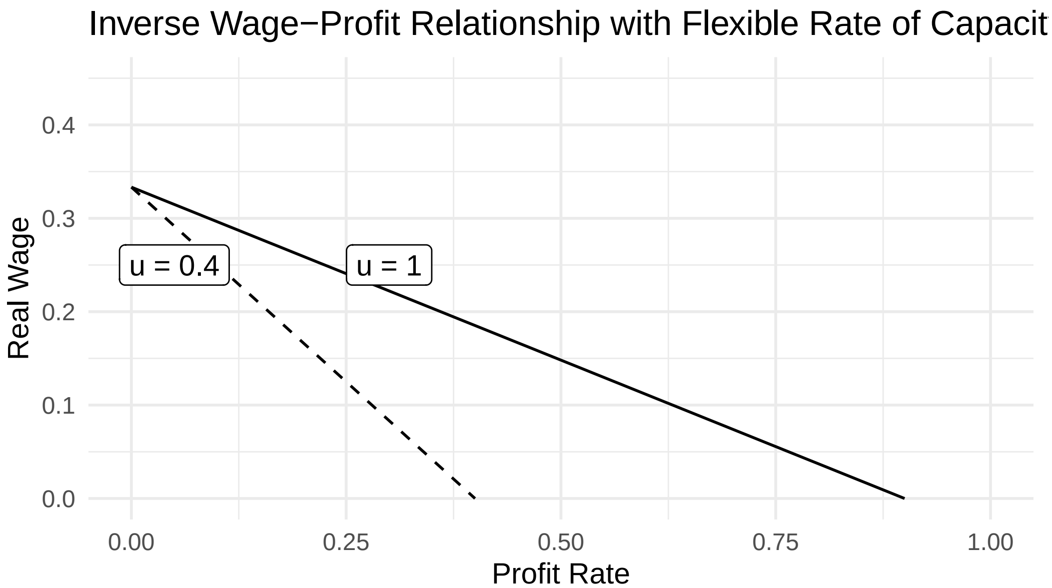
As with the CMMs, we start with the definition of national income under the income approach: national income is the sum of capitalists and workers' income (profits and wages, ignoring depreciation, no government, only one good):

$$PY = WL + rPK$$

Dividing by PY, we get a new inverse wage profit relationship:

$$w = \frac{1}{a_0} - \frac{a_1}{a_0}\frac{r}{u}$$

This equation is almost the same as the one we derived in the classical-marxian models. Since the CMMs assumed a full and constant capacity rate of utilization $u = 1$, it does not appear in their wage-profit equation. However, u appears here in the denominator of the r/u fraction because it is assumed to be inferior to one (below full capacity) and flexible. In the equation above, wage appears to be a positive function of u, but this is misleading since u and profit rate r are endogenous and not independent from each other: the causality usually comes from somewhere else.



A rise in rate of capacity u = Y/Y_k will make the wage−profit curve rotate up to the right, improving the inverse relationship between profits and real wage

The graph above shows the inverse wage-profit relationship when the capacity rate is equal to one (u = 1), as in the CMMs, and when it is inferior to one, as in the Neo-Kaleckian models. **A rise in u allows for both the profit rate and the real wage to rise**.

Recall that real wage w is W/P. By replacing P by the price equation we saw above ($P = (1+\tau)Wa_0$), we can see how the real wage is related to income distribution and inequality:

$$w = \frac{W}{P} = \frac{W}{(1+\tau)Wa_0} = (\frac{1}{1+\tau})\frac{1}{a_0}$$
$$w = \frac{1-\pi}{a_0}$$

To sum up, we have

1. Real wage as a positive function of wage share $\psi = 1 - \pi$, labor productivity $1/a_0$, utilization rate $u = Y/Y_K$ and negative with profit rate r
   - $w = \frac{1-\pi}{a_0}$
   - $w = \frac{1}{a_0} - \frac{a_1}{a_0}\frac{r}{u}$
2. Profit rate as a positive function of profit share π, utilization rate u, and capital productivity $1/a_1$; and profit share π as a positive function of markup τ
   - $r = \frac{\pi u}{a_1}$
   - $\pi = \frac{\tau}{1+\tau}$

7.3 Model Solution and Equilibrium

As usual, the equilibrium values of our variables of interest (growth rate, profit rate, real wage…) will be determined by the equilibrium between savings and investment. To do so, we must first define the saving and investment functions.

7.3.1 Saving function

The saving function is essentially the same as in the NKMs: all savings come out of profits (**no savings out of wages**):

$$\sigma = s_r r$$

Assuming that:

1. All savings come out of profits
2. Closed economy (no foreign trade)
3. No government

7.3.2 Investment function

Unlike the saving function, the neo-Kaleckian investment function has a major difference with NKMs. The difference is that investment is now not only a positive function of actual profits r, but also of the capacity rate of utilization u:

$$g = g_0 + g_1 r + g_2 u$$

Recall that the neo-Robinsonian model considered that investment was a positive function, not of realized profits, but also of expected profits. The neo-Kaleckian model considers that investment is a positive function of actual profits because the latter influences investment decisions by relieving financial and liquidity constraints.

Regarding the capacity rate $u = Y/Y_k$, if this variable increases (meaning that a given firm is utilizing more unused capital, for instance to catch up with a rise in demand), firms will want to invest more to keep excess capacity (recall that firms in this model want to keep a certain level of excess capacity, the reasons are listed at the beginning).

Replacing u using the profit equation $r = \frac{\pi u}{a_1}$, the investment function can be written as a function of profit rate and profit share:

$$g = g_0 + (g_1 + g_2 a_1/\pi)r$$

7.3.3 Saving-Investment Equilibrium

7.3.3.1 Deriving Equilibrium

Equalizing Investment and Savings equation, we get:

$$\sigma = g$$

Replacing σ and g by their respective definition, we get:

$$s_r r = g_0 + g_1 r + g_2 u$$

Then we replace the profit rate r by $\frac{\pi u}{a_1}$:

$$s_r \frac{\pi u}{a_1} = g_0 + g_1 \frac{\pi u}{a_1} + g_2 u$$

Solving for (isolating on the left) the capacity rate u, we get:

$$u^* = \frac{g_0}{(s_r - g_1)(\pi/a_1) - g_2}$$

The equilibrium capacity rate is thus a positive function of g_0 (firms' confidence in the economy), of g_2 (effect of a one unit increase in u on investment), of g_1 (degree of positive response of profit rate on investment)

On the other hand, u^* is negative function of π (profit share), and of a_1 (and thus positive function of labor productivity $1/a_1$).

The equilibrium profit rate is:

$$r^* = \frac{g_0(\pi/a_1)}{(s_r - g_1)(\pi/a_1) - g_2}$$

The latter increase with: g_0, g_1, g_2 and decrease with s_r.

Equilibrium saving and investment are:

$$g^* = \sigma^* = \frac{s_r g_0(\pi/a_1)}{(s_r - g_1)(\pi/a_1) - g_2}$$

Which are thus positive functions of g_0, g_1, g_2

7.3.3.2 Vizualizing Equilibrium

The neo-Kaleckian model can be graphed using the three main equations of the model:

1. Real Wage: $w = \frac{1}{a_0} - \frac{a_1}{a_0}\frac{r}{u}$
2. Savings: $\sigma = s_r r$
3. Investment: $g = g_0 + (g_1 + g_2 a_1/\pi)r$

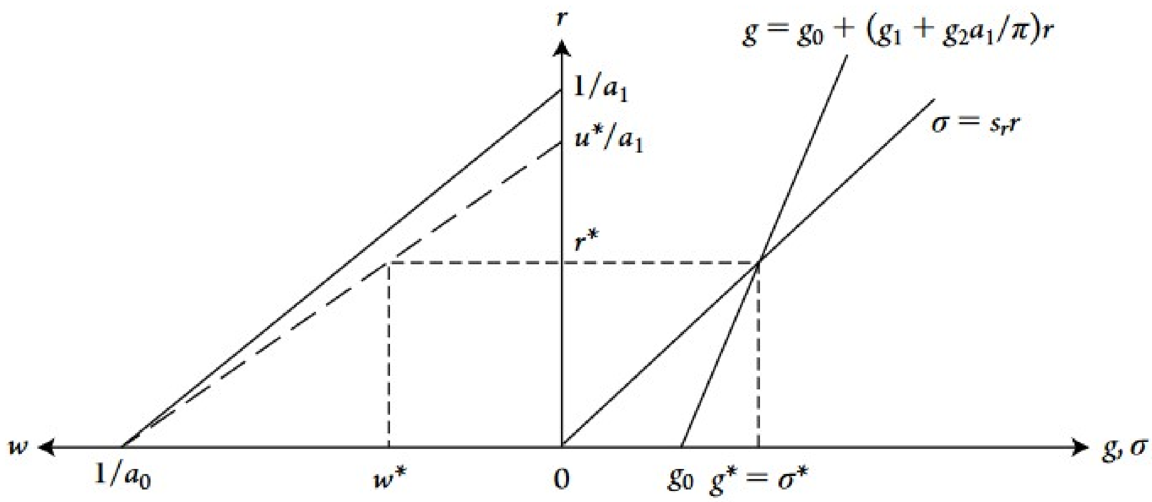


Figure 7.1: Kalecki-Steindl growth model equilibrium (Blecker and Setterfield , 2018: 176)

Some remarks about the graph above and the main equations:

1. The more firms have excess capacity, the more u will be inferior to one, and the more the curve on the left (wage-profit curve) will rotate down to the right (because the intercept on the r axis will go down).
2. Rates of utilization u , profit rate r and real wage w are mutually and simultaneously determined.
3. A rise in profit share π will make the investment curve rotate to the left.
4. A rise or fall in wage and profit share depends on technology and markup.

7.4 Main Results of the Kalecki-Steindl model

The main implication of this Neo-Kaleckian (Kalecki-Steindl) model is that **faster economic growth can be achieved through a more equal distribution of income, rising real**

wage and profit rates. These conclusions of the model are very different from CMMs and NKMs, in which faster growth can only happen with greater inequality.

This stand is sharp contrast with the CMMs and NKMs, which tell that faster growth comes at the expense of real wages, wage share and thus with more inequality. The difference lies in the fact that, in most CMMs and NKMs, the rate of capacity utilization is considered constant at full level $u = 1$, so that a simultaneous increase in profit rates, real wage and growth can happen only if there is technological change (except a Marx-biased technological change), which is also considered exogenous.

This Neo-Kaleckian model thus implies that growth can be *wage-led*, which means that faster growth can be achieved with a more equal distribution of income: higher real wage and wage share allow for faster growth. We arrived to this result mainly by introducing markups in the model and a flexible capacity rate.

But what is the logic behind wage-led growth? Think for example of what would happen if the profit share rises in an economy. A rise in profit share implies a redistribution of income from wages to profits. Since, in this model, 100% of wages are consumed whereas only a fraction of profits are consumed $(1 - s_r)$, a rise in profit share reduces total consumption demand in the economy. A fall in consumption demand will then slow down growth, because there are less outlets for finished products and services to be sold and consumed. Note that this mechanism looks a lot to underconsumption theory expressed by some Marxists.

Keep in mind that it could be possible for a fall consumption (due to a fall in real wage) to be offset by a rise in investment (firms have more income, and thus can invest more). In this model, not only this is not possible, but if the profit share rises (and wage share declines), even investment itself falls because of a fall in utilization rate and realized profits. This is a paradoxical result in which there is an inverse **relationship between profit share and profit rates**. Bhaduri and Marglin (1990) argue that the specification of the investment function, which double counts the capacity rate, is the reason behind this paradox. But logically, this paradox is due to the fact that, when profit share π rises, the negative effect of the decline in consumption demand out of wages is so strong that capacity rate u falls more than profit share π rises, making the profit rate $r = \pi u / a_1$ fall.

The graph below shows the negative effect of rise in the profit share. The investment curve g rotates to the left and the wage-profit curve rotates down to the right:

7.5 Conclusion

This neo-Kaleckian model, also called Kalecki-Steindl model, has strong differences with CMMs and NKMs. First, the **rate of capacity utilization** $u = Y/Y_k$ is **considered flexible**, inferior to one, and has a positive impact on investment. Second, the model defines prices and profit share as positive functions of markup τ, which depends on the five factors listed at the beginning of this chapter. A higher markup leads to higher profit share, lower growth,

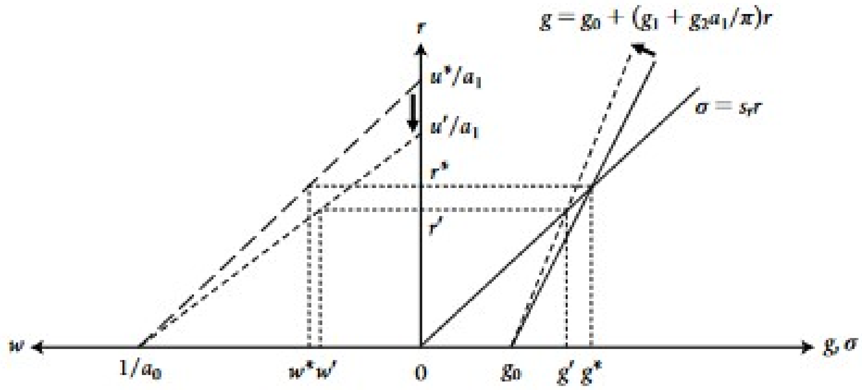


Figure 7.2: Blecker and Setterfield (2018, 180)

real wage, wage share, utilization rate, and higher unemployment. The model introduces two important assumptions/ideas: (1) **flexible capacity** rate and (2) **markup pricing**.

Finally, the Kalecki-Steindl model is a good illustration of the negative effects of the increase in industrial concentration (increase in monopoly, decrease in competition) and that the latter can lead to economic stagnation. Regarding the effect of an increase in propensity to save s_r, or a rise in confidence g_0, the model leads to conclusions similar (but not totally) to NKMs: a rise in s_r (propensity to save out of profits) reduces equilibrium level of capacity rate u^*, profit rate r^*, and investment g^*. An increase in g_0 has the opposite effects. The difference with NKMs is that u is affected in this Kalecki-Steindl model, but is not in the NKMs.

In the next chapter, we will see models which are developments of this basic neo-Kaleckian model. More precisely, we will see that an economy can not always be wage-led, but also profit-led or export-led when we introduce saving propensity out of wages, change the specification of the investment function and introduce foreign trade.

8 Demand Regimes and Open Economy Neo-Kaleckian Models

8.1 Summary of Kalecki-Steindl model

Wa saw in the previous chapter that the Kalecki-Steindl has strong implications for growth. A decrease in markup and profit share leads to higher growth, real wage and profit rates. Such an economy is known in the literature as *wage-led economy*.

However, these rather unusual results, compared with all the models seen until now, are the results of the assumptions of the model, which are:

1. Flexible capacity rate of utilization
2. Markup pricing
3. Specification of the investment function: $g = g_0 + g_r + g_2 u$
4. No Government (no taxes, no government spending)
5. Closed economy (no foreign trade)
6. No savings out of wages (all savings come out of profits)

In this chapter, we will see that some economists came out with different conclusions by relaxing some of the assumptions above. In fact, it will be shown that, by relaxing assumptions 6 and by considering another specification of the investment function, an economy can not only be *wage-led*, but also *profit-led* (when demand resulting from investment drives economic growth). A further complexification of the model is to relax assumption 5 and include foreign trade in the model.

8.1.1 Savings out of Wages

8.1.1.1 Similarities with the Early Kaldorian Model

Assuming, as the Kalecki-Steindl model does, that there is no positive savings out of wages is not a realistic assumptions. In effect, savings out of wages can be very low and most of the time lower than savings out of profits, but they still exist. It it thus important to consider how positive savings out of wages can be included in the model, and see how the model changes. It is also important to take savings out of wages into account, because the latter varies a lot accross countries: there are countries in which savings out of wages are relatively higher than other countries (East Asia for instance). Hence, relaxing this assumption is of great interest. But how is it done?

Remember that we already a model which includes positive savings out of wages: the early Kaldorian model (EKM). (Blecker and Setterfield 2019, 182) introduces the following saving function, which is very similar to the EKM saving function:

$$\sigma = S/K = [s_r \pi + s_w(1-\pi)]\frac{u}{a_1}$$

Note that we assume positive savings out of wages, but with a lower propensity than savings out of profits: $0 < s_w < s_r < 1$. The rational behind this is that wages recipients have a higher propensity to consumer that profits recipients since the latter have a relatively higher income.

Note that the only difference with the EKM savings function is the fact that u appears in this alternative Neo-Kaleckian model, whereas is was assumed constant at full capacity in the EKM.

It is important to keep in mind that s_r and s_w are the saving propensities *out of the types of income received* (here profits and wages), they do not refer to saving propensities of workers and capitalists. A worker can receive both wage and profits revenues, and we assume here that workers will save income out of profits more than income out of wages. That means that **profits are always saved at a higher propensity than wages**.

8.1.1.2 Effects on the model

The main effects of including positive savings out of wages are the following:

- The main variables of the model (capacity, profits, investment rates) are now not necessarily inversely related with the profit share. It can be thus possible that the economy is not wage-led.
- Whether an economy is wage-led or profit-led depends on the gap between the saving propensity out of profits and wages ($s_r - s_w$). The higher the gap (the higher s_r is relatively to s_w), the more likely is the economy (through demand) to be wage-led, because the gains from increasing consumer demand after redistribution of income towards wages will be large. Remember that when $s_w = 0$, the economy would always be wage-led.
- If the gap between s_r, s_w is small (when s_r is closed to s_w), demand is more likely to be profit-led. The logic behind this is that the loss of investment demand after a redistribution of income unfavorable to profits and favorable to wages will outweigh the gain in consumption demand, because the propensity to consume out of wages is relatively low.

- The higher the responsiveness of investment to profits (g_1), the more likely are demand and growth to be profit-led. That means that higher profit share would boost investment so much that the negative effects of reduced consumption out of wages would be surpassed and outweighed.

8.1.2 Modifying the Investment function

8.1.2.1 Flaws of the Kalecki-Steindl Investment function

In the previous chapter, the Kalecki-Steindl investment function was:

$$g = g_0 + g_1 r + g_2 u$$

This specification (was of defining) the investment function as positively related to profit rate of utilization rate was criticized by Marglin and Bhaduri (1991), who argued that the utilization rate is double counted in this specification, imposing an overstated role of demand on investment in the economy. u is double counted because profit rate can be written as $r = \pi u / a_1$:

$$g = g_0 + g_1 \frac{\pi u}{a_1} + g_2 u$$

But the double counting of u is not the only problem. In fact, assuming that g_2 is always positive (meaning that increase in capacity rate will have a positive effect of investment) is also unrealistic, because it implies that when utilization increases and profit share falls simultaneously, firms will always want to invest more[1]. Marglin and Bhaduri (1991) argued that this was not a reasonable assumption and that g_2 could be either positive or negative.

8.1.2.2 Marglin-Badhuri Investment Function

Marglin and Bhaduri (1991) thus proposed a new investment function combining Kaleckian and Robinsonian elements:

$$g = f[r^e(\pi, u)] = h(\pi, u)$$

This modified investment function means that investment depends positively on the capacity rate u and profit share π. This specification assumes that the partial derivatives h_π and h_u are positive. That means that if u stays constant and π increase (or conversely), firms will be

[1] Here's the complete explanation: g_2 is the effect of u on investment with r fixed. Since $r = \frac{\pi u}{a_1}$, assuming $g_2 > 0$ implies that when u rises, r stays constant because profit share π falls in the exact same proportion.

willing to invest more. h_π is interpreted as the profitability effect of investment (the marginal effect of profit share on investment, with u fixed).

Using this new investment function, an economy can be profit-led even if we assume that there is not positive savings out of wages $s_w = 0$ and no international trade.

8.2 Summary

To sum up, here's first an explanation of what is meant by "wage-led" and "profit-led" demand:

- *Wage-led* demand means that aggregate demand $Y = C + I$ (recall that we assume no government and foreign trade, so aggregate demand ignores G and $X - M$) is driven by private consumption C. In other words, when the wage share increases (and profit share decreases), aggregate demand increases through C and this effect surpasses the fall of investment I due to lower profitability. The logic behind wage-led demand is to consider that a redistribution of income towards wages boost private consumption so much that growth, investment, real wage and profit rates increase. Thus, a rise in the wage share boosts the economy through positive effect on demand.
- *Profit-led* demand means that a rise in the profit share boosts investment so much that this effect offsets and even surpasses the fall in private consumption due to a fall in the wage share. Firms are very responsive to the increase in their profit share and are thus willing to invest a lot.

8.3 Open Economy Neo-Kaleckian Model

How would the neo-Kaleckian model change is the assumption of no foreign trade is relaxed? So that aggregate demand now includes $X - M$, the external balance (exports minus imports) in $Y = C + I + (X - M)$.

Taking foreign trade into account changes how labor costs, or rising real wage/wage share can affect aggregate demand and output. A rise in unit labor costs $Wa_0 = WL/Y$ in an economy ("home economy") can potentially lead to a rise in the price of exported goods, for instance if unit labor cost rise in a firm which exports a lot of goods. This rise in the price of exports implies a loss of competitiveness: demand for the exported goods can decrease in the price increase too much relatively with other exporting countries. Home products thus loose competitiveness, and this can have an negative impact on aggregate demand which surpasses the positive impact due to the rise of consumer demand (due to rise in wages). **A redistribution of income favorable to wages can, even if the domestic economy is wage-led, lead to a contraction of aggregate demand and output**.

8.3.1 New Markup Pricing Equation

Relaxing the assumption of no foreign trade also affects how markup pricing is defined. Remember from last chapter that the markup pricing equation was:

$$P = (1+\tau)Wa_0$$

This equation can be rewritten to write markup rate $1+\tau$ as a function of price and unit labor cost:

$$1+\tau = \frac{P}{Wa_0}$$

(Blecker and Setterfield 2019, 190) then rewrite the right part of this equation as follows:

$$1+\tau = \mu \left(\frac{EP_f}{P}\right)^{\eta}$$

With $\mu > 1$ the target or desired markup rate of firms, P_f the foreign price level, P home price level, E nominal exchange rate and η the elasticity of the price–cost margin with respect to the real exchange rate.

This equation basically tells that when real exchange rate rises $\nearrow \left(\frac{EP_f}{P}\right)$, meaning that home goods and services become relatively cheaper (foreign goods become more expensive, there is a real depreciation of home currency, foreign currencies become more expensive), firms will respond by raising their markup to take advantage of increasing competitiveness (make more revenues for each sale).

Conversely, if home products become relatively more expensive (the real exchange rate appreciate, $\searrow \left(\frac{EP_f}{P}\right)$), firms will decrease their markup to try to keep competitiveness (keep selling goods).

By replacing P in the denominator of the equation above by $(1+\tau)Wa_0$, leads to:

$$1+\tau = \mu^{\frac{1}{1+\eta}} \left(\frac{EP_f}{Wa_0}\right)^{\frac{\eta}{1+\eta}}$$

$\frac{EP_f}{Wa_0}$ is the ratio of foreign price to domestic unit labor cost (how much labor costs for each unit of output). This ratio is a measure of firms' international competitiveness in terms of unit labor costs. Thus, international trade changes the model by showing a negative impact of unit labor costs on markup τ.

8.3.2 New Profit Share Equation

The factors affecting profit share π will also change. When there is no international trade, profit share was a positive function of markup τ only:

$$\pi = \frac{\tau}{1+\tau}$$

Once international trade is included, profit share is not only a positive function of (target) markup, but also of the ratio $\frac{EP_f}{Wa_0}$ written as z below:

$$\pi = \pi(\mu_+, z_+)$$

With $\pi_\mu > 0$ and $\pi_z > 0$ (both partial derivatives are positive, meaning that both μ and z have positive impact). Conversely, the wage share $\psi = 1 - \pi$ is negatively related with these two factors.

8.3.3 Modelling the Trade Balance

The next step is to model net exports $(X - M)$. The trade balance is considered a positive function of the real exchange rate $\frac{EP_f}{P}$ and negatively related to the ratio of capacity utilization on the capital-output ratio $\frac{u}{a_1}$:

$$b = b\left(\frac{EP_f}{P}_{(+)}, \frac{u}{a_1}_{(-)}\right)$$

Net exports are positively related with the real exchange rate, because an increase of the latter is synonym of real depreciation and, assuming that the Marshall-Lerner condition is satisfied[2], real depreciation ameliorates the trade balance by increasing exports.

Trade balance b in inversely related to u/a_1 because the increase in the latter is associated with rising demand for imports relative to capital.

[2]The Marshall-Lerner condition refers to the conditions that leads real depreciation to improve net exports (trade balance). A depreciation has basically two effects. On the one hand, it makes home products relatively cheaper in the world market and thus increases exports of domestic products. On the other hand, real depreciation also makes imported goods dearer (for the same quantity of imports). The effect of depreciation on exported quantities is called "volume effect" and the effect on imported price "value effect". For the depreciation to have a positive impact on net exports, the volume effect has to outweigh the value effect. In other words, the increase in exports needs to surpass the increase of the value of imported goods and services.

8.3.4 New Investment Function

Regarding the investment function, the latter becomes:

$$g = h_0 + h_1(\pi - \pi_f) + h_2 \frac{u}{a_1}$$

With $h_1, h_2 > 0$. What changes is that investment now depends positively on the difference between the domestic profit share and the foreign profit share $(\pi - \pi_f)$. The reason is that once we consider competition with foreign countries, the profit share of the domestic country must be greater than profit share in foreign countries. Otherwise, capital would simply move abroad (firms would not invest in the home economy if profits are higher in other parts of the world). $(\pi - \pi_f)$ can be interpreted as a difference in profitability between the domestic economy and the rest of the world.

8.3.5 New Equilibrium Condition

Now that we are considering trade balance, domestic savings σ are not only equal to domestic investment g, but also equal to the trade balance b:

$$\sigma = g + b$$

The variables above could be replaced by their respective definitions, but since it would be tedious, I will simply conclude by summarizing the intuitions of how the main variables of interest interact between them.

8.3.6 Impacts of variations in z and μ

Since the two exogenous variables of this model are the target markup for firms μ and the international competitiveness to labor costs ratio $z = \frac{EP_f}{Wa_0}$, we have to see how their variation impact the other variables of the model to see what are the main results and conclusions of the model.

8.3.6.1 Increase in markup μ

An increase in target markup for firms (for instance after reduced competition) increases (domestic) profit share, but decreases international competitiveness since an increase in target markups increases domestic prices.

A rise in markup μ makes home products more expensive and thus reduces net exports while at the same time increasing the profit share π and reducing the equilibrium rate of capacity, making the economy more likely to be wage-led.

$\nearrow \mu \Rightarrow \searrow b \Rightarrow \searrow u, \nearrow \pi$

8.3.6.2 Increase in international competitiveness z (decrease in wage share)

An increase in z (for instance after a fall in labor costs after a cut in nominal wages) also increases profit share and has a positive impact on international competitiveness.

Furthermore, an increase in z, makes home products relatively cheaper, increases net exports and increases profit share π, thus having a positive impact on u and making profit-led demand more likely to obtain.

$\searrow W \Rightarrow \nearrow z \Rightarrow \nearrow b \Rightarrow \nearrow u, \nearrow \pi$

The main conclusion of the open-economy model is that an economy cannot be classified directly as having wage-led or profit-led demand, because it is the source of the exogenous shocks (changes in either z and μ) on income distribution that will provoke wage-led or profit-led effects.

To sum up:

1. **Changes in the industrial structure affecting** μ (concentration and all the factors affecting markup explained in the previous chapter) **will in general have wage-led effects**.
2. **Changes in international competitiveness relative to labor costs**, z, **will in general have profit-led effects**

It is important to keep in mind that these effects of international trade can still be offset and surpassed by domestic impact of distributional shifts. If the domestic demand is strongly wage-led, an increase in the wage share will still lead to higher growth and capacity rate even if exports decline (assuming that international competitive effects are relatively weak). This would be the case, for instance, of any country which is rather closed to foreign trade or has relatively low level of foreign trade with other countries.

Similarly, if any given economy is strongly profit-led, then a rise in markup μ can still have a positive impact of utilization rate and growth even though there are losses on the international trade side.

8.3.7 Open Economy neo-Kaleckian Model and Currency Depreciation

This neo-Kaleckian open economy model also has strong implication for foreign trade policy (currency depreciation).

A depreciation makes z rise. If the domestic economy shows profit-led response to such a shock (meaning that exports increase a lot and outweigh the loss in consumption demand from decreased purchasing power of households), the depreciation is expansionary.

On the other hand, if the economy shows a wage-led response, the depreciation will not be expansionary. The reason is that depreciation reduces domestic purchasing power of households and if domestic demand is strongly wage-led, depreciation will not rise exports enough to compensate the loss in domestic consumer demand and will have negative effects on growth.

Finally, a depreciation, rise in z, will always rise profit share and thus make the distribution of income more unequal. In addition, if the economy has wage-led demand, the depreciation is likely to be contractionary.

Part VI

Extended Heterodox Models: Distributional Conflicts and Cycles

9 Distributional Conflict, Aggregate Demand, Neo-Goodwin Cycles

9.1 Preliminary Notes

9.1.1 Importance and Motivations for Distributional Conflict Models

Neo-Keynesian and neo-Kaleckian seen in the previous chapters are key models within heterodox macroeconomics. However, all these models consider important variables as exogenous. Neo-Keynesian models typically assume a given nominal wage and the neo-Kaleckian models generally assume an exogenous markup rate (except open-economy models).

A major drawback of these two types of model is that they do not explicitly give an explanation of inflation arising from distributional conflict. The only exception is the Marglin's synthesis we saw in the neo-Keynesian models part.

Developing models which include class conflict between workers and capitalists over the distribution of national income is crucial in heterodox economics, because one characteristic common to all heterodox schools (Marxian, Kalecian, Keynesian...) is that they all recognized that capitalists economies are marked by class conflict over the distribution of total income.

We will see that the outcome of distributive conflict models is the derivation of the **distributive curve** (DC), which is an important result of post-Keynesian/heterodox macroeconomics. In simple terms, the DC describes the relationship and dynamics between aggregate demand (measure through capacity rate u) and inequality (measured through wage share ψ). If the DC is positive, higher aggregate demand and growth lead to higher wage share because increase in the former redistributes income to wages (thus a positive DC implies that workers have strong bargaining power). Conversely, a negative DC means that as output and aggregate demand increase, the wage share decreases. We will see that a positive DC corresponds to a **profit-squeeze** effect of growth on distribution and a negative DC a **wage-squeeze** effect.

9.2 Basic Distributional Conflict Model

A very simple distributional model assumes that capitalists and workers both fight to achieve given objectives. On the one hand, workers want to reach and negotiate a target real wage w_w, while they get their actual real wage w. On the other hand, firms want to reach a given target markup rate τ_f, which corresponds to an implicit target real wage for firms w_f. But let's first see how nominal wage changes according to change in target real wage for workers.

9.2.1 Change in Nominal Wage $\hat{W}$

When the discrepancy between target real wage and the actual real wage $w_w - w$ is high, workers are willing negotiate higher nominal wage wage to reduce this difference.

The degree to which workers will be able to rise their nominal wage depends on many institutional factors such as the strength of labor unions, labor market regulations, unemployment rate and social norms. All these factors will affect the target real wage w_w, while the degree to which the discrepancy will pass through higher nominal wage depends on a coefficient, ϕ, which can be interpreted as the speed of adjustment of nominal wage:

$$\hat{W} = \phi(w_w - w)$$

9.2.2 Change in Price $\hat{P}$

On the price side, change in price level will be a positive function of the difference between actual real wage and target real wage for firms $w - w_f$. The higher this difference, the more firms will raise their price depending on the price adjustment speed factor θ, which depends on the monopoly power of the firms and antitrust regulation:

$$\hat{P} = \theta(w - w_f)$$

9.2.3 Effects of Labor Productivity, Target Wage Share instead of Real Wage

However, this simple model omits important factors such as labor productivity. An increase in labor productivity $Q = 1/a_0$ decreases the wage share $\psi = \frac{W}{P}a_0$. Hence, when labor productivity rises, workers may want to negotiate higher nominal wage so that the wage share is held constant. On the firms side, increase in labor productivity allow them to reduce price increase, because labor productivity gains reduce (unit labor) costs.

Moreover, workers and firms may rather target a given wage share and profit share instead of real wage (and markup rate).

Including labor productivity changes the simple model as such:

$$\hat{W} = \phi(\psi_w - \psi) + \beta q + \alpha\hat{P}$$

Note that I also include here $\alpha\hat{P}$, which reflects to what degree nominal wage are indexed to inflation (no inflation would be the $\alpha = 0$ case, perfect indexation, $\alpha = 1$).

$$\hat{P} = \theta(\psi - \psi_f) - \gamma q$$

With $q = Y/L = 1/a_0$ labor productivity, ψ_w the target wage share of workers and ψ_f the target wage share for firms.

9.3 The Distributive Curve (DC)

Some further steps are required to derive the distributive curve from the model above.

9.3.1 Modeling Target Wage Share for Firms and Workers as Functions of u

The next step is to model changes in target wage share for firms and workers.

A rise in the capacity rate of utilization $u = Y/Y_k$ can be considered as synonymous of increasing employment rate. Moreover, as employment rate increases, workers are assumed to be more able to negotiate higher wage share, mainly because lower unemployment implies stronger bargaining power for workers. Hence, the model assumes that ψ_w is a positive function of utilization rate u:

$$\psi_w = \lambda_0 + \lambda_1 u$$

In addition, the target profit share $1 - \psi_f$ can also be written as a function of capacity rate:

$$1 - \psi_f = \eta_0 + \eta_1 u$$

Note that η_1 can be either positive or negative. On the one hand, firms could target higher markup rate, hence profit share, because they would try to raise profits when sales are reduced during a recession. On the other hand, during expansion (rise in u), firms could raise prices without fearing to lose customers.

Now that target wage share for firms and workers are modeled as functions of u, they can be substituted in the nominal wage and price change equations. Thus,

$$\hat{W} = \phi(\psi_w - \psi) + \beta q + \alpha\hat{P}$$
$$\hat{P} = \theta(\psi - \psi_f) - \gamma q$$

become

$$\hat{W} = \phi(\lambda_0 + \lambda_1 u - \psi) + \beta q + \alpha \hat{P}$$
$$\hat{P} = \theta(\psi - 1 + \eta_0 + \eta_1 u)) - \gamma q$$

9.3.2 Modeling productivity as a Function of u, ψ, y

The final step to complete the model and derive the DC curve is to model labor productivity growth $q = \hat{Y} - \hat{L}$ as function of capacity rate $u = Y/Y_k$.

However, q also depends on other variables such as the wage share or output growth, here is a summary of the variables affecting labor productivity growth:

- **Capacity utilization** u (+):

  In the short run, labor productivity growth is positively associated with output and utilization because of overhead labor. Overhead labor refers to managers, engineers and all the workers who are not easily fired during a recession. Thus, in a short run recession (when output and u fall), L does not fall enough and thus Y falls more than L, making the labor productivity ratio fall $Q = \frac{Y}{L}$. Conversely, during short run expansion (rise of output and utilization), labor productivity increases because hiring is less than proportional to output increase (Y increase more than L).

- **Wage Share** ψ (+):

  A higher wage share can induce firms to invest more in labor-saving equipment. The reason is that by investing in labor-saving equipment, firms can decrease workers' bargaining power. Hence, when labor costs are high, labor productivity is expected to rise.

- **Output Growth** y (+)

  Verdoorn and Kaldor showed that growth of output and labor productivity are positively associated and even positively influence each other. Labor productivity growth increases output growth, because more Y is produced for the same quantity of labor, but this rise in output growth will in return also have a positive impact on q.

To sum up, labor productivity growth can be written as a linear function of u and ψ:

$$q = q_0 + q_1 u + q_2 \psi$$

9.3.3 Equilibrium and Distributional Conflict curve

We have thus the following wage and price inflation functions:

$$\hat{W} = \phi(\lambda_0 + \lambda_1 u - \psi) + \beta(q_0 + q_1 u + q_2 \psi) + \alpha \hat{P}$$

$$\hat{P} = \theta(\psi - 1 + \eta_0 + \eta_1 u)) - \gamma(q_0 + q_1 u + q_2 \psi)$$

To derive the DC, we equate $\hat{P} = \hat{W}$ and solve for the equilibrium wage share ψ, which gives:

$$\psi = \frac{\phi\lambda_0 + \theta(1-\alpha)(1-\eta_0) - q_0 + u[\phi\lambda_1 - \theta\eta_1(1-\alpha) - q_1]}{\phi + \theta(1-\alpha) + q_2}$$

This equation seems complicated, with a lot of different variables. However, it is only the sign of

$$u[\phi\lambda_1 - \theta\eta_1(1-\alpha) - q_1]$$

which truly is of interest here, because it will determine whether the utilization u will have a positive impact of the wage share or not.

Remember that:

- ϕ is the speed of adjustment of nominal wages when workers bargain for higher wage share.
- λ_1 is the positive marginal impact of u on target wage share ψ_w for workers.
  - Hence, the product $\phi\lambda_1$ can be interpreted as a set of institutional factors which reinforce workers' bargaining power. $\phi\lambda_1$ reflects the bargaining power of workers.

But this product is subtracted by:

- $\theta\eta_1$, which is the degree to which firms raise price during a short term recession (η_1) multiplied by the speed of adjustment of price to target wage share for firms. This product is also multiplied by the inverse of the degree of indexation (of nominal wage to inflation). The higher are nominal wages indexed to inflation, the more likely the final sign of the bracket will be positive.
  - **Hence,** $\theta\eta_1$ reflects the monopoly power of firms

- q_1, which is the marginal impact of utilization on labor productivity growth. The higher is q_1, the more a rise in utilization makes labor productivity increase and since the latter has a negative impact on the wage share, the higher is q_1, the more likely a rise in u will have a negative impact on the wage share.

To sum up, the DC can be either positive or negative depending on the final sign of the bracket above. The more is the institutional framework favorable to workers (wage indexation, strength of labor union, labor market legislation…), the more likely is the DC to be positive (and conversely).

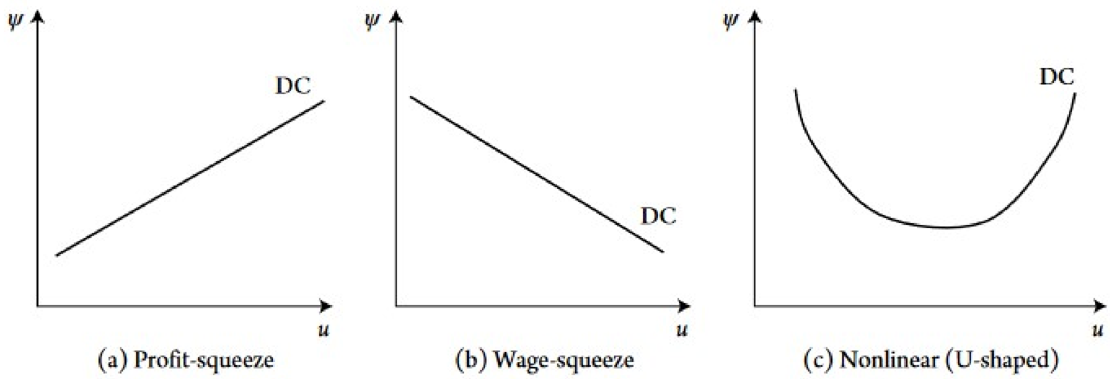


Figure 9.1: The different types of DC, Blecker and Setterfield (2019, 222)

As explained in the introduction, there are two types of DC (we ignore the third type shown in the illustration above):

- **Profit-squeeze** DC:

  When the impact of higher utilization and employment of wage increase is superior than the effect on price and productivity growth, an increase in utilization will increase the wage share. This positive relationship between wage share and utilization is called "profit-squeeze" because an increase in output and u make redistribute income to wages and thus decreases the profit share.

- **Wage-squeeze** DC:

  When the impact of higher utilization, output and employment on productivity growth and price increase is superior to the rise in wages, the DC is called "wage-squeeze" because there is a negative relationship (impact) of output and utilization on the wage share. The more output and utilization increase, the more is total income more favorably redistributed to profits and thus the wage share decline and the profit share increase.

9.4 Combining Distributional Curve and Demand Regimes

In the last chapter on neo-Kaleckian model, we saw that the demand regime (how utilization and output are related to the wage share and profit share) could be either:

- **Profit-led**

  When an increase in the wage share has a negative impact on utilization and output, because aggregate demand is driven mainly by investment and/or exports.

- **Wage-led**

  When an increase in the wage share has a positive impact on utilization and output, because aggregate demand is mainly driven by private domestic consumption.

We now saw that an economy is not only characterized by either wage-led or profit-led demand, but that is has also either a wage-squeeze or profit-squeeze DC. There are thus many combinations possible: an economy can have a profit-led demand with a wage-squeeze DC, a wage-led demand and a wage-squeeze DC and so on.

However, how these combinations can be interpreted depends on some assumptions. There are two possible assumptions:

1. Demand and output (utilization) adjust more rapidly than distribution (nominal wages and prices).
2. Demand and output, and prices, wages and distribution have the same adjustment speed.

9.4.1 1. Demand adjusts more rapidly

9.4.1.1 Wage-led demand

In that case, the economy is always on the AD curve in the short run and the DC curve only puts pressure on the wage share and utilization at the medium and long run. At any point below the DC curve, there is an upward pressure on the wage share and a downwards pressure at any point above it.

The illustration above shows the possible scenarios in the case of a wage-led demand regime (upward slopping AD curve).

But what does it actually mean to have, for instance, a wage-led demand regime with a wage-squeeze distributive curve (graph a)? Wage-led demand regime means that, as the wage share increase, utilization and output rise as well. But since distribution is wage-squeeze, as output and utilization increase distributional dynamics which are unfavorable to workers and their wage share will decrease the wage share and increase the profit share. Therefore, at low level of utilization (any point on the left on the graph, at low u), the wage share is also relatively

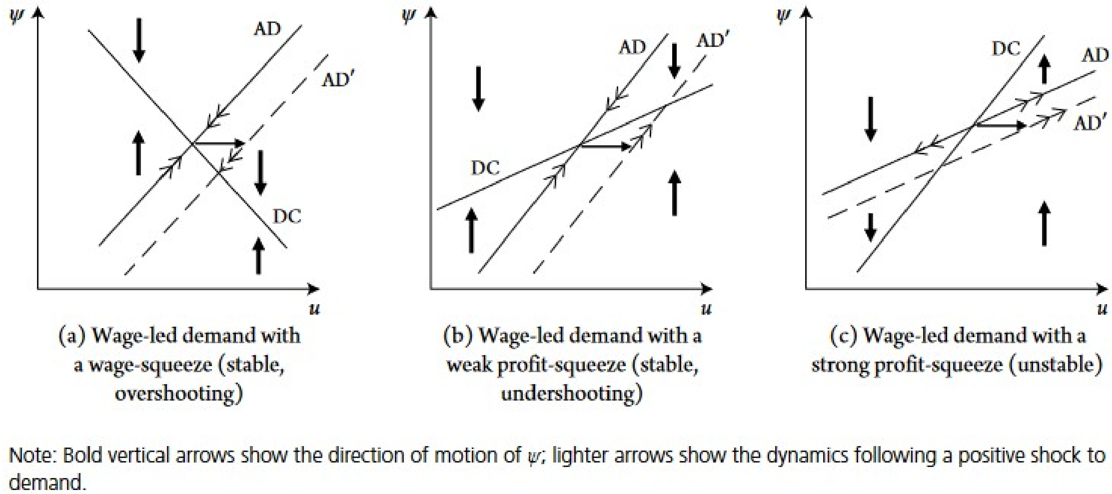


Figure 9.2: Blecker and Setterfield (2019, 227)

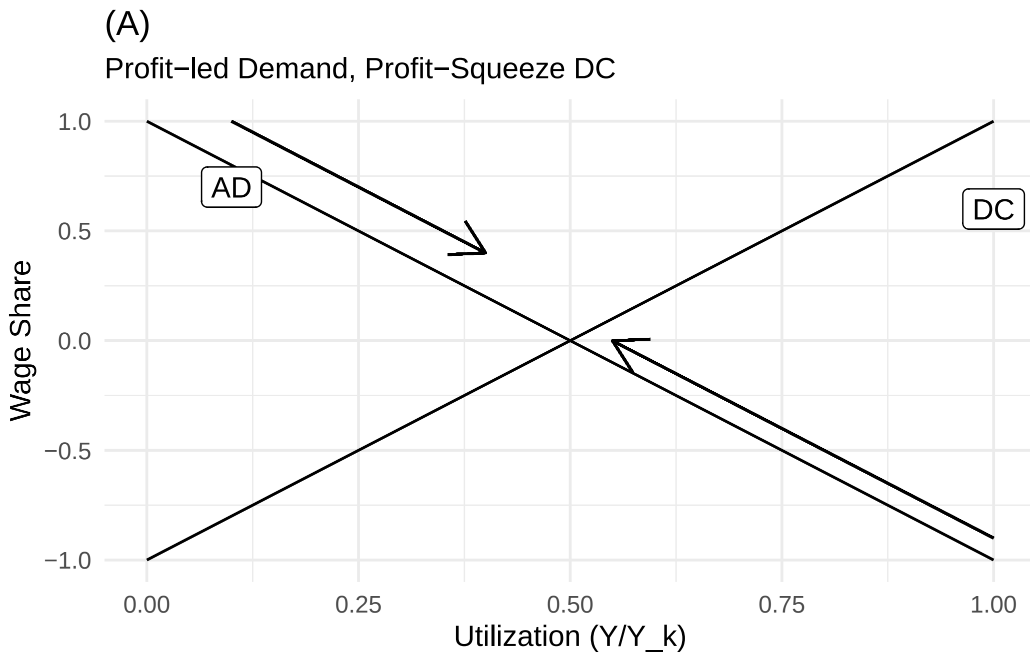
low. Subsequently, output, utilization and the wage share will gradually increase (because either increase in wage share or utilization will have a positive feedback) on each other until the AD curve crosses the DC curve.

If the DC and demand curves are positive, we have both wage-led demand and profit-squeeze distribution. If the DC curve has a slower slope than AD curve, we are in scenario (b), if it is higher, it corresponds to scenario (c). Having wage-led demand and profit-squeeze distribution means that higher wage share will have a positive impact on utilization which, in return, will redistribute even more of total income to the wage share, which in return will increase utilization even further and so on. The difference between scenario b and c is that in c the slope of the DC curve is higher, meaning that the effect of u on distribution is very favorable to workers and their wage share. In that case, it is possible that the positive interaction between increasing u and the wage share never stops (this is why there are arrows pointing away from equilibrium in graph c).

9.4.1.2 Profit-led demand

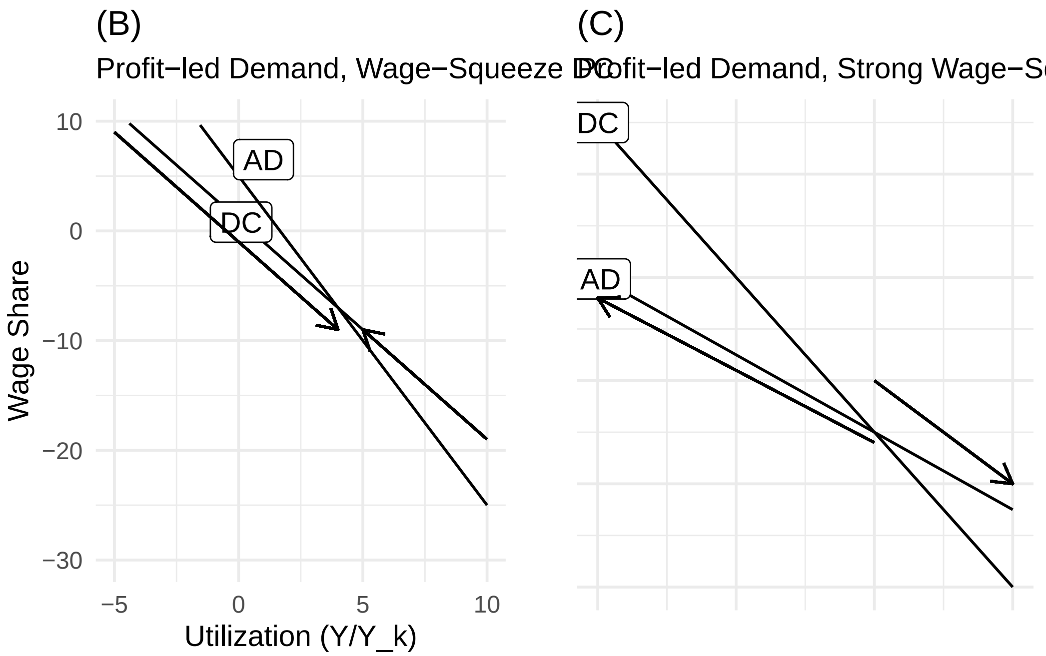
How do the three scenarios above change is demand is profit-led? When demand is profit-led, the AD curve becomes negative: the higher the wage share, the lower the capacity rate.

As with wage-led, there are three possible scenarios:



- (A): In the case of profit-led demand with profit-squeeze distribution, the situation is stable. When the wage share is high, utilization and output will be low (since demand is profit-led, high wage share depress demand and thus output). At this low level of utilization and high level of wage share, distribution is not in favor of workers (low output implies low employment and thus low bargaining power): nominal wages will slowly decrease, this decrease will in return have a positive impact on utilization and will continue until utilization rises enough so that workers have regain enough bargaining power to stop the fall in their nominal wage. If utilization is initially very high, workers have a lot of bargaining power to bargain a high share of national income. However, a high wage share has a negative impact on utilization (firms would not want to invest a this level) and demand will be depressed: utilization, demand, output and employment fall until the wage share falls enough so that demand stabilizes at equilibrium

If distribution is wage-squeeze, there are two scenario depending on whether the wage-squeeze DC is strong or not:



- (B) The situation in which demand is profit-led and distribution weakly wage-squeeze leads to a stable equilibrium. If utilization is low, the wage share is high, but workers would not be able to keep such a high share of national income, because any increase in utilization, demand and output will redistribute more share to profits, which will stimulate demand further and so on. The wage share gradually decreases, which stimulate investment, increase utilization, output and employment until workers can stop the decrease in their wage share. If we start at high level of utilization, the wage share is low but distribution is favorable for workers. The latter can negotiate higher wages and capture higher share of national income until capacity decreases enough so that workers loose this bargaining advantage and stop capturing higher share at equilibrium.

- (C) In the case of a strong wage-squeeze, the situation is unstable and wage share and output can move perpetually away from equilibrium. For low level of utilization, the wage share is high. As output and demand decreases because of high wage share, workers are able to capture even more share of national income, which depresses demand even further, redistributes even more income to the wage share and so on. Conversely, strong demand dynamics lead to lower wage share, which stimulate demand and growth even further, redistribute income even more to profit share and so on.

9.4.2 2. Demand and Distribution (nominal wage and price) have similar adjustment speed

What happens when demand and distribution adjust with similar speed? After specifying the change of aggregate demand $\hat{u}$ and distribution $\hat{\psi}$, we will see that the model implies can, under some specific conditions, describe business cycles dynamics.

9.4.2.1 Change in wage share $\hat{psi}$

Change in the wage share is a positive function of nominal wage and a negative function of productivity and price:

$$\hat{\psi} = \hat{W} - q - \hat{P}$$

Using the definition of the rate of change in the wage share, $\hat{\psi} = \dot{\psi}/\psi$ and rewriting the function in the log form, we get:

$$\hat{\psi} = \omega_0 + \omega_1 ln(u) + \omega_2 ln(\psi)$$

With:

- $\omega_0 = \phi\lambda_0 + (1-\alpha)\theta(1-\eta_0) - q_0$
- $\omega_1 = \phi\lambda_1 - (1-\alpha)\eta_1 - q_1$

  Which corresponds to whether increase in u whether the response of wages to demand pressures dominates the responses of prices and productivity
- $\omega_2 = -[\phi + (1-\alpha)\theta + q_2]$

  Which is assumed to be negative $\omega_2 < 0$, implying that increase in the wage share decreases its own rate of increase. That means that the more the wage share increases, the less workers will bargain for even further increase in the wage share.

9.4.2.2 Dynamic Aggregate Demand Curve

Change in aggregate demand can be describe as:

$$\hat{u} = \hat{Y} - \hat{Y}_K$$

With:

$$\hat{Y} = d_0 + d_1 u + d_2 \psi$$

And

$$\hat{Y}_K = b_0 + b_1 u + b_2 \psi$$

d_0 represents autonomous and exogenous determinants of aggregate demand (government expenditures, exports, business and consumer confidence…)., d_1 is assumed to be negative and d_2 will determine whether demand is profit-led (if negative) or wage-led (if positive).

b_1 (effect of u on investment) is assumed positive, b_2 can be assumed either negative or positive.

In log form, the equation is:

$$\hat{u} = v_0 + v_1 ln(u) + v_2 ln(\psi)$$

With $v_i = d_i - b_i, i = (1, 2, 3)$.

We have thus two simultaneous equations:

$$\hat{u} = v_0 + v_1 ln(u) + v_2 ln(\psi)$$

$$\hat{\psi} = \omega_0 + \omega_1 ln(u) + \omega_2 ln(\psi)$$

If we set $\hat{u} = 0$ and $\widehat{psi} = 0$, we get the nullcline curves, and then rewrite the two equations to get the wage share as a function of utilization:

$$ln(\psi) = -\frac{v_0}{v_2} - \frac{v_1}{v_2} ln(u)$$

$$ln(\psi) = -\frac{\omega_0}{\omega_2} - \frac{\omega_1}{\omega_2} ln(u)$$

v_1 is assumed negative, so that the AD curve will be positive if $v_2 > 0$ (wage led demand) and negative if $v_2 < 0$ (profit led demand).

Since ω_2 is also assumed to be negative, distribution curve will be wage squeeze if $\omega_1 < 0$ and profit squeeze if $\omega_1 > 0$.

Depending on the signs of v_2 and ω_1, we can get many possible combinations and results, Blecker and Setterfield present the following cases in the case of profit led demand:

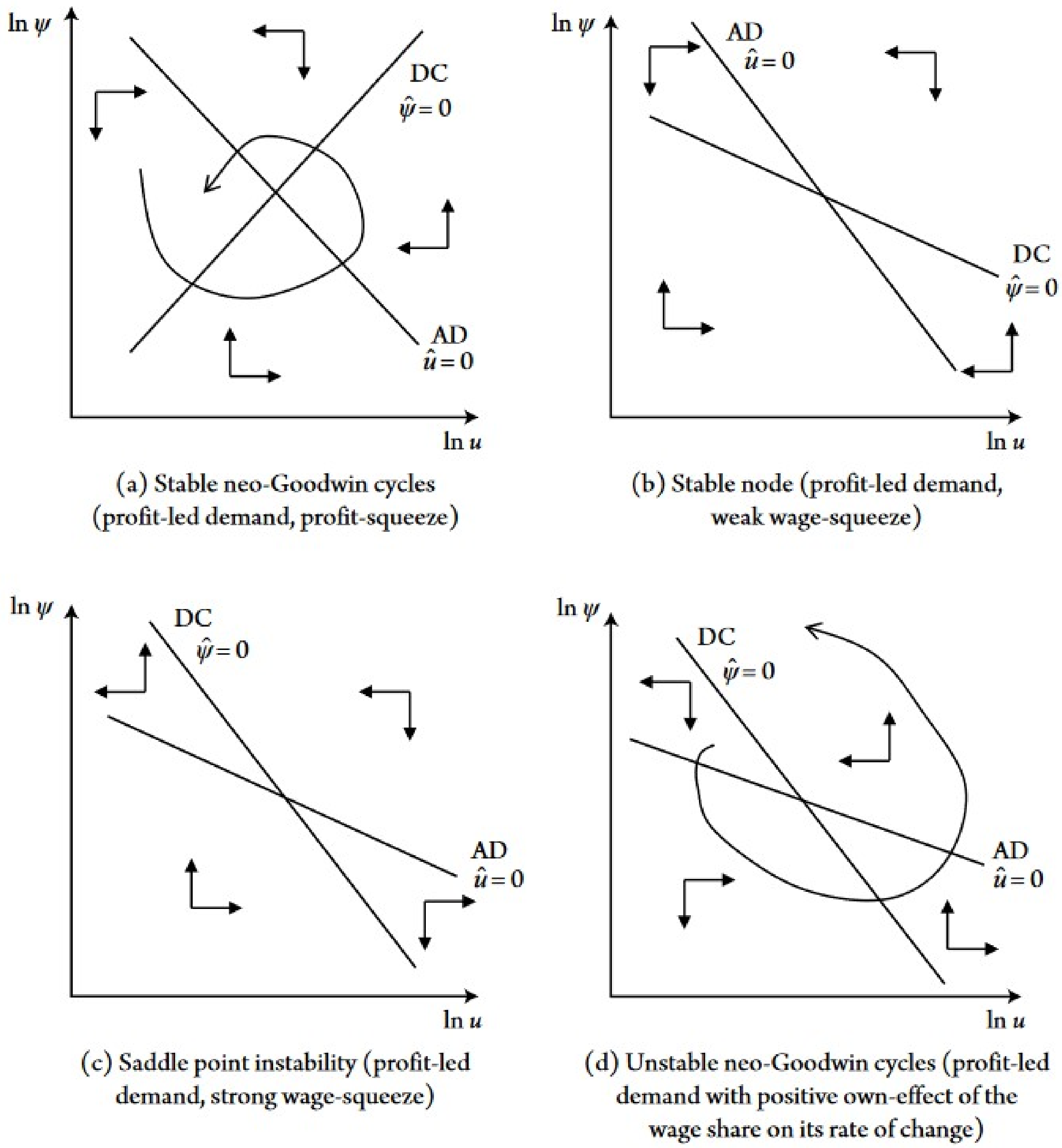


Figure 9.3: Blecker and Setterfield (2019, 233)

If demand if profit led and distribution is profit squeeze, we are in the case of stable "neo-Goodwin" business cycles. The more the economy grows (moving gradually on the right on the u axis), the more the wage share increases, the more the wage share will increase (growth redistributes bargaining power and income to workers). However, increasing wage share will gradually depress demand because declining profit share will eventually depress investment demand and growth. The decline in growth and demand will in return decrease the wage share until the latter decreases enough so that firms begin to invest again, which will increase demand, output and wage share. The increase in wage share will gradually depress demand through, again, decline in investment and so on… This cycle is "stable" because as cycles unfold, we get closer to equilibrium. Conversely, the graph down on the right shows unstable neo-Goodwin cycles (when $\omega_2 > 0$, meaning that when the wage share increase, workers seek to bargain even higher wage share).

Part VII

Kaldorian models: Export-led Growth and Balance of Payment Constraint

10 Export-led Growth

10.1 Introduction

Kaldorian growth theory represents an important branch of heterodox macroeconomics. Within Kaldorian theory, two distinct models were developed by Kaldorians. Unlike the models seen until, with the exception of the open-economy neo-Kaleckian model, Kaldor and Kaldorians developed models of demand-driven growth based on the positive effects of export demand for growth. Furthermore, Kaldorian theory is based on a generalization of stylized facts, empirical relationships between economic variables which were found during his time. The most famous example of these stylized facts is *Verdoorn law*, which is a law based on an empirical correlation between manufacturing output and labor productivity growth. Therefore, the Kaldorian story of export-led growth can be briefly and roughly summarized as such:

- Aggregate demand is what drives economic growth whether it be in the short or long run. Demand for exports (demand by other countries/regions for domestic products) is a crucial source for aggregate demand. Additionally, there is a positive interactive relationship between manufacturing output growth and labor productivity growth. The latter has also, ceteris paribus, a positive effect on exports since higher productivity reduces the price of exported goods and thus increases international competitiveness of domestic goods. Labor productivity, exports and manufacturing output growth have thus positive cumulative interactions leading to sustain growth process. For instance, an increase in labor productivity will increase exports, which will increase manufacturing output, which will in return increase labor productivity, increase exports even further and a virtuous and cumulative cycle of growth is launched. Note that the impetus of this growth mechanism can be launched by any of the three factors (rise in productivity, manufacturing output or exports after a currency depreciation).

This short but essential Kaldorian story of export-led cumulative causation growth (ELCC) is based on the following laws

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