Lecture Note 12: Austrian economists, capital theory, Wicksell

The tradition following from Menger and his followers, mainly working in Austria (of that time), differs in many respects from that of Walras, in particular in their treatment of time and interest.

Carl Menger (1840 – 1921) who is considered as the founder of the Austrian school, is credited together with Walras and Jevons for introducing the marginalist approach in economics (even if some of it was known before them). His main work was published in its first edition in 1871 but went through many subsequent revisions, the second edition appearing after his death, edited by his son Karl Menger (1902 – 1985, a wellknown mathematician). Menger had a very broad outlook and thought of marginalism as provided a framework for not only economics but also other social sciences.

In his discussion of prices and markets, the viewpoint is very different from that of Walras, who considered well organized markets with a single price taken for given by all. Menger looks at markets where there may be few traders and no single price, trying to explain how utility and scarcity works together to establish a value. Here Menger introduces a distinction between *commodities* and *goods,* the first can be resold immediately at the same price, whereas the second may have utility but the price at which they can be sold can vary considerably. This happens since there can be many cases where markets are *not* in equilibrium in the sense that supply equals demand. For example, in a monopolistic market supply would correspond to marginal cost, and at the monopoly price supply is much greater than demand, and the buyer cannot sell it again at the high monopoly price, giving a case where we could hardly speak about a commodity. The most clearcut case for a commodity is money (or gold) which can be sold immediately, its marketability is perfect.

Friedrich von Wieser (1851 – 1926) succeeded Menger as professor at the Vienna University. His contributions are from 1889 and later, so that he cannot be counted as one of the early marginalists, but his work had several original traits although he continued the tradition laid out by Menger, he cannot be considered a typical Austrian economist.

Wieser introduced a concept of *natural value,* which can be realized only in a communist society with no private property. In such a society, the value of a consumption good is derived from the marginal utility that it gives the citizens. Production goods, which have no such utility, derive value since one can get a return from them in the form of goods which have utility.

Suppose that m individuals have a utility functions $u_i(x_{i1}, \dots, x_{il})$ defined on bundles of consumption goods $\mathbf{x}_i = (x_{i1}, \dots, x_{il})$, for $i = 1, \dots, m$. Society's overall welfare is given as a function of the utitlties enjoyed by each of its individuals, $U(u_1, \dots, u_m)$. In an initial simple society, the natural value v_h of a commodity h is such that the marginal utility of this commodity is the same for all,

$$\frac{\partial U}{\partial x_{ih}} = \frac{\partial U}{\partial u_i}\frac{\partial u_i}{\partial x_{ih}} = v_h,$$

The simplest way in which this can be accomplished is where society weights all its members equally, so that

$$U(u_1(\mathbf{x}_1), \dots, u_m(\mathbf{x}_m)) = \sum_{i=1}^{m} u_i(\mathbf{x}_i).$$

Natural values of input commodities are now derived from those of final consumption goods, technically by solving the equations system

$$v_h = \sum_{k=1}^{r} a_{hk} v_k, h = 1, \dots, l$$

where a_{hk} is the input coefficient of the kth input good in production of consumption good h. The technology could be generalized from linear coefficients to production functions with substitutability, something which already Menger had considered, so that the production of consumption good h is given by

$$x_h = f_h(y_{h1}, \dots, y_{hr}), \tag{1}$$

where x_h is output of consumption good h and y_{hk} input of production good k in the production of h. With this terminology, we have that)

$$v_h \frac{\partial f_h}{\partial y_{hk}} = v_k, h = 1, \dots, l, k = 1, \dots, r.$$

Assuming constant returns to scale, the production functions are positively homogeneous, and we can use Euler's theorem to get that

$$v_h x_h = v_h \sum_{k=1}^{r} \frac{\partial f_h}{\partial y_{hk}} y_{hk} = \sum_{k=1}^{r} v_k y_{hk},\ h = 1, \dots, l,$$

which gives the same kind of equations system as with fixed input coefficients, but now it fits better with the marginalist tradition.

If we consider the bundles $\mathbf{x}_i$ as emerging from maximization of social utility $\sum_{i=1}^{m} u_i(\mathbf{x}_i)$ subject to the constraints given by the production functions in (1) and the feasibility conditions

$$\sum_{i=1}^{m} x_{ih} = x_h, h = 1, \dots, l,$$
$$\sum_{h=1}^{l} y_{hk} = \overline{y}_k, k = 1, \dots, r,$$

where $\overline{y}_k$ is society's endowment with production good k, then the natural values emerge as the Lagrange multipliers in the optimum.

Wieser proceeded from natural values in the simple economy to consider cases where individuals are not treated equally, which he calls *stratified* economies, with $U' = \sum_{i=1}^{m} a_i u_i$, where the weights a_i reflect purchasing power derived from private property. One may consider a social optimum here, or alternatively a decentralized equilibrium, giving rise prices different from the natural values. These considerations point to the systems debate of the 1930s.

Eugen von Böhm-Bawerk (1851 – 1914) is the most wellknown of the early Austrians. His main contributions are those dealing with the nature of interest. According to Böhm-Bawerk, there are three reasons why interest rates must be positive, namely

(i) individuals expect that there will be more commodities in the future,

(ii) the future is risky so what will be obtained is not fully known, and

(iii) the superiority of more roundabout methods of production.

In particular, much emphasis is put on (iii). Intuitively, if the output is increased if more time is allowed to pass, then all producers would gain more, the longer they waited, and only positive interest rates will counteract this tendency.

The test of whether (iii) is a valid theory of interest rates will be to present a model with positive interest rates even when there is no growth. Consider a simple economy with only two goods, a consumption good and capital. The capital good is produced using labour alone, and production X of the consumption good from labour L and capital K satisfies

$$X = F(L, K),$$

where F is positively homogeneous, so that one can write it as

$$X = Lf(a) \text{ with } f(a) = F(1, a) \text{ and } a = \frac{K}{L}.$$

If the amount of labour needed to furnish one worker with a units of capital is $N(a)$, then the amount of labour directly or indirectly needed to produce X is

$$W(X, a) = L + aLN(a) = L(1 + N(a)a) = \frac{X}{f(a)}(1 + N(a)a) = X\frac{1 + N(a)a}{f(a)}.$$

We now take superiority of roundabout methods of production to mean that for given X, $W(X,a)$ is decreasing in a, so that its derivative

$$X\,\frac{f(a)(N(a)+N'(a)a)-(1+N(a)a)f'(a)}{f(a)^2}$$

must be negative, which means that we assume that

$$N(a)+N'(a)a<(1+N(a)a)\frac{f'(a)}{f(a)}. \tag{2}$$

The rate of interest in this simple economy is the rate of return on capital r defined to be what is left of the output divided by the stock of capital, that is

$$(1+r)=\frac{F(L,K)-wL}{K}=\frac{L(f(a)-w)}{LwN(a)a}=\frac{f(a)-w}{wN(a)a}, \tag{3}$$

where w is the wage rate (the consumer good has been chosen as numeraire), and we have once again used that one needs $N(a)a$ units of labour to produce X. The producers of capital goods choose a so as to maximize return $1+r$, and the derivative of r with respect to a is

$$\frac{\mathrm{d}r}{\mathrm{d}a}=\frac{wN(a)af'(a)-(f(a)-w)(wN(a)+wN'(a)a)}{(wN(a)a)^2}=\frac{f'(a)-(1+r)w(N(a)+N'(a)a)}{wN(a)a},$$

where we have inserted from (3). For $r=0$ we have that $f(a)=w(1+N(a)a)$, and our assumption (2) becomes

$$f'(a)>\frac{N(a)+N'(a)a}{1+N(a)a}\,f(a)=w(N(a)+N'(a)),$$

showing that $\frac{\mathrm{d}r}{\mathrm{d}a}>0$ at $r=0$, so that the value of r for which the first order condition is satisfied must be positive. This shows that advantageous roundaboutness alone is enough to give positive interest rates, even in a stationary economy.

The model used here is not altogether standard (capital producers use only labour as input, and they can decide which capital-labour ratio should be used in production of consumer goods), and if its assumptions are relaxed, one needs to add one of the other two conditions for positive interest rates, so roundaboutness alone is not enough.

As V&G involves Wicksell in the discussion of Böhm-Bawerk, we may just as well proceed to the chapter on **Knut Wicksell** (1851 – 1926). The treatment of capital and interest in Wicksell connects the marginalist, and here in particular Austrian, theory of interest rates with the quantity theory of money, involving both a financial sector ("banks") and prices. This particular theory is known in the literature as the *cumulative process.* The part of it involving capital and interest and that concerned with money and the level of prices are treated in S. in two separate sections, but they should be considered in connection with each other.

A very simple formulation of the model, due to Humphrey (1986), is the following:

We begin with investment I and savings S in the economy. Both are assumed to be determined by fundamentals of the economy, investment by the yield which can be obtained from investing and savings by the time preferences. Since additional yield in the future must balance the disutility of foregone consumption today, there is a natural rate r at which I and S would be balanced.

Once we take into consideration that investment and saving is not decided upon by the individuals in this abstract way, but rather trough the lending and depositing with banks, we must extend the model somewhat. Investment $I(i)$ is now a function of the loan rate i, and the demand for loans $L_d = I(i)$ should be balanced by the supply L_s of loans. This balancing of supply is not performed by the loan rate, rather we have than

$$L_s = S(i) + \frac{dM}{dt},$$

where we assume that individuals deposit all their savings in banks, and that the balance of supply and demand is performed by extending bank credits (in the case where demand exceeds savings) or terminating outstanding credits if savings are larger than investment. This gives os the equation

$$\frac{dM}{dt} = I(i) - S(i) = a(r - i) \tag{4}$$

where $a > 0$ is a constant. Next, we connect the excess demand $E(i) = I(i) - S(i)$ with price changes,

$$\frac{dP}{dt} = kE(i). \tag{5}$$

That M and P move in the same direction, is not surprising given the quantity theory of money. We need however another equation to determine what happens to the loan rate i,

$$\frac{di}{dt} = b\frac{dP}{dt}, \tag{6}$$

which expresses that the banks will have to react on general price level changes, since otherwise their cash reserves would change in an undesirable way, so they adjust the loan rates.

Taking (6) and (5) together, we get the expression

$$\frac{\mathrm{d}i}{\mathrm{d}t} = bka(r - i).$$

To find the solution, we rewrite it as

$$\frac{\mathrm{d}\ln(r - i)}{\mathrm{d}t} = -bka$$

which has solution $\ln(r - i) = -bkat + C$, where C is a constant. Taking exponentials on both sides and moving r to the other side, we get that

$$i(t) = (i_0 - r)e^{-bkat} + r$$

with $i_0 = i(0)$ the initial value of the loan rate.

The model is perhaps too simple to capture Wicksell's argumentation fully (and its purpose in Humphrey (1986) is mainly to argue that the basic ideas in Wicksell's theory had already been put forward by earlier writers, in particular Henry Thornton (1760 – 1815), writing about issue of paper money as early as 1797), since the money supply has a passive role, adapting to the disequilibrium of savings and investment. Changing this passive role of M to a more active one could make the model accommodate also other scenarios such as the perpetual inflation.

References:

Humphrey, T.M. (1986), Cumulative process models from Thornton to Wicksell, Economic Review, Federal Reserve Bank of Richmond,18 – 25.