Employment and Equilibrium: the first comprehensive answer by Pigou to Keynes[1]

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Abstract

I examine the argument elaborated by Pigou in his *Employment and Equilibrium. A Theoretical Discussion* which was the first comprehensive answer Pigou gave to the analysis put forward by Keynes in his *General Theory*. The paper is in seven sections. In the first the motivation of the paper is outlined. In the second, third and fourth sections I will concentrate on how Pigou elucidates the conditions *necessary* for an economic system to attain a short period flow equilibrium. In this context he elaborates an "open" macro model which can be "closed" in two different ways. The paper will also present a diagrammatic analysis of Pigou's theory in the two cases elucidating the structure and the working of the model. Differences with his previous book (*TU*) related to (real/monetary) wage inflexibility and the importance of monetary factors are also described and discussed. Pigou however does not limit himself to deal with the short period but engages in an interesting discussion of the long period centred on the notion of stationary state that is the object of section five. In this way he admits that Keynes's theory is not limited, to the short run. In arguing along these lines he comes close to describe what will be recognized later as the Pigou effect. A short comparison with the renewed stagnationist theory is sketched. The sixth section includes a brief discussion of the comparative statics and dynamic analyses elaborated by Pigou. A final section including a few conclusions completes the paper.

1 The background

The aim of the paper is to analyse the response Pigou gave in his book published in 1941 to the *magnum opus* by Keynes. This is a further step in the exchange between the two economists since Keynes first outlined *Theory of Unemployment* (hence *TU*) as the *locus classicus* of the classical school with respect to the determinants of unemployment.[2] Elsewhere (Di Matteo 2016) I discussed at length the central elements, the structure and the working of the model put forward by Pigou in 1933. In search for what really constitutes the theory of the classical school with respect to employment and income, I then (Di Matteo 2019) complemented my reconstruction with a detailed comparison of the model embedded in *TU* with the one developed by Hicks in his seminal paper (1937), noting similarities as well differences. The next step in my research is to assess how Pigou reconsidered in depth his views *after* Keynes's fully fledged attack to the classical school and in particular to *TU*. The main question underlying my research is how Pigou revised his previous ideas in relation to Keynes's with respect both to the long run and the short run and to what extent he actually produced a *comprehensive* alternative to the *General Theory*.[3] My treatment will combine mathematical modeling with diagrammatic analysis.[4] In what follows I overlook the long debate that took place between Pigou (1937, 1938), Kaldor & Keynes (1937) on the EJ as it ended with Pigou conceding to his critics.[5] The results however did not produce any macro model until this book was completed.

The main object of *Employment and Equilibrium (*hence *EE)* is to define the (necessary) conditions for short run and long run equilibrium. Once again the exposition by Pigou is rather peculiar so that the reader is sometimes put off from further reading. In what follows I will simplify the argument by eliminating what appear to be unnecessary elements and qualifications.

The book is in four parts. I will concentrate on the second which in my opinion includes the core of his theory and limit myself to a brief summary of the others. In the first part definitions of a few basic concepts are offered: Pigou analyzes real and money income, investment and saving, short run and stationary (flow) equilibria. In the second part he puts forward a model with the object of describing the necessary elements that define a short period flow equilibrium. The idea is to elaborate a general model and understand how the classical view is related to the conditions for full employment equilibrium. Then he analyzes from a micro economic viewpoint savings as a function of real income (and interest rate). This part ends with a discussion of the long period

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[2] Since I am reviewing the discussion between Keynes and Pigou I adhere to their use of the word classical. I am well aware that the term neoclassical probably would better describe Pigou's approach: I dealt with the relations between the two terms in Di Matteo (2016).

[3] In 1949 he published a second edition with minor changes.

[4] There is no such a treatment in the literature. Kaldor (1941) does not pay sufficient attention the long run and overlooks the Pigou's effect. Samuelson (1941), while offering a rather complete review of the book, does not deal with the Pigou's effect. Malanos (1949), recognizing that the book "was intended to serve as answer to Lord Keynes's *General Theory*, focuses on the "inherent weaknesses of some neoclassical basic assumptions" and limits his analysis to the short run. Roncaglia & Tonveronachi (1985, p.54) explicitly admit that their model differs from Pigou (1941) being concerned with Pigou (1950): on the latter see Di Matteo (2019). Béraud (2003) does not refer to E&E (not even in the bibliography). Ambrosi (2003) deals only peripherally with E&E criticizing Pigou for having assimilated his concept of the short run with Keynes's (pp.254-6).

[5] The debate has recently been surveyed by Beraud (2003).

stationary equilibrium where the mechanism of what will be known as the Pigou effect eventually surfaces. In the third part attempts are made to compare different positions of short period equilibrium through a detailed and somehow clumsy argument. The fourth and final part is devoted to an embryonic dynamic analysis.

The questions the paper seeks to answer are the following. Does Pigou accept Keynes's theory for the short as well as the long run? If not, what is the mechanism Pigou introduces to try to reaffirm the validity of the classical theory? What are the main differences with what he advanced in *TU*? And finally is there any analogy between Pigou's analysis (which also refers explicitly to Schumpeter) and the secular stagnation theory recently resurrected by Summers?

2 The model

The model put forward is again (as in *TU*) a two sector model with a composite consumption good and a composite investment good.[6] The short run in *TU* was characterized, *inter alia*, by a hypothesis of rigidity of the real wage as a result of the wage policy pursued through collective bargaining by Trade Unions and employers (with the possible interference of the State which sometimes sets a minimum wage). In *EE* the short run is defined with a set of simplifying hypotheses (fixed amount of homogeneous capital, no depreciation, homogeneity of labour, perfect labour mobility across sectors, no unemployment benefit, closed economic system, no savings out of wages, etc.)[7] some of them already present in *TU* and a hypothesis on the wage which I will come to at the end of section 3 of the paper.

He describes two examples of flow equilibrium: the stationary state and a short period flow equilibrium.[8] The first entails a constant rate of purchase and sale per unit of time, a stationary population and a constant stock of capital in addition to unchanged tastes and technique. The second differs from the first in that it does not require a nil rate of investment but only a constant (usually positive) rate of investment. The latter of course produces a change in the stock of capital but "(..) we then ignore the reactions which the existence of this positive rate of investment evokes in the other parts of the economic system- reactions which are in fact trifling in respect of periods that are very short (..). This sort of equilibrium is the subject matter of Mr. Keynes's *General Theory*".[9] Short period flow equilibrium also requires that expected and actual prices are equal so that real and nominal rate of interest are equal too.[10]

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[6]Pigou (p.43). From now on quotations from *E&E* will omit reference to the title of the book and contain only Pigou and the number of the relevant page(s).

[7] While maintaining that savings are out of profits only, Pigou, as will be clearer later in the paper, discards the classical assumption made in *TU* that all profits are saved and invested. On the latter point see Di Matteo (2016, p.350)

[8]Pigou (p.33). Samuelson (1947, p.547) notes that "some such term as intermediate short run equilibrium is preferable to flow equilibrium" as stocks are equilibrated.

[9]Pigou (p.34)

[10] Pigou (p. 36)

3 The mathematical model

Let us now come to the mathematical formulation. The first equation is the equilibrium condition between savings and investments.[11]

(1) $\varphi(r) = f\{r, F(x)\}$

where the LHS is the demand for funds (investments) and the RHS the supply of funds (savings).

To be precise in commenting the above relation Pigou writes: "(..) the demand for and supply of labour for investment must exactly balance".[12] However he has previously made it clear that "To demand or supply, say, y units of labour for investments *implies* demanding or supplying $p_2\psi(y)$ units of money for investments, where p_2 is the money price per unit of investment goods."[13]

The demand for savings, when expectations and technical factors are given, is a negative function of the rate of interest, r.[14] Pigou discards the possibility that the function is affected by the quantity of labour engaged in the consumption industry: "It is true that in certain circumstances if the quantity of labour in consumption industries undergoes an increase, an addition will need to be made to the stock of machines, and that short period flow equilibrium cannot be re-established until this and (..) other things also have been done. But these reactions belong to states of disequilibrium."[15]

As for the supply of savings P. argues that "nobody [sic!] would doubt that this is a function of two variables, the rate of interest and the community current income of consumption goods." Keynes has left his mark! And adds: "Of the fact that, in respect of any given rate of interest, the supply of labour for investment will be larger, the larger is consumption income, we need, therefore, have no doubt."[16]

As for the influence of the rate of interest Pigou acknowledges that a positive relation is not universally accepted, but concludes (following Marshall's opinion) that for the community as a

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[11]We keep Pigou's original notation.
[12]Pigou (p.64)
[13]Pigou (p.50)
[14] When the stock of capital is fixed "(..) the form of the demand function for labour for investment in instruments for making consumption goods must be such that, after a point, more labour devoted to investment yields diminishing returns; and therefore (..) more will be demanded at a lower than at a higher rate of interest (..)" (Pigou pp.53-4). In his reply to Kaldor, Pigou (1942) argues, on the basis of Marshall, that the long rate and the short rate of interest move in close sympathy so that it is legitimate to operate with a single rate representative of both.
[15] Pigou (p.52). In his reply to Kaldor Pigou (1942, p. 251) adds that the crucial variable will impinge " in some measure on expectations about the labour force that will be *available*" (..) and "(..) will not depend to any appreciable extent on the quantity of labour that is *actually employed* now".
[16]Pigou (p.56). The reason why the relevant variable is only consumption income and not total income is that the latter is an ambiguous concept, "(..) the precise significance of which depends on a more or less arbitrary decision about the relative weights to be assigned to consumption and investment goods respectively; whereas, since throughout our analysis it is postulated that, while, indeed, there are many kinds of consumption goods, their relative quantities and values are always the same, the concept, income of consumption goods, is wholly free from ambiguity" (p.57)

whole, for some ranges, it must be so. The reason being that "(..) otherwise in a state of full employment there will be no machinery through which an enhanced demand for labour for investment could evoke a correspondingly enlarged supply."[17]

The second relation equates y, the quantity produced of investment goods,[18] to savings

(2) $y = f\{r, F(x)\}$

and deserves no particular comment.

The third equation can take on different forms as it depends on the actual behaviour of the Central Bank. To arrive at it however we need a few preliminary steps. Barring the case of monopolistic competition,[19] we can state that, in each sector, real (better, product) wages are equal to their marginal products, namely

$W_1 = F'(x)$

$W_2 = \psi'(y)$

where $W_1(W_2)$ is the product wage in the consumption (investment) goods industry, F and ψ are the short run production functions of the two sectors, x (y) the output of consumption (investment) goods respectively. On the other hand we also know that the following relations hold, when, in equilibrium, the money wage, w, must be the same in both industries:[20]

$w/p_1 = W_1$

$w/p_2 = W_2$

Finally we have a relation of equality between money income, I, and the value of total output. At this point it has to be remembered that money income is also equal to MV, where M is the total stock of money and V the velocity of circulation.[21]

Then:

[^] $p_1F(x) + p_2\psi(y) = I$

Combining all the above equations we get

[*] $\{F(x)/F'(x) + \psi(y)/\psi'(y)\}\ w = I$

Pigou states that, "for brevity", the first expression within the brackets of [*] might be written as $K_1(x)$ and the second as $K_2(y)$.[22] The relation [*] then becomes:

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[17] Pigou (p.57). In a Keynesian fashion Samuelson (1941 p. 549) is highly critical of this passage.
[18] Pigou (p.42)
[19] This is one of the complications that I will omit as mentioned at the outset of the paper.
[20] Pigou (p.2)
[21] Pigou (p.58-60) is explicit in recognizing that V is a direct function of the rate of interest, whereas (quoting with approval Robertson's position) he disregards a negative influence of real income.

[°] $(K_1 + K_2)\, w = I$

At this point Pigou argues that "with a banking policy that is normal or of the constant-income type or of the constant-interest type, I = g(r)". In the first case the derivative of g(r) with respect to r is positive, in the second zero, in the third infinite.[23]

Therefore the third equation of the model is

(3) $(K_1 + K_2)\, w = g(r)$

By a normal banking policy Pigou means a situation where "the Central Bank may so act as to allow M to rise and fall as the rate of interest rises or falls".[24]

On the other hand: "With a banking policy directed to keep the price level of consumption goods constant "the third equation, taking into account relations [^] and [*], becomes[25]

(3') $wK_1/F = C$

where C is a constant.

The model which we have arrived at, however, is one equation short, as the unknowns are four (x,y,r,w) and the equations only three (1,2,3 or 1,2,3'): therefore the model is "open" and we can "close" it in several ways.[26]

"If, however, we wish to keep contact with reality, two only are of interest" Pigou states.[27] We can impose the condition that either aggregate employment is equal to the quantity of available labour, Q, or money wages are fixed (by authority or collective bargaining) at the level T. We can then have two alternative versions of the fourth equation:

(4) $x + y = Q$

(4') $w = T$

where both Q and T are constants.[28]

4 The short run equilibrium

We have now to discuss the solution to the model.

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[22] With K_1' e K_2' greater or equal to 0. See Kaldor (1941 p. 463) and also Pigou (p.67)

[23] Pigou (p.67).
[24] Pigou (p.60)
[25] Pigou (p.68)
[26] Pigou (p.68-71)
[27] Pigou (p.68)
[28] Here, as in *TU* (pp. 7-8), Pigou assumes that the quantity of labour force waiting to be employed is more or less fixed, not substantially affected by economic variables such as the real wage.

Let us first concentrate on the particular model made of equations 1,2,3,4 (the “full employment” model). In this case equations 1,2, and 4 are enough to determine x, y, and r, whereas the third equation (the money equation) suffices to find the money wage. To better understand the working of the model let us draw two diagrams. The first summarizes equations 1 and 2, the second equation 4.

TAKE IN FIG 1

TAKE IN FIG 2

In diagram 1 the supply function is drawn for two alternative values of x, where $x^* > x_0$. In this way we find a positive relation in equilibrium between x and y that we report in diagram 2 together with the full employment condition ($x + y = Q$). Along the upward sloping curve the rate of interest decreases from left to right. The first diagram expresses various combinations of x and y (reported as an upward sloping curve in diagram 2) that depict situations of equilibrium with either under employment or full employment; only the couple x^*, y^* in diagram 2, namely point F, which is also on the downward sloping curve, will be a full employment equilibrium. In F the rate of interest is r* (from diagram 1).

Pigou assumes that this value is feasible. Kaldor noted[29] that if on the contrary the rate of interest could not fall below, say r_0, then full employment is not achievable and therefore we end up in point U in diagram 2. In the full employment equilibrium money wage is endogenously determined and consistent with the overall equilibrium via equation 3 since the equilibrium rate of interest r* (**and MV with it**) has been determined from diagram 1.

Let us now consider the other major case, namely the one characterized by a given level of the money wage. The relevant equations are 1,2,3, 4'. In this form the model cannot be split into two parts as before.[30] However the diagrammatic apparatus can be adapted to this case in order to describe the equilibrium position.

Remembering that $K_{1(2)}$ is a (positive) function of x(y), following Kaldor,[31] we use a simplified form of 3, namely

(3'') $(x + y)T = g(r)$

The first diagram is unchanged whereas we need diagram 2'. From the first diagram we see that when r falls, both x and y increase, so that we can draw a downward sloping (linear for simplicity) curve, call it h, in the plane (x+y, r). On the other hand, with a normal monetary policy, g' is positive and therefore we have an increasing curve in the same plane. The equilibrium is then determined.

Clearly it depends on w: a higher (lower) value of the money wage, say $w_1 > w_0$, will shifts the upward sloping curve downwards (upwards) and reduces (increase) its slope.[32] As a conclusion a higher wage is associated to a higher rate of interest, a higher MV and a lower level of overall employment.

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[29] See Kaldor (1941 p.465)
[30] Pigou (p. 69-71) discusses this point.
[31] Kaldor (1941 p. 463). See also Pigou (p.67)
[32] This is obtained by taking the derivative of (3″) with respect to w

TAKE IN FIG 2'

We could build other models combining the three hypotheses on banking policy with the two assumptions embedded in 4 and 4': all in all, we could have up to six different models. However we better discuss the two cases we have just introduced.[33]

Pigou argues that to assert, as the critics state, that "full employment always exist, i.e that our (..) equation always has the form (x + y) = Q" is a "travesty" of the classical view".[34] In particular the critics, as Pigou reports, think that according to the classical school "changes in the demand and supply attitude towards investment always and necessarily leave aggregate employment unaffected."[35] And goes on in the same page: "The fact that, in discussing industrial fluctuations, no economist, classical or other, ever does assert this, is a tribute to common sense paid in despite of logic."[36]

With a splash of irony[37], he answers to this misinterpretation by noting that, according to the classical school, "full employment does, indeed not always exist but always *tends* to be established." One can also state that "in actual fact employment fall short of full employment by a certain quantity attributable to disturbances." The latter being low labour mobility across sectors, exogenous disturbances, frictions that prevent wages from adjust instantaneously, etc: he practically reiterates the position taken in *TU*. In modern language we would say that there is always frictional unemployment.[38]

On the other hand if money wages were *flexible in the face of different levels of unemployment*, the correct, namely the full employment, level of real wages would be brought into existence, the reason being that a fall in money wages, *relative to product prices*, leads to a fall in real wages and, *other things being equal*, an increase in employment as in fig. 2'. The words in italics represent crucial conditions that Pigou discusses at length[39] arguing, against his critics, that, on empirical grounds, the position of the classical school is the most sensible. Indeed if they were not satisfied, the case for the classical school would be greatly weakened.

First "(..) the evidence is conclusive that (..) they [money wage rates] neither are now nor ever have been *rigid*". Secondly "(..) we conclude that (..) cuts in money wages will not carry with them proportionate reductions in the price level in any *practicable* circumstances."[40] Finally "(..) everybody will know that, once a *sufficient* cut is made the pressure will cease and therefore the downward tendency [of real wages] will stop". It is revealing that in all the sentences I quoted,

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[33] These are the only two interesting cases (Pigou p.135)
[34] Pigou (p.78)
[35] As I detailed elsewhere (Di Matteo 2016, p.344) according to Pigou's *TU* a fall in the consumption of non wage earners could increase the wage fund and therefore employment: but this is a minor case.
[36] The position of Pigou on industrial fluctuations is very clearly discussed by Zenezini (2010).
[37] "(..) as one who is supposed to hold it [the classical view], I am perhaps in a better position to know than those who say that they do not (..). (Pigou p. 78)
[38] Pigou mentions frictional unemployment only marginally (p.89,91) giving more attention to it in Pigou (1950)
[39] Pigou (p.82-91)
[40] Practicable as opposed to "imaginary" (p.86)

italics are used to mean that the propositions are cautiously advanced and qualified. Performing a statistical analysis over a (long)[41] period for which data are available, Pigou concludes that: "(..) the volume of employment over the average of good and bad times was a constant proportion of the available labour force". And more: "(..) in this examination the classical view, as it really is – to be carefully distinguished from current caricatures of it – has not, I suggest, done badly." For the years following the first world war Pigou argues[42] that the "period has not lasted long enough to enable us to compare the average levels of employment over a series of cycles". From the above discussion it is pretty clear that Pigou, following Marshall,[43] thinks that the classical theory of employment is concerned with long run tendencies and not with short run equilibrium or cyclical fluctuations.[44]

5 The stationary state equilibrium

Therefore let us turn to the discussion of the stationary state that Pigou introduces in his book. In *The Economics of Stationary States* (1935) Pigou had conducted an extremely meticulous enquiry (based on successive approximations) arriving at a precise definition of the stationary state, a concept that in a simplified form he is using here.

The model we have discussed before has to be modified inserting the additional condition that the investment (saving) is equal to zero. At the same time a new variable, S, is introduced, namely the stock of capital, that was a *datum* in the short run analysis, but is now endogenous. We modify the previous equations to get:

(1°) $\varphi (r, S) = f\{r, F(x, S)\}$

(2°) $y = f\{r, F(x, S)\}$

(3°) $y = 0$

where S is the stock of capital. As "(..) the forms of function, F, are taken as given",[45] the above simplifies to

(1^) $\varphi (r, S) = f\{r\}$

(2^) $0 = f\{r\}$

In the end two equations and two unknowns, r and S.

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[41] To be precise between 1853 and 1914.
[42] Pigou (p.90)
[43] This is made clear also in his defense of Marshall's theory of the rate of interest expounded in chapter V.
[44] "Critics of Marshall at the present day do not always remember what is obvious to his pupils that the *Principles* was conceived as an introductory volume". Further: "Industrial fluctuations were to have been the subject of a later volume which to our great misfortune was never written" as Pigou (p.95) states. One could speculate that *Industrial Fluctuations* was meant to fill the gap.
[45] Pigou (p.119-20)

The model is completed by the full employment condition (4) and the equation (3) that concerns the conduct of the monetary policy. Once again the latter equation determines the value of money wages consistent with full employment.

Although the following two points are not explicitly made by Pigou, it must be observed that in a stationary state x is determined via equation 4 and that the position of the savings function still depends on the capital stock that, according to Pigou,[46] is correlated to real income (as will be clear in a moment). From this it is clear that Pigou assumes full employment and then seeks the conditions on r and w necessary to assure the result.

To introduce the description of the equilibrium it is reasonable to postulate with Pigou that $\delta\varphi/\delta S$ and $\delta\varphi/\delta r$ are both negative whereas $\delta f/\delta r$ is probably positive. For the time being it can be argued that the first assumption descends from the existence of diminishing returns to scale, the second from the decreasing marginal efficiency of capital, the third from the positivity of the marginal rate of time preference. He suggests[47] that there are *two* solutions; one in which S is small and r large and the other in which S is large and r small, the reason being that it is possible for savings to be zero in both cases. In the first S is so small (and his income too) that the representative man does not save even if the rate of interest is very high;[48] in the second the rate of interest is so low, in the consequence of a large accumulation of capital, that the representative man does not save in spite of his high income.[49] The first is labeled the low (LL) level stationary state whereas the second is the high (HL) level stationary state.[50]

TAKE IN FIG 3

To better appreciate Pigou's argument I refer to diagram 3 where there are two investments and savings curves, each of them traced for a different value of the stock of capital: they cross on the horizontal line (y=0) at different levels of the interest rate. The one at the right can be seen as the low level stationary state (LL), whereas the other at the left is the high level stationary state (HL).

A low level stationary state is always possible in that it does exist a very low level of S (and income) such that the representative man does not save anything. Can we also state that a high level stationary state *always* exist? In order to prove this Pigou proceeds by steps in order to overcome several possible objections. First he shows that the level below which the rate of interest cannot fall, although strictly positive, is only marginally above zero. And this is meant to overcome the objection that the rate of interest required for a HL equilibrium could be so low as to be unfeasible.[51] Secondly he shows that even if savings, under well specified circumstances, could occur for negative levels of the (nominal) rate of interest, there would be a mechanism that enables HL equilibrium to be finally established. Thirdly he argues that the case Keynes puts forward (and

[46]Pigou (p.120)
[47]Pigou (p.120)
[48] This is in contrast with an earlier statement by Pigou (p. 33) where he argued that with an ever lasting capital the rate of interest is zero.
[49]Pigou (p.120)
[50] It could be argued that as long as there are two equilibria there could be many of them, as later recognized by Pigou (1947, p.183)
[51]This possibility was raised by Keynes (1936 p.219) and reiterated by Kaldor (1941 p. 465).

that he has previously labeled "Day of Judgement"[52]) according to which unemployment can occur as a result of the impossibility of the mechanism identified by Pigou to work, is a only a possibility.

Coming to the details, let us start from the low level stationary state and allow capital to accumulate (via filling new profitable investment opportunities) up to the point where the marginal efficiency of capital falls to a level at which the representative man (in spite of his high income) no longer saves.[53] The question then arises: if a level under which r cannot fall exist, this could prevent full employment from being established. In diagram 3 suppose, for the sake of argument, that the investment schedule is $\varphi(S_1)$ with a dotted part, signaling that at negative levels of the rate of interest there is demand for funds for real investment: this however cannot be. Indeed, should this be the case, the demanders of resources for investment will simply demand money to hold, an option which has no cost, enabling them to minimize losses. In other words at slightly more than zero rate of interest, they will stop making productive investments. So far so good: the high level stationary state is achievable.

However in his *General Theory* Keynes[54] argued that the level of the rate of interest at which this phenomenon of hoarding occurs is not (around) zero but positive and more precisely in the range 2-2,5 %. This would imply that the high level stationary state could not be reached if it requires r less than 2%. Pigou criticizes Keynes because the latter did not consider that in *a stationary state* [italics mine] there are no expectations of improvements (and therefore no inducement to stay liquid in order to reap benefits afterwards), the firms reinvest in their businesses, there is no uncertainty about the future level of the rate of interest.[55] In this case the investment schedule is consistent with a very low (and positive) level of the interest rate.

Let us follow Pigou in his successive argument regarding the savings decisions. If people saved only for the return they get, savings of a wealthy man is zero only when the rate of interest is equal to the marginal rate of time preference, q, in Pigou's terminology.[56] The latter is nevertheless always positive (although very small).[57] In this case the high level stationary state can be reached.

But this is not the end of the story as one could imagine a situation in which the representative wealthy man desires to save also at negative rates of interest. In this case the two curves of savings and investment would not meet at zero level of investment and a high level stationary state does not exist because, as already stated, there is no investment curve to the left of the vertical axis.

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[52]Pigou (1936, p.129)

[53] Although Schumpeter is not mentioned at this point (but only later in the book) this view is consistent with the theory of cyclical development as exposed diffusely in the second and sixth chapters of *Theory of economic development* (Schumpeter 1934, particularly on p. 214). See also Austin Robinson in his portrait of Pigou (1968, vol. XII, p. 95): "[…] he conceived of the development of an economy […] a set of steps – stationary states that are disturbed by spasmodic changes in technology, in accumulation, or in other factors."

[54]See Keynes (1936 p. 219)

[55] All these considerations appear to be relatively weak and somehow inconsistent with what Pigou himself has stated a few paragraphs earlier. On the other hand q and v do not play any role in the short run.

[56] Pigou (p.125)

[57]"(..) no matter how rich a man may be, he is sure to discount the future to *some* extent" (Pigou p. 125, emphasis in the original). He however does not make explicit how small is.

Indeed, saving is also made for the sense of power and security that it carries with it (amenity value in Pigou's terminology).[58] If this factor, that Pigou labels v, is sufficiently high, then a wealthy man would save even if the rate of interest were negative. In this case the zero level of savings can be reached for a negative r that is equal to q-v. This is represented by the dotted line for savings, f(S^) in diagram 3. Is this case a real possibility? In what follows we repeat the argument by Pigou who, contrary to his methodological observation,[59] describes the situation as if it were evolving over time and not, as it would be correct, as a different level of the stationary state. Suppose that at a zero level of the (nominal) rate of interest q-v is still negative and therefore the individual wishes to save. How can he satisfy his desire? He can buy already existing durable assets such as money (and land). He will hoard money out of the active part of the stock of money with the consequence of reducing the volume of money income. *If* full employment is to be maintained (according to the equation 4 of the model) this means an "appropriate" fall in money wages. As a consequence the real value of the stock of money increases and the amenity utility of a marginal unit of investment reduces.[60] The latter is nothing but v: the deflation process in other words reduces v so that q-v becomes positive first and equals q (which is always positive) in the end. In this way a high level stationary state is possible: this is the first description of what will be called Pigou's effect.

It would be interesting here to understand what Pigou meant by "appropriate" movements in the money wage to preserve full employment following a fall in money income. It appears as money wages and prices should fall roughly in the same proportion.

At this point only is Pigou ready to meet Keynes's objection: the essence of the latter can be reformulated as the effects of a very high level of v when Pigou's effect does not work. Indeed Pigou, immediately after, admits that the sequence of events could be different from the one just recalled: the full employment condition could be violated as the contraction of money income could carry with it a contraction in the volume of employment and then in the volume of real income. A low level stationary state at less than full employment could be reached and this would be a "truly deplorable kind" of equilibrium. This is a theoretical possibility that Pigou explicitly recognizes, but is it likely? Pigou's answer runs as follows: "(..) is a matter on which opinions may well differ".[61]

Coming to the question whether the Day of Judgement is not only theoretically possible but, according to him, also likely, Pigou answers in the negative calling to his defense historical evidence. "An era which has witnessed the development of electrical apparatus, motor cars, aircraft, gramophones (..) is not one in which one can reasonably forecast a total disappearance of profitable openings for new investments."[62] In other words the situation in which we are next to a lack of

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[58] Pigou (p.126)
[59] Pigou (footnote 1 to p.129). I will come back to this point later.
[60] We do not enter into the details of the micro foundations of the savings function Pigou undertakes in chapter VI which is different from Keynes's function**.** We simply restate with him that the marginal utility of consumption falls as income increases more and more rapidly, inducing the consumer to devote a higher and higher proportion of income to savings. In addition the marginal rate of time preference also declines as consumption (and income) increases, at least for low and medium levels of income: this factor again pushes for a higher proportion saved of income. Pigou (1903) is an interesting statement of his early views on the subject.
[61] Pigou (p. 130)
[62] Pigou (p.132)

profitable investment is not likely and therefore the Pigou's effect is not likely either to be called upon for assuring full employment.

As a momentary conclusion of this part of the paper I want to stress that Pigou identifies the problem of the industrial economy not in a short run context but in a long run: what Keynes was worried about was the long term incapability of the system, unaided, to reach and remain in full employment as the accumulation process unfolds.[63] We notice first that for Pigou the increase in the real value of money is a condition for the *existence* of a high level full employment stationary state and secondly that the goods market is an important element of the analysis, a clear influence of Keynes's approach to the problem. In this line of thought full employment could not be preserved if the money wage were inflexible or did not fall as much as the price level.

Indeed Pigou makes it clear that to show that an equilibrium position does exist, does not imply that the position tends to be attained. He goes on arguing that it cannot be excluded that the equilibrium is not a centre of rest but of oscillations, namely that the economic system moves for a period around that equilibrium. Having said that however, Pigou thinks that "it is surely *probable* that people eventually will learn by experience and will not continue always making decisions that lead to the same type of loss. If this be so, the oscillations must eventually fade away so that in the absence of new factors of disturbance the economic system will presently come to rest (..)"[64]

I conclude this part stressing that the objective of the present paper is not to assess the validity of the real balance effect and the criticism raised against it by eg Kalecki, but to point out that Pigou has built a revised version of the classical position within which it is theoretically possible *also* a situation characterized by lack of full employment**.**

Finally it could be interesting at this stage to compare Pigou's analysis, referring to historical evidence, with recent attempts, started by Summers (2015), to reintroduce in the present debate the thesis of secular stagnation.[65] The fall in population growth and the reduction in the capital intensity of the new leading enterprises tend to depress investment; on the other hand the worsening of income distribution reduces consumption demand from workers and increases savings from capitalists. The two (and other elements introduced by Summers[66]) phenomena could lead to a negative equilibrium real rate of interest. If this is the case, Summers argues, full employment equilibrium cannot be achieved by market forces. He does not mention Pigou's effect that a deflationary process could decrease savings: to the contrary, he argues that "falling prices by redistributing from high spending debtors to low spending creditors and by raising expected real rates are likely to reduce rather than increase output".[67] It cannot be established by monetary policy either as there is a zero lower bound on nominal interest rate and inflationary expectations cannot be

[63] This shows that Pigou was well aware of the actual problems of the economic system of the period and not someone totally confined within the abstract schemes of the classical school.
[64] Pigou (p.129). In other words in an ergodic context expectations tend to be correct.

[65] For a collection of the papers on the theme see Baldwin & Teulings (2014). For a thorough critical discussion of this literature see Di Bucchianico (2019) who takes into account the results of the Cambridge capital debate.
[66] See Summers (2015)
[67] Summers (2015 p.61)

very high in a depressed economy and in an environment (like today's) where central banks are strongly committed to price stability. It must be noted that Summers does not explore the implications of an equilibrium negative real rate which seem to be eccentric, for example with reference to income distribution. Summers appears to see the real interest rate only as a (borrowing) cost for the firm and not as a return: in other words he admits that there could be a difference in the rates of return for different assets: this situation, however, cannot be considered an equilibrium.[68]

Pigou, as we have shown earlier, denies the possibility that in a stationary state there can be real (as opposed to monetary) investment at a negative interest rate: real investment will stop before as, at most, we can conceive of a zero rate of interest corresponding to a zero marginal productivity of capital.[69] The only possibility that a negative rate of interest could be required for full employment equilibrium derives from the amenity value of savings. But Pigou's effect would come to the rescue *most* of the time. In other words, according to Pigou, a lower bound to the nominal rate is irrelevant *as long as Pigou's effect works*. Failing the latter Pigou would probably admit, with Summers, that there could be a case characterized by unemployment and output below the potential level. At the same time Pigou would be in strong disagreement with the supply side interpretation of the secular stagnation given by Gordon (2015) who puts the blame on the low level of technical progress.

One further point needs to be discussed. The Pigou effect is reconsidered by Pigou in two other occasions. In his celebrated EJ paper (1943) the story is slightly different revealing a certain vagueness in Pigou's idea of which of the two mechanism is at work. He concentrates on the behavior of the workers who in the presence of (prospective) unemployment would accept lower money wages: this would carry with it the fall in prices, whereas in the book he started from the price level and then considered money wages. So that one could ideally split Pigou effect into two parts, the fall in prices and the fall in money wages. In the EJ paper there is a necessary link going from money wages to prices,[70] so that if workers do not accept lower money wages, prices are not going to fall; in the book prices are falling because savers are changing their behavior, *irrespective* of the behaviour of the workers.[71] In other words the fall in prices would reduce savings and therefore increase aggregate demand, even if money wages were inflexible. This however would lead to a fall in real wages and therefore an excess demand in the labour market! This is a result that Pigou would probably not have liked. Hence my earlier qualification that Pigou in the book by "appropriate adjustment in wages" meant a fall of wages of the same order of the fall in prices. In the paper he changed his description putting the workers and their behavior at the centre of the stage: if they do not accept lower wages, the Pigou effect is not there to be found![72] And indeed he appears to be rather confident in the appropriateness of the classical theory asserting that "That type of stationary state [i.e. high level stationary state] (..) is the goal to which (..) the economic system

[68] For sure not a stationary state as in Pigou!
[69] Pigou does not distinguishes between real and nominal interest as he assumes that in a long run equilibrium prices are given and expected equal actual prices.
[70] Pigou (1943 p.349)
[71] On the passive role of savers in *TU* see Di Matteo (2016 p. 343)
[72] Pigou (1943 p.350: "(..) the money rate of wages being maintained, and, therefore prices (approximately) maintained, the value of the stock of money in terms of real income cannot be expanded."

necessarily tends."[73] He sticks to the EJ reformulation in his later paper (Pigou 1947): although the analysis is more detailed and refined, he derives the fall in prices from the fall in money wages.

6 Comparative statics and dynamics

Let us now briefly describe the third and fourth parts of Pigou's book. Following the discussion about the stationary state two more topics are dealt with.[74] The first concerns the effects on overall employment of different values of parameters or exogenous variables. Indeed he considers single variations, being understood that if there have been changes in many parameters at the same time, the overall result will be the sum of each of them. He is also interested in what he calls "employment multipliers, namely the differences in aggregate employment divided by the associated differences in employment in the investment industries (..)" and further "in money multipliers, namely the differences in money income divided by the associated differences in money investment".[75] In modern language he attempts at performing a comparative statics exercise.[76] In order to restrict the analysis to the most interesting case, Pigou confines his attention to the particular model in which the level of money wages is given from outside and is subject to infinitesimal variations. In additions he postulates on the basis of empirical investigations[77] that the distribution of income between labour and property is fairly constant. He concentrates his calculations mainly (although not exclusively) to the case of perfect competition and normal monetary policy. Leaving aside a detailed study of the whole amount of cases (that can be "very cumbrous") we limit ourselves to report a few results. An increase in the money wage entails a fall in overall employment even if this can be accompanied by a higher level of money income. In terms of our diagram 2' a higher level of money wages shifts the curve downwards and therefore reduces x+y, namely the level of overall employment. Indeed a higher level of money wages induces a higher level of money income (via equation [°]) and an increase in the rate of interest. This will reduce the demand for labour in the investment sector and also the employment in the consumption sector. If the latter did not reduce, real income would generate a level of savings that would remain higher than investment. At the same time Pigou maintains that a higher level of money income (however come about) has the same effect of a proportionate reduction in money wage.[78]

It is interesting to compare these results with those that derive from Hick's model (Hicks 1937). In the latter the effects of a reduction of money wage and an increase in the money supply are not perfectly identical.[79] On the other hand in both approaches an increase in the money wage will reduce employment in the two sectors although in Hicks the reason lies in a corresponding reduction of the real wage following the fall in money wages.

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[73] Pigou (1943 p.350)
[74] Pigou extends the analysis put forward in Pigou (1935)
[75] Pigou (144-5)
[76] Pigou (p. 150) excludes unstable equilibria.
[77] Performed by Bowley (1933), Douglas (1937), and Kalecki (1939) as reported in Pigou (p. 148-9)
[78] Pigou (155)
[79] See Di Matteo (2019)

Further, an increase in the quantity of labour for investment (a surge in optimism) for any given rate of interest, must increase the volume of employment. In terms of our diagram 2' (which in section 4 was traced taking as given the level of optimism) this is an outward shift in the decreasing function h and therefore an increase in overall employment and money income.[80] In Hicks's model on the other hand the effect on total employment is generally zero.[81]

Pigou completes his analysis by examining the model under alternative monetary rules as defined earlier. After that he introduces three more models: one assuming the presence of monopolistic competition uniform across the two sectors, another relaxing the assumption of a constant distribution of income but retaining the perfect competition and finally a third allowing the degree of imperfect competition to be different in the two sectors. Each of this is again examined under different assumptions regarding the conduct of monetary policy. All these possibilities, together with the computation of employment and money multipliers, as defined earlier, are summarized in nine tables relegated in a lengthy appendix.

As said in the introduction we are not to discuss the last part of book where there is an attempt at introducing a dynamic analysis.[82] Pigou refers to his previous book *Industrial Fluctuations*[83] which appears to embody his views about the business cycle. He limits himself to a heuristic discussion of the effects of changes in business confidence as "over *short periods* [italics mine] this type of disturbance plays a leading part in actual life".[84] And he adds: "The essential fact is that variations in this confidence (..) manifest themselves (..) in the form of shifts in the aggregate demand function for labour for investment".[85] On the other hand Pigou recognizes that changes in expectations can, and often do, cause further shifts in expectations: instead of expecting that future demand will continue at the level to which has fallen, the sellers may well expect it to fall still further.[86] Equilibrium however requires that e.g. the downward movement of prices necessary to restore equilibrium no longer creates an expectation of further changes.

7 By way of conclusion

We can summarize the results of our enquiry as follows. For Pigou, a faithful pupil of Marshall, the classical theory concerns the long run. Marshall did not write the section of the theory that examines the behavior of the economy in the short run and over the business cycles. Pigou completed Marshall's theory by developing first a theory of industrial fluctuations (Pigou 1927) and

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[80] In Pigou when g' in eq. (3) is positive, the quantity of money is not given as postulated by Hicks. This was noted by Samuelson (1941, p. 548).

[81] And depends on supply elasticities: see Di Matteo (2019)

[82] For a criticism stressing the inadequacy of Pigou's analysis see Samuelson (1941)

[83] Zenezini (2010) offered *inter alia* an exhaustive and detailed study of the book to which we refer the interested reader.

[84] Pigou (p.212)

[85] Pigou (p. 220). The analysis is integrated by a tentative (back on the envelope) estimation of the multipliers that has theoretically computed in the previous chapter.

[86] Pigou (p.244). This is exactly the kind of objection Keynes raised against the "virtues" of the deflation!

a theory of short run (static) equilibrium (Pigou 1933).[87] But stimulated by Keynes he engaged in further research. In his *E&E* Pigou offers a different view (explicitly abandoning the wage fund theory of *TU*) that includes a short run as well as a long run model of the behavior of the economy. In so doing a provides a comprehensive analysis of the behavior of the economy.[88] Following the analysis put forward in Pigou (1935) he builds two reference frameworks, the short run and the stationary state. According to him the classical analysis, once complemented by the Pigou's effect firstly presented here, is perfectly sound as it only asserts a tendency towards full employment: this is also confirmed, in his view, by a simple statistical analysis. This does not exclude however that, from the theoretical point of view, there is a possibility, identified by Keynes, that the long run can be characterized by a significant level of unemployment (the so called "Day of Judgement"). The latter, according to Pigou, can be the outcome of an extremely high level of the amenity value of savings that, by requiring a negative rate of interest, prevents full employment from being established *when the Pigou's effect does not work, a possibility that is explicitly recognized*. In other words the equilibrium in the labour market has to be supplemented by an analysis of the goods market in order to be sure that demand equals (full employment) output. Contrary to *TU* where the equilibrium in the labour market is all that counts, in *EE* he realizes that the full employment output could be accompanied by an *excessive* level of savings[89]: this however can be eliminated via Pigou's effect.

One of the peculiarity and novelty of Pigou's analysis (overlooked by the previous literature) is that he interprets Keynes as dealing with the very long prospects of the capitalist system: is the latter capable of maintaining full employment in a situation where "year after year more capital is accumulated, openings for profitable investments are progressively filled up"?[90] In this context we have also proposed a comparison between Pigou and a recent attempt by Summers at resurrecting the secular stagnation theory. It must be remarked that the two approaches come to a different conclusion. Pigou argues, within a well specified stationary state context, where there could be no difference between the rate of return on capital and the borrowing cost or, seen in a different perspective, between the rate of return on different assets. In such a situation the possibility of an equilibrium negative rate of interest is discarded as the Pigou's effect (when it works) shifts the savings function appropriately making the full employment stationary state achievable. On the contrary Summers implicitly allows a difference between the rate of return on investment and the real rate of interest as the borrowing cost of capital. Full employment equilibrium could require the latter to be negative: this cannot be reached via Pigou's effect which, on the contrary, would be destabilizing, according to Summers. And cannot be achieved through monetary policy as there is a lower bound on nominal interest rate.

As for the short run Pigou puts forward a theory of output and employment that is rather different from the one developed in *TU*. He abandons an approach that was mainly in real terms and based on

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[87] For the first book see Zenezini (2010), for the second Di Matteo (2016)
[88] This appears to reflect his considerations in the Presidential address where he acknowledges that "now the short run presents itself with far greater urgency relatively to the long run than it did then [namely the period from 1890 to 1910]". (Pigou 1939 p.217)
[89] He also provides a possible micro foundation for this behaviour without appealing to an unexplained "propensity" to save.
[90] Pigou (p.122)

the wage fund theory coming close to the model by Hicks (1937).[91] However, as we have mentioned earlier in the paper, the results are not wholly coincident and, even when they are, the working of the two models are rather different. The novelty is that, differently from *TU*, he discards the assumption that all profits are saved and reinvested and takes into consideration also the market for savings/investments.

The book we have discussed is an important step in the exchange between Keynes and Pigou and marks a position that is different from the model of the *General Theory* and aims at the same level of generality: I repeat that it is not the task of my reconstruction to pass judgment on the validity of the real balance effect. Indeed Pigou maintains that the position of the classical school (supplemented by the Pigou's effect) for the long run is sound and that there is also a classical monetary model of the short run: in a nutshell, Keynes's theory is either too pessimistic (in the long run) or superfluous (in the short run).

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[91] As remarked by Roncaglia & Tonveronachi (1985, p.53)

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