Chapter 11

Revisit Phillips Unemployment: Evidenced Wholly from Curves to Lines, for 86 Countries by Sector

Foreword to Chapter 11

Phillips, A. W. (1950,1954, 1956, and 1958) suggests us a righteous direction and goal of economics, when evidences attain theory=practice, as questions raised in *Newsletter* 165 April 2014, *RES*. Relying on the real assets of the SNA (1993, 2010), the author's evidences show that we enjoy full-employment under no inflation/deflation by country, reinforcing the market principles by goods/services in a whole economic system and cooperating macro and micro, vertically, horizontally, and geometrically, and using KEWT Short database 9.15, 1990-2013. The author proves in reality that the smaller the deficit at the government sector, the less the inflation/deflation rate is. This is because the real rate of returns/profits equals zero under inflation/deflation=GDP growth.

Special for Readers

Phillips, A. W. (1950, 1954, 1956, and 1958) makes it possible to lead us to a utopian economy by country and by sector (Total, Government, and Private sectors) in that people by country could enjoy full-employment under no inflation/deflation. The literature has approaching this goal totally and step by step, as currently pursued by Features of *Newsletter* 165 April 2014, *Royal Economic Society*. Behind Phillips empirical researches, according to the author's purely endogenous standpoint with no assumption to each equation, key words are hidden in open economy: Saving and net investment by sector, the balance of payment and deficit, the growth rate of population=the rate of change in population, preferences (national taste, culture, and history), the rate of technological progress as flow, the growth rate of total factor productivity (*TFP*) as stock, the relative share of capital/labor, the capital-output ratio, the rate of return/profit, the growth rates of output and per capita output, the endogenous Phelps coefficient between the rate of return and the growth rate of output, macro inequality by individual, the qualitative net investment coefficient, β^*, the valuation ratio, the speed years for convergence, business cycle, seven endogenous parameters, all the parameters and variables, dependent and independent. These values and ratios are precisely measured once a constant capital-output ratio is measured in the Kamiryo Endogenous World Table (KEWT) Short database 9.15, 1990-2013.

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Why is it possible for us to purely measure any parameter and variable? This is because a Cobb-Douglas production function holds under constant returns to scale by revealing hidden parameters and variables under a constant capital-output ratio by year and over years. Yet, exogenous results related to Phillips curves are still connected with endogenous results using the database 9.15. This is because statistics data remain within a certain range of endogenous data and endogenous data take their original data from ten real asset values and fifteen financial/market and external data published in "*International Financial Statistics Yearbook* (*IFSY*)," IMF. What do these mean? Statistics data are recording-oriented and can be overlap endogenous data that are solely policy-oriented and successfully used for fundamental methodology in economic and social policies.

Concretely, seven endogenous parameters are a key for evidences of full-employment and no inflation/deflation and directly measured by the speed years for convergence. Also, full-employment is not alternative against how to attain equality, macro and micro. Furthermore, the speed years for convergence originally have a specific case that results in minus years, which is properly related to arithmetical combination between the capital-output ratio and β^*. The speed years for convergence, however, have another case that express the quality of the endogenous-equilibrium. The quality differences appear each in several stages between developing to mature economic stages. In anyway, the wage rate naturally (without artificial treatments) increases with full-employment so that wages and returns/profits must be direct target for evidences in this chapter.

Acknowledgements

From the bottom of my heart, I present this chapter to late Phillips, Alban William Housego (1914-1975). While I was reading his original papers (1950, 1954, 1956) repeatedly, I could learn my lesson which is an invaluable fact that Phillips was helped by Mr. and Mrs. R. W. Langley who made the original order-made machine series, for Phillips' experiments and evidences. As a result, Phillips could complete his researches mechanically as well as theoretically. Wonderful, indeed!

In addition, I appreciate the extra pairs of eyes offered by James Ronald, Prof. in English, and his student, Yumiko Tsuhara, an expert librarian at my University Library. I am much obliged to their librarians as well; Tajuma, Masuda, Toyama, Watanabe, and others.

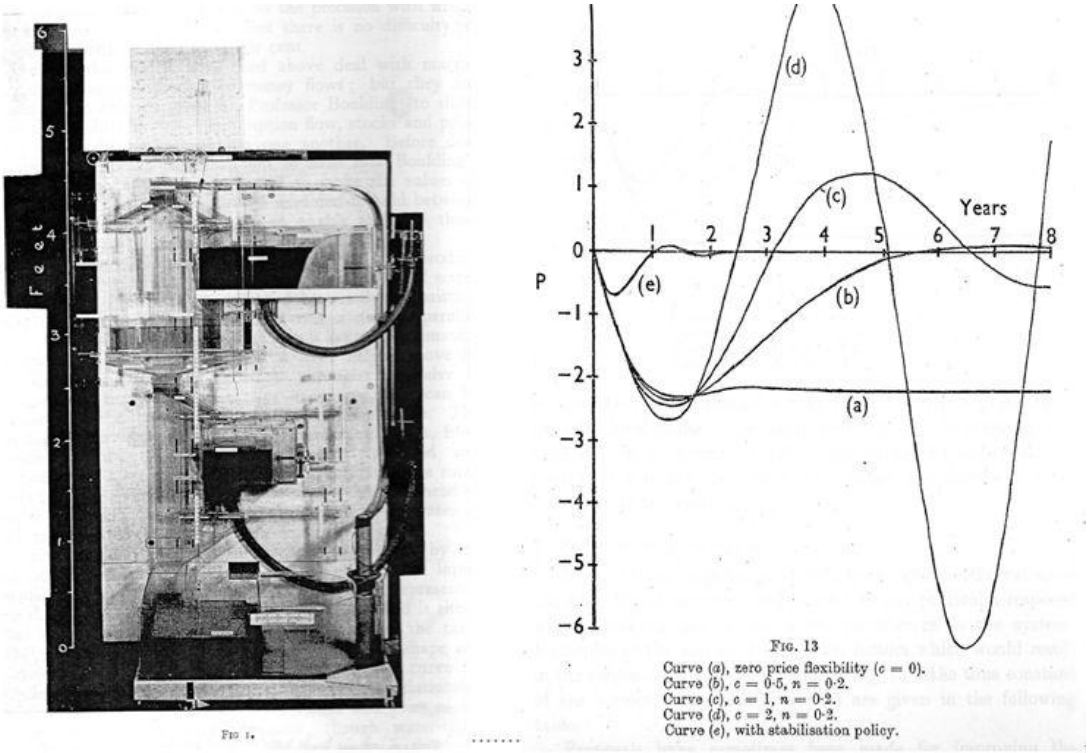


Fig. 1.

Fig. 13
Curve (a), zero price flexibility ($c = 0$).
Curve (b), $c = 0{\cdot}5$, $n = 0{\cdot}2$.
Curve (c), $c = 1$, $n = 0{\cdot}2$.
Curve (d), $c = 2$, $n = 0{\cdot}2$.
Curve (e), with stabilisation policy.

LHS: Phillips, A. W. (282, *Economica*, 1950) by Langley family. ····· RHS: Phillips. (312, *the EJ*, 1954)

1. Introduction

This chapter is directly connected with the following new fact-findings:

i) The real rate of return=zero.

ii) National taste is independent of technology.

iii) The macro-inequality independent of the relative share of technology.

iv) Deficit=zero is most effective=efficient and results in highest growth rate of output and rate of return.

These fact-findings were discovered during and after publication of the *EES*, or, "*Earth Endogenous System* (the 1st Ed. in 2013; the 2nd Ed. in 2014)" and, are included in this book. These fact-findings and results are geometrical and, simpler and shorter than the *EES* 2nd. Happily, all the fact-findings, past and future, are consistent with endogenous equations and reduced forms expressed by hyperbolas.

What is simpler and shorter in the above fact-findings? First of all, the speed years are always shown by plus values after converting minus by plus. Nevertheless, the essence of the *EES* has never changed. When the qualitative level of the speed years is low, there appears sudden, rapid, or delicate business

cycle. When the qualitative level of the speed years is high, there appear sustainable, balanced and dynamic, or over 100 years business cycles; typical case might be close to Nature. What are the most interesting evidences by country? The relative share of capital/labour is independent of stop macro-inequality and yet, the higher the relative share of capital, the higher the rate of return and accordingly, the growth rate of output and the valuation ratio against assets bubbles. Stop macro-inequality is never inconsistent with full-employment and rather reinforces full-employment under inflation/deflation. Then, are assets-bubbles inconsistent with inflation/deflation? Here, even if deficit is zero, do assets bubbles occur in reality? Is there good and bad circulation of business cycles? Capital, flow and stock, obeys Axiom 1 as a constant capital-output ratio, where the rate of technological progress is consistent with the rate of Total Factor Productivity (*TFP*) precisely measured, differently from that reported in the literature. The speed years are essentially not stock but flow: Is 'the speed years' a top butter against stock-oriented assets-bubbles in the *EES* and this book? This is proved and evidenced by presenting pertinent data and related figures in this chapter.

The *EES* has been evidenced by KEWT series, LONG and Short, since 2007 (1.07; 1990-2005): Databases, 1.07, 2.08, 3.09, 4.10, 5.11, 6.12, 7.13, 8.14, and now 9.15 (1990-2013). Except for the changes in the original statistics data in *IFSY*, IMF, these endogenous data will not change even for 100 years, because results=causes under no assumption and accordingly, under perfect competition.

Lastly, for evidences: Features of *Newsletter* 165 April 2014, *Royal Economic Society*. Has two sub-title in 'Can economics be evidence-based?.' The first: Is it possible to build theories that are based on evidence? The second: Where do explanatory categories come from? The author does not repeat each in detail but, in References at the end of this chapter the author cites related URL with one article written by Katarina Juselius (2011). We are approaching harmonious stage where statistics and endogenous economic analyses are united wholly as a system. The only difference between statistics and endogenous is (1) just after the redistribution of total taxes to enterprises and households or (2) just before the redistribution of total taxes to the government sector and the private sector. Concretely, accounts names are: (1) *GDP* or Gross national Income (*GNI*), or after capital consumption (economic depreciation) or, (2) National Disposable Net Income that evidences the sum of saving and consumption equals the sum of wages and returns/profits. The former is estimated and forecasted and the latter scientifically and accurately measured with 100 % probability and reproducibility when the size of government is appropriate or the rate of return is maximized while net investment is minimized by sector.

2. Methodology:
Key equation structure reinforced by hyperbola functions

For simplicity, this chapter does not repeat notations or cite pages for endogenous equations in the *EES*. The key equations are geometrically expressed by the following three classifications: i) $speed(i)$ and $speed(n)$; ii) $i(n)$ and $n(i)$; and iii) $r^*(i)$ and $r^*(n)$.

In equilibrium, the theoretical wage rate (endogenously measured; hereafter the wage rate) is the same by sector and by year. In addition, equilibrium is tightly connected with the growth rate of population. Policy-makers are able to attain full employment with any growth rate of population when equilibrium is attained moderately by changing the current parameters with various policies. The external rate of unemployment in statistics is now replaced by an endogenous rate of employment, where statistically the rate of employment is minus (unemployment exists), zero (full employment exists), or plus (over-employment exists). What determines moderate equilibrium?

This is the speed years for convergence as one divided by the convergence coefficient: $1/\lambda^* = 1/(1-\alpha(n+i(1-\delta_0)(1-\beta^*)))$. The speed function of the growth rate of population, $\left(\frac{\mathbf{1}}{\boldsymbol{\lambda^*}}\right)(n)$, is hyperbolic. Its vertical asymptote is $n = -\frac{\boldsymbol{i(1-\beta^*)(1-\delta_0)}}{\boldsymbol{(1-\alpha)}}$. The more minus the vertical asymptote the more room for the level of *n* is. The closer a manipulated *n* is to the vertical asymptote, the more risky is the economy. For instance, if the vertical asymptote is close to zero, *n* for equilibrium, n_E, is less than *n*, where the rate of employment is minus and unemployment exists. If the vertical asymptote is significantly minus, n_E is more than *n*, where the rate of employment is plus and over-employment exists. Unemployment and over-employment hold due to the change in the marginal wage rate by sector.

For the growth rate of population, the rate of return function of *n* exists, $r^*(n)$: $r^* = \left(\frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)} + \frac{\alpha(1-\alpha)}{i\cdot\beta^*(1-\alpha)}\right)n + \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}$, where its gradient and intercept are measured at the same time. This function is linear, but not directly related to the inflation/deflation rate. The relationship between the inflation/deflation rate and the rate of return, r^*, was clarified in the *EES*. This is shown as an extension of Fisher, I. (1907, 1930). Similarly to the replacement of the rate of unemployment in the literature by a plus or minus endogenous rate of employment as in this chapter, the author expresses an endogenous inflation rate by using plus and, an endogenous deflation rate by using minus. The inflation/deflation rate is measured by connecting the market 10 year debt yield with $r^*(i)$. The inflation rate is the market 10 year debt yield (*N*) less the real rate of return (*R*) while the deflation rate is the real rate of return (*R*) less the

market 10 year debt yield (N): N–R versus R–N. The $r^*(i)$ has its horizontal asymptote, $r^*_{HA} = \frac{\alpha(1-\beta^*)(1+n)}{\beta^*(1-\alpha)}$. The real rate of return is shown by $r^* - r^*_{HA}$. In short, inflation/deflation rate is derived using $r^*(i)$ and externally, using the market 10 year debt yield.

As a result, the relationship between the inflation/deflation rate and the rate of employment are each independently derived. This relationship cannot be directly derived using a new function. The conventional Phillips' curve sets the external inflation rate on the Y axis and the rate of unemployment on the X axis, each externally and independently. The author's Phillips' curve independently sets the inflation/deflation rate on the Y and the rate of employment on the X axis. However, definite differences between the author's and the conventional Phillips curves are: (1) the two items are each external versus endogenously measured, (2) no existence of equilibrium versus existence of equilibrium, (3) the two items each have plus and minus values versus the inflation rate and the rate of unemployment each as plus, and (4) line (with gradient and intercept) versus curve (but without hyperbolic curve since no equation exists behind).

This chapter will first present various cases using the data-sets, comparing the author's Phillips' line with the conventional Phillips's curve. The author proves that the conventional Phillips' curve cannot show a certain fixed results.

3. Evidences:
Key equation structure reinforced by hyperbola functions

The above equations and their reduced forms are presented using tables and figures mathematically and geometrically in this section, after up-dating all the data using Short 9.15, 1990-2013. The author interprets typical common cases by country.

As shown in Supplements separated, the *EES* is 'evidence-based,' whose terminology comes from Newsletter, Issue no. 165, April 2014 (see References below). The *EES* is solely causes=results oriented so that always it is evidence-based. Under the market principles (plural), markets are classified by market. For example, Salop, Steven, C. (1979) defines the natural rate of unemployment in the labor market. Who could integrate all the markets? This is unknown but the market principle (single) will wholly determine the results, where causes=results prevails scientifically.

The stream of Phillips curve questions Non-Accelerating Inflation Rate of Unemployment (NAIRU). Does NAIRU hold under the market principles (plural) or under the market principle (single)? Both 'plural' and 'single' are the same so that NAIRU holds similarly, with no distinction between 'plural' and 'single.' The *EES* and the KEWT database series, however, always clarify the

essence of NAIRU definitely using endogenous data and wholly as a measurement-system.

For example, the author analyse 17 tables designed for the essence of Phillips curve, as shown in **Supplement** (1). Endogenously, there is no inconsistency between Phillips curve and the essence of the real assets; full-employment, deficit & the balance of payment, and inflation rate, growth rate, and the rate of technological progress.

Table 1 The inflation/deflation rate derived using real assets and the 10 year debt yield

The government sector	For the inflation rate (+)			For the deflation rate (-)			
unit: %	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Remarks
Real 1. r^*	8	7	6	-2	-5	-9	Minus' shows the trap of liquidity.
(at real assets 2. r^*_{HA}	4	3	2	-1	-2	-3	If $r^*_{HA}=0$, $r^*=r^*_{REAL}$.
3=1-2; $r^*_{REAL}=r^*-r^*_{H}$	4	4	4	**-1**	**-3**	**-6**	To match $r_{DEBT}=0$ as a lower limit
Real is only measured endogenosu	If r^*_{REAL} defined as $r^*-r^*_{HA}$ is minus, it shows the trap of liquidity.						
Market 4. r_{DEBT} (as an external	10	7	5	3	2	1	A trustworthy signal from the market
5=4-2 (for def., 2-4): $r_{DEBT}-r^*_{HA}$	6	4	3	-4	-4	-4	To confirm the work of r^*_{HA}
6=4-1 (for def., 1-4): $r_{DEBT}-r^*$	2	0	-1	-5	-7	-10	To test an inflation/deflation gap
7. Inflation/deflation rate: (4-3) or (3-4)	**6**	**3**	**1**	**-4**	**-5**	**-7**	Able to manipulate a 'desired' level.

1. For the inflation rate (+), **Nominal** = **Real** + Inflation rate, where the lower limit of the nominal interst rate is zero.
2. For the deflation rate (-), **Real** = **Nominal** + Deflation rate, where the upper limit of the nominal interest rate is zero.
3. The inflation rate = **Nominal** - **Real** holds, but the deflation rate = **Real** - **Nominal** holds; as an expansion of Fisher, I. (1907, 1930).

Further, evidences and causes=results are tested by **Tables 1**, **2**, and **3** that each simulates all the range of geometrical equations/functions plainly and accurately (compare these results with **Appendixes 1**, **2**, and **3** in **Supplement** (1)).

Table 2 Fundamental structure of the rate of unemployment to the growth rate of population: the total economy and the government sector

unit: %	Milder to the unemployment rate			Sensitive to the unemployment ra			Remarks
The total economy	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	As illustarative cases
at real asset: 1. Intercept of r*(n)	20	10	5	5	10	20	1. and 2. have the same sign.
2. Gradient of r*(n)	40	40	40	160	160	160	as a linear line
3. The VA of the speed of (1/λ*)	-200	-100	-50	-100	-50	-20	as a hyperbolic curve
1/3: Intercept / the VA of (1/λ*)(	-0.100	-0.100	-0.100	-0.050	-0.200	-1.000	The minus the quatient the more norr
2/3: Gradient / the VA of (1/λ*)(	-400	-400	-400	-3200	-800	-160	The minus the quatient the more norr
The government sector	Case 7	Case 8	Case 9	Case 10	Case 11	Case 12	**Abnormal cases with huge deficits**
at real asset: 1. Intercept of r*(n)	-5	-10	-20	-5	-10	-20	1. and 2. have the reverse sign.
2. Gradient of r*(n)	50	50	50	-200	-200	-200	as a linear line
3. The VA of the speed of (1/λ*)	-100	-100	-100	100	100	100	as a hyperbolic curve
1/3: Intercept / the VA of (1/λ*)(	0.050	0.100	0.200	-0.050	-0.100	-0.200	The minus the quatient the more norr
2/3: Gradient / the VA of (1/λ*)(	1000	500	250	4000	2000	1000	The minus the quatient the more norr

1. r*(n) is a linear funtion of *n: r*=a+bn. T*he more above zero its intercept the more employment is if its gradient is positive.
2. If the gradient is zero, the employment is neutral to the growth rate of population, *n*. The *n* externally given shows always full employment.
3. The vertical asymptotoe of (1/λ*)(n) is usually minus (at the fourth quardrant). The more minus the VA, the more stable the employment is.

Table 3 The rate of unemployment as the difference between full employment at the initial *n* and the n_E in equilibrium by sector

unit: %		Unemployment. in equili. is near the			Equilibrium by sector is far from the full			Remarks
The total economy & by sect		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	As illustarative cases
1. n at full employment		1.10	1.10	1.10	1.80	1.80	1.80	Due to flexible *r* and *w* by year
in equilibriun	2. $n_{EQUI(G)}$	1.10	0.85	1.25	1.80	1.00	0.40	By huge deficit, $n_{EQUI(G)}$ is near ze
	L_G/L for $n_{EQUI(G)}$	0.15	0.15	0.15	0.25	0.25	0.25	$L_G=L(W_G/W)$, where $w=w_G=w_{PR}$
in equilibriun	3. $n_{EQUI(PRI)}$	1.10	1.30	1.00	1.80	1.60	1.40	Equilibrium differs by sector.
	L_{PRI}/L for $n_{EQUI(PRI)}$	0.85	0.85	0.85	0.75	0.75	0.75	Each data is theoretically measure
4=2+3: n_{EQI} as a weighted averag		1.10	1.23	1.04	1.80	1.45	1.15	$=n_{EQUI(G)}(L_G/L)+n_{EQUI(PRI)}(L_{PRI}/L)$
5=4-1: unem.rate; if it is zero, $w=w_G$		0.00	0.13	-0.06	0.00	-0.35	-0.65	If $n_{EQUI}>n$, $w_{PRI}<w_G$ is suppose
(un)employ	6=2-1: $n_{EQUI(G)}$-n %	**0.0000**	-0.2500	0.1500	**0.0000**	-0.8000	-1.4000	Either usual minus (-) or plus (+).
ment rate	7=3-1: $n_{EQUI(PRI)}$-n %	**0.0000**	0.2000	-0.1000	**0.0000**	-0.2000	-0.4000	Often influenced by the G sector.

1. Equilibrium (EQUI) by sector differs significantly: the G sector is more delicate to reach EQUI than the PRI sector.
2. If equilibrium by secor is obtained under $n=n_{EQUI(G)}=n_{EQUI(PRI)}$, full employment is enough maintained by sector.
3. $w=w_G=w_{PRI}$ by year is always maintained by year, but each marginal wage rate significantly differs by year and sector.

4. Concluding remarks

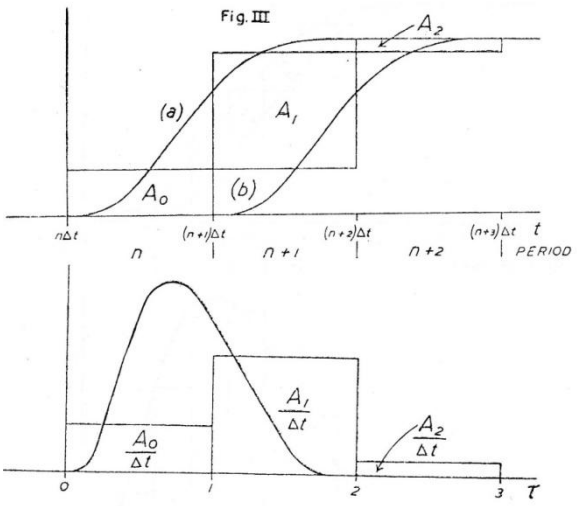
Endogenously, geometrically, and mechanically and cyclically, as evidenced by Phillips (1950, 1954), our society has steadily approached *full-employment*, *no inflation/deflation*, and *the real wage increasing* in sustainable economies by country. This is Utopia economy by country (please, recollect a beginning chapter of "Royal Roads to Utopia Economy"). This chapter summed up ultimate evidences illuminated by the lighthouse of Utopia Sea. This chapter is in reality in the real assets.

This chapter has two supplements for evidences and fact-findings in Phillips target: One, **Supplement** (1), is geometrically composed of a short essay and three Appendixes, with figures full of ideas in a broad range although these data are not so new. The other, **Supplement** (2), only shows figures that deepen the essence of Phillips target and use up-dated data based on KEWT database series 8.14 and 9.15. Concluding remarks here plainly clarifies the essential evidences of Phillips target and interprets **Supplement** (2) principally without referring to mathematical and geometrical terminologies, parameters, and variables.

Figures **1** to **17** in **Supplement** (2) is composed of two parts: One on the LHS is; i) the rate of inflation shown endogenously measured by horizontal asymptote (HA) using the rate of return to net investment/national disposable net income, *Y*; ii) the actual rate of unemployment; iii) the rate of change in CPI. These three data in each figure clarify transitional relations between the rate of inflation and external unemployment and external prices in consumer goods. Each country has shocks during 23 years or so, 1990-2012, and differently due to national taste and preferences. The base is the HA, as an accurate measure vaguely hidden in actual statistics data. The HA is a key for solving complicated threads, vertical and horizontal under the market principles.

The other on the RHS is; i) the technological coefficient, β^*; ii) the coefficient, *x*, between the rate of return and the growth rate of output, which is composed of the relative share of capital, the technological coefficient, and iii) the valuation ratio that avoids assets bubbles, *v*, which is composed of the rate of return and the cost of capital. These three data are deeply connected with each other. Circumstances surrounding the endogenous-equilibrium are mostly expressed by these three data. When the circumstances are weak in equilibrium, signals are shown much clearly. The HA empirically exists and controls Phillips target. Actual data are always within a certain range of endogenous data.

The wage rate is wholly based on the endogenous-equilibrium (see a specified chapter that connects the (real) wage rate with the propensity to save/consume by country). The wage rate is an ultimate key for expressing and solving all the economic policies taken by decision-makers for the last 23 years or so. This is because $\boldsymbol{Y = C + S = W + \Pi}$ holds by country, sector and years and over years, under market productivity of capital = the rate of return and, marginal productivity of labor = the wage rate in an open economy, where the balance of payments is composed of deficit plus the difference between net saving and net investment at the private sector just before redistribution of taxes. References below support historical accumulations of the literature.



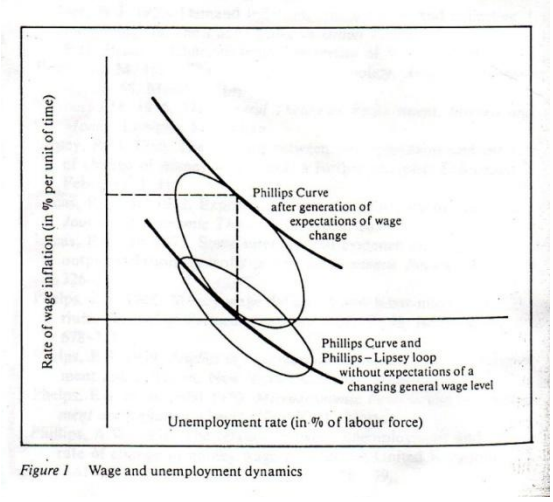


Figure 1 Wage and unemployment dynamics

Appendix Figures

Left: Phillips (1956), page 106. Fig I, after 1954;

Right: Phelps, Edmund (*A Dictionary of Economics*, 1987), 858, Fig. 1

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www.res.org.uk/view/resNewsletter.htm
Can economics be evidence-based? pp.14-16. Sub-titles are the following:

1. In this follow-up to his earlier article, Michael Joffe, Imperial College, discusses what it means for economics to be 'evidence-based'.
2. Evidence-based economics in context.
3. If it's untrue, don't accept it.
4. Is it possible to build theories that are based on evidence?
5. Where do explanatory categories come from?
6. Theories and models.
7. Conclusion.

Notes:

1. http://www.res.org.uk/view/art6Oct13Features.html
2. The phase 'evidence-based economics' has previously been used, notably by the philosopher of economics Julian Reiss: see in particular his 'Evidence-based economics—issues and some preliminary answers' (2004) *Analyse & Kritik* 26: 346-363; and his book, *Error in economics: towards a more evidence-based methodology* (Abingdon: Routledge, 2008).

   There is also a doctoral programme on this subject, based in Munich: see http://www.evidence-based-economics.de/home.html and a letter in the last issue of this Newsletter. Another contribution is by Sean Harkin, in *World Finance*:
   http://www.worldfinance.com/home/contributers/evidedence-based-economics

   The phrase 'evidence-based economics' has also been in a number of articles, to bolster a particular viewpoint, sometimes without any actual evidence being presented. On the other hand, many authors have embraced a position close to that argued here but without using the phrase 'evidence-based economics), e.g., Katarina Juselius (2011) 'Time to reject the privileging of economic theory over empirical evidence? A reply to Lawson' *Cambridge Journal of Economics* 35 (2): 423-436.