

National Research University Higher School of Economics

Centre for the History and Methodology of Economic Science

**History of Economic Theory and Policy of the 20th
century (Online course)**

Theoretical and methodological developments
in the neoclassical approach: capital,
expectations, equilibrium

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Overview

1. Neoclassical theory: Wicksell (1934) and Walras (1900)
2. The problem of capital.
3. What the Cambridge controversies of the 1950s-1960s unveiled
4. A new phase and transformation of the neoclassical approach: Neo-walrasian models of intertemporal and temporary general equilibrium (Arrow-Debreu models, Hicks, etc)
5. Methodological problems.
6. New perspectives in the neoclassical theory?

1. Neoclassical theory: Wicksell (1934) and Walras (1900)

Both authors developed general equilibrium models: production (and production of capital goods), consumption, distribution and (re)investment are determined: i.e, output and prices and distributive variables.

Difference: treatment of capital

2. Problem of capital: Wicksell (1934) conceived of capital in value terms.

No aggregate production function.

Heterogeneous capital goods endogenously determined.

Yet, capital is in value among the *data* of the theory.

“Capital includes the raw materials and other commodities which must be saved-up. (...) This, of course, is **the commonly accepted sense of the term** (...) all these [different capital goods] have **only one quality in common**, namely that **they represent certain quantities of exchangeable value** so that they may be regarded as a **single sum of value**, a certain amount of the medium of exchange, money.”

(Wicksell, 1901[1934] pp.144-5)

However Wicksell did not limit analysis only to count equations and unknowns but he took the long view of the working of the equilibrium model.

As Wicksell wanted to determine a long period equilibrium, an *inverse* relationship between the *rate of interest* and *Demand for capital* should be derived, despite the illegitimacy of conceiving of capital in value among the data of theory (supply side).

Is that possible?

On the grounds of the *principle of factor substitution* Wicksell as well as many of his contemporaries believed in the inverse relationship between interest rate and demand for capital.

“Such an increase [in the capital available in the economy] must itself, apart from simultaneous technical inventions, reduce the marginal productivity of saved up resources and, at the same time, increase the marginal productivity of current resources.” (Wicksell, 1934, p. 162)

Capital as a *single magnitude in value terms* allows the determination of the Uniform Rate of interest (profits) on the capital goods' costs, while the physical form of the capital goods is endogenously determined by the general equilibrium.

The adjustment of the physical stock of capital as a result of the tendency (force) towards uniformity of the interest rate on the supply prices of the several capital goods.

The uniformity of the rate of interest guarantees a long period equilibrium.

Persistence of variables.

Gravitation centres of empirical variables.

Theory and evidence.

Yet capital must be taken in value terms among data.

“The actual value at any time, the market value as it is often called, is often more influenced by passing events, and by causes whose action is fitful and short lived, than by those which work persistently. But in long periods these fitful and irregular causes in large measure efface one another’s influence so that in the long run persistent causes dominate value completely.”

(Marshall, 1920[1959], p. 291)

2. Walras (1900) conceived of capital in physical terms among the data.

Contradiction with capital goods endogenously determined.

His treatment of capital prevents a uniform rate of interest (profits) on the capital goods.

Yet Walras shared with his fellow neoclassical economists the traditional concept of a long period equilibrium, for which a uniform rate is a necessary condition.

“It never happens in the real world that the selling price of any given product is absolutely equal to the cost of the productive services that enter in to that product, or that the effective demand and supply of services or products are absolutely equal. Yet equilibrium is the normal state, in the sense that it is the state towards which things spontaneously tend under a régime of free competition in exchange and in production.” (Walras 1900 [1954], pp. 224-5)

It is for this apparent contradiction between theory and method that actually Walras did not enjoy much influence among economists, at least until the 1930s – 1940s (Hicks, 1939).

Influence of Walras increased chiefly after the 1940s and in particular in the 1960s-1970s with the so-called Neo-walrasian models of Intertemporal and Temporary General Equilibrium (Arrow-Debreu, Hahn, Bliss, Hicks, Malinvaud, etc).

Before analysing these models let us see some results of the Cambridge capital theory controversies

3. What the Cambridge controversies of the 1950s-1960s unveiled

The problem is not actually to take capital in value as data (this is evident, and authors such as Wicksell were aware of that).

The issue is how to found the construction of downward sloping demand functions for factors of production (capital among them)

$$p_a = 1 = l_a w + c_a p_c (1+r)$$

$$p_c = l_c w + c_c p_c (1+r)$$

Wage function

$$w = \frac{1 - c_c (1+r)}{[l_a + (l_c c_a - l_a c_c)(1+r)]}$$

that is

$$w = \frac{1 - c_c (1+r)}{l_a + D(1+r)}$$

where

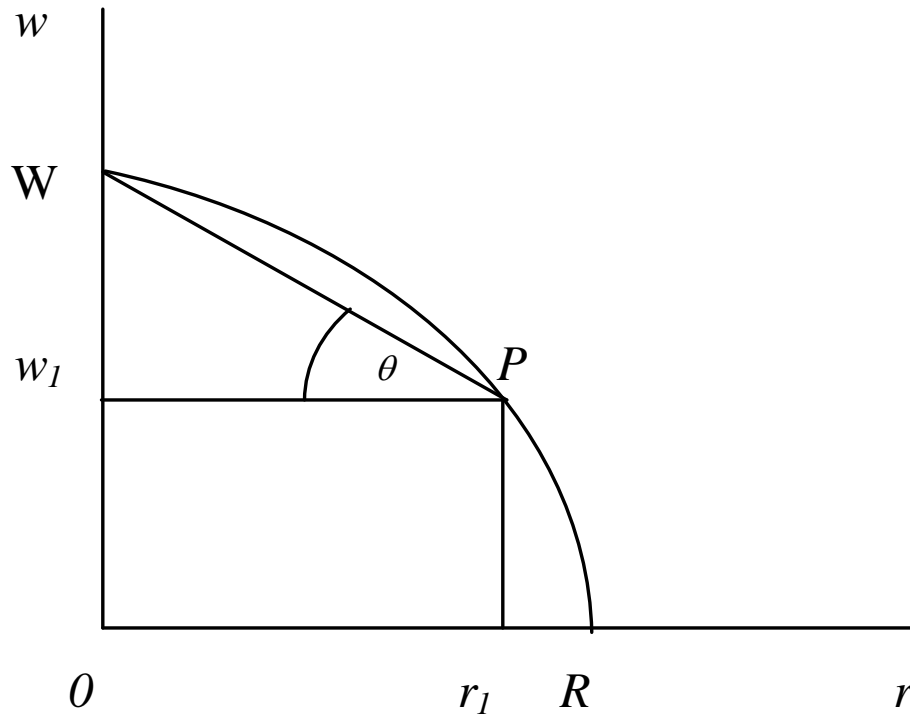
$$D = \begin{vmatrix} l_c & l_a \\ c_c & c_a \end{vmatrix}$$

- If $D > 0 \rightarrow$ convex wage-curve
- If $D = 0 \rightarrow$ straight line wage-curve
- If $D < 0 \rightarrow$ concave wage-curve

The system of production gives the relationship between r and w

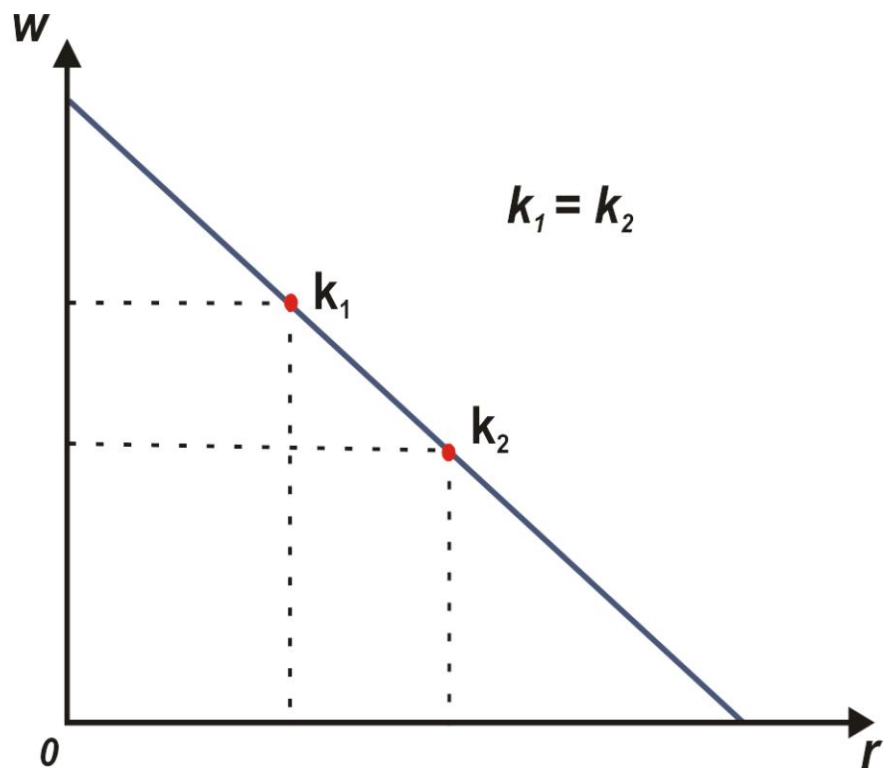
$D < 0$

k increases as r increases.

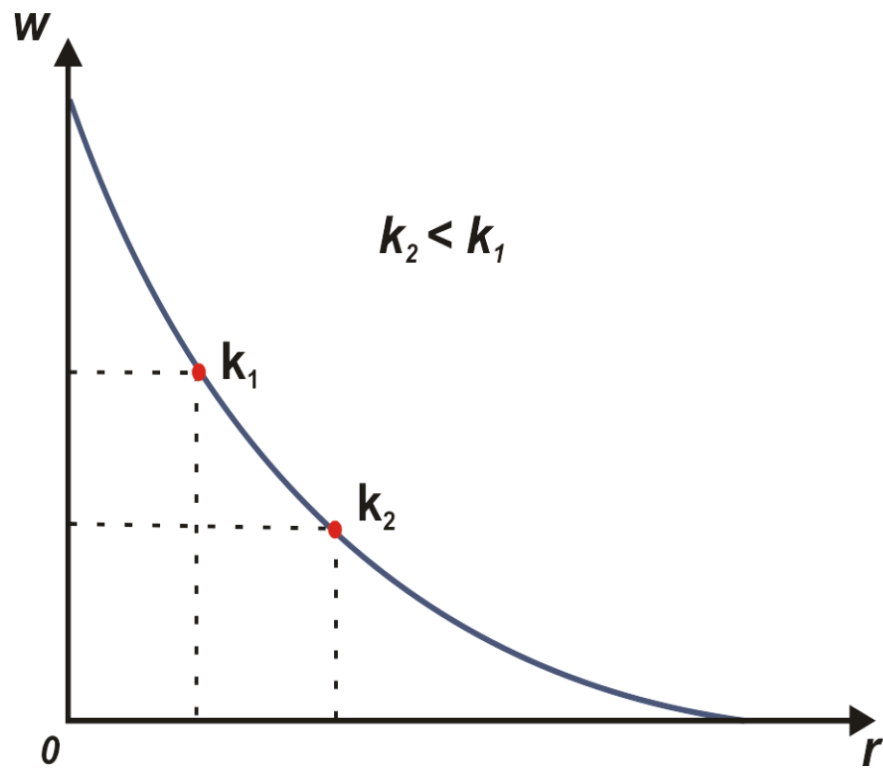


The “wage-curve”: OW is the net physical product per worker;
 $\tan(\theta)$ is the value of capital per worker when the wage rate is $0w_1$.

$D=0$

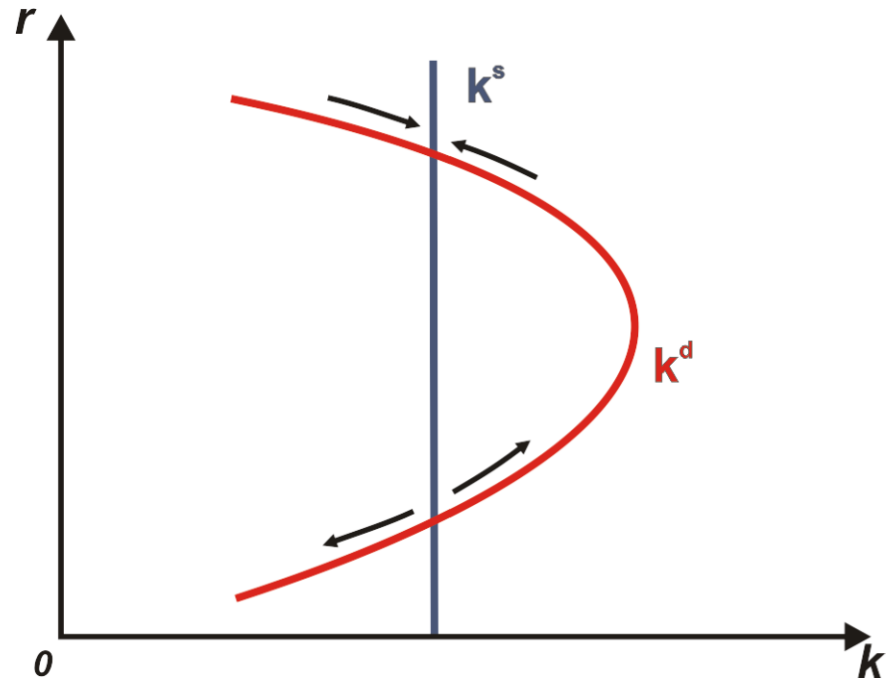
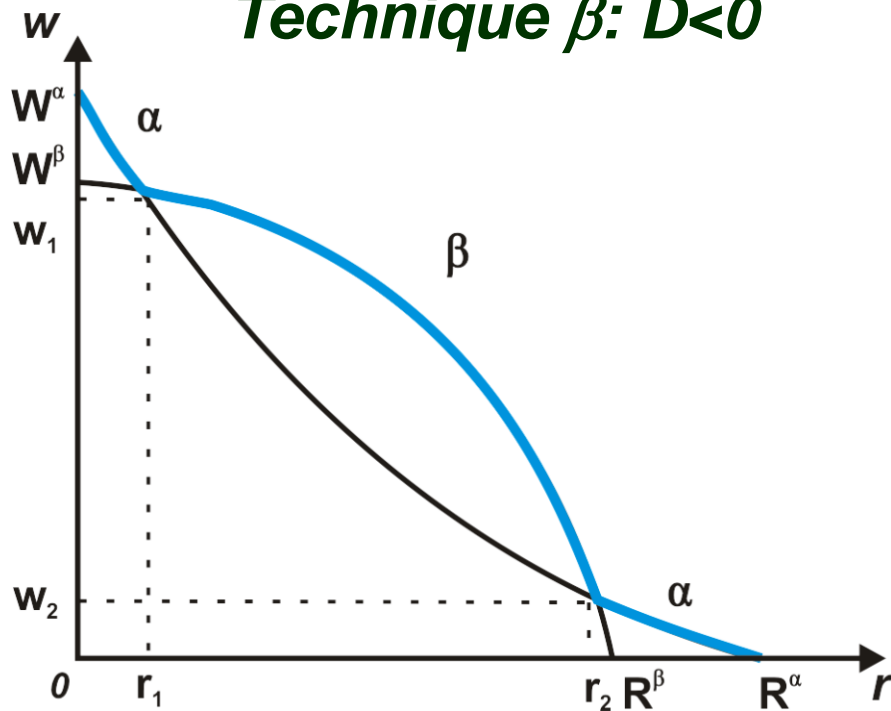


$D>0$



Technique α : $D > 0$

Technique β : $D < 0$



$0 < r < r_1 \rightarrow \alpha \rightarrow k_\alpha$

$r_1 < r < r_2 \rightarrow \beta \rightarrow k_\beta$

$r_2 < r < R_\alpha \rightarrow \alpha \rightarrow k_\alpha$

These phenomena had been early discovered in the literature by J. Robinson (1953), and D. Champernowne (1953); though it was after Sraffa (1960) that they gained the centre of stage.

Implications of 'reswitching' and 'reverse capital deepening'

Undermine the **principle of Factor substitution**, i.e. the premise to derive plausible equilibrium of supply and demand.

The “belief” in substitution and scarcity by the marginal approach collapses.

4. A new phase and transformation of the neoclassical approach: Neo-walrasian models of intertemporal and temporary general equilibrium (Arrow-Debreu models, Hicks, etc)

Walrasian specification of capital:

treatment of capital as a vector of physically heterogeneous capital goods among data.

C. Bliss (1970, 1975, [2005], [2009]) and F. Hahn (1972, 1975, [1982])

Walrasian capital **cannot determine a uniform rate of interest.**

Yet, Walras shared with his contemporaries the concern to determine a long period general equilibrium. (Cfr. Walras, 1926[1954], pp. 83-4, 225, 282-3, 294)

The way out of this contradiction was to **renounce to the uniformity of the rate of returns.**

This is **the way adopted by modern intertemporal general equilibrium** (Debreu, 1959; Arrow and Hahn, 1971, Bliss, 1975) and by temporary general equilibrium (Hicks, 1939)

The specification of capital as a heterogeneous-capital-good vector among the data entails a **radical change in theory.**

The neoWalrasian equilibrium

5. Methodological problems.

Let us compare long period against TGE:

Long-run equilibrium features

- **Feature 1.** Equilibrium as a centre of gravitation of the empirical variables, so the theory must include an explanation of the basic mechanisms that allow such equilibrium to be achieved.
- **Feature 2.** The nature of a centre of gravitation entails that the variables defining the equilibrium position are persistent enough so that they can determine the trend or average of the empirical magnitudes without being substantially affected themselves by accidental or disequilibrium phenomena.

- **Feature 3.** Equilibrium prices of the capital goods must yield a uniform rate of return on their supply prices, and thus the physical composition of the capital stock must be endogenously determined.
- **Feature 4.** The endogenously determined composition of capital goods needs a given, single-valued scalar endowment for the factor 'capital'

Temporary GE

- Equilibrium is conceived as a **Fixed Point**, a “*Market Nash equilibrium*”: *agents mutually best respond at each t.*
 - *firms maximize expected profits.*
 - *Households maximize utility*
 - *Arbitrage condition: uniform return on demand prices of capital goods.*
- *The mechanisms of convergence are **not part** of the equilibrium concept itself.*
- *The evolution of the economy is studied as a **sequence of equilibria.***
- *The economy is assumed to be always in equilibrium due to the assumption of the **auctioneer: adjustment time is negligible and disequilibrium takes place in logical time.***

- *The variables that define the equilibrium must be dated and are not persistent (there is no repetition of transactions): **endowments of capital goods and expectations***
- *The system is **not generally compatible with the Uniform of Reutr condition due to the given endowments of capital goods assumption.***

- As Hahn (1973, p. 7) noted, contemporary general equilibrium theory *'makes no formal or explicit causal claims at all.'*
- Within the TGE approach, 'equilibrium theory'—the determination of the fixed point vector of prices and quantities—and stability analysis—the study of the mechanisms that bring about the equilibrium position itself—bear no necessary relation to each other; it is as if they dealt with two isolated phenomena.

6. New perspectives in the neoclassical theory?

Summary: neo-Walrasian equilibrium

- 1. Not persistent → due to walrasian specification of capital goods...hence...
- 2. to overcome this issue, TGE and IGE rely on the auctioneer because, otherwise time-consuming adjustments will cause path-dependence and hence indeterminacy.....but...
- 3. due to increasing -and understandable- dissatisfaction with auctioneer , theorists were led to assume equilibrium, rather than explaining the mechanisms that allow the equilibrium to come about.

- Hence, focus on equilibrium as such leads to concentrate on existence of equilibrium ...
- But even if we only focus on existence, we may have problems of zero prices → “zero income problem”.

To conclude...and to think about it...

- Neo-walrasian theory → very-short period equilibrium → not persistency of equilibrium variables → poor guide to understand real-economies behaviour → hence poor guide to economic policy....
- High price paid for saving mainstream theory is very high.
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- Not surprisingly, though, empirical work still relies on the traditional versions of neoclassical theory which is however undermined by results of the controversy.

Thank you!