Rueff's Laws of Unemployment and Inflation

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ABSTRACT. Judging from empirical evidence confirming his theories nearly a century after he formulated them, the French economist Jacques Rueff (1896-1978) was almost certainly the most under-rated economist of the 20th century.

After reviewing evidence showing that the formerly dominant Phillips Curve explanation has not merely shifted but reversed, the paper considers revisions to Keynes's economic model proposed by Rueff, Keynes's frequent debating partner.

Finally, the paper tests Rueff's economic model in the United States, providing strong support for both 'Rueff's Law of Unemployment' and 'Rueff's Law of Inflation.' The paper concludes by briefly outlining the main economic policy consequences.

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1. *The Phillips Curve's disappearance*.

After dominating discussion of macroeconomic policy for several decades, the Phillips Curve disappeared just as its partisans were preparing to celebrate its 60th anniversary. This fact strongly suggests that economists must re-learn Rueff's Laws of Unemployment and Inflation.

'Every prejudice, which has long and extensively prevailed among the educated and intelligent,' John Stuart Mill once observed, 'must certainly be borne out by some strong appearance of evidence; and when it is found that the evidence does not prove the received conclusion, it is of the highest importance to see what it does prove' (Mill, 1844). Since countless economists, policymakers and central bankers still presume (and teach) the Phillips Curve, its disappearance requires us to ask what the Phillips Curve ever did prove.

Since shortly after its first graphical exposition (Phillips 1958), a 'Phillips Curve' tradeoff between inflation and unemployment has been advocated by followers of John Maynard Keynes (Samuelson and Solow 1960, Blaug (1962) cf. Friedman 2010, Schwarzer 2013) and used as a primary input into policy decisions by the Federal Reserve and other official monetary authorities (Gordon 2011, Lipsey 2016). Understanding whether empirical evidence actually supports the Phillips Curve is therefore crucial for understanding the influence of monetary policy.

The Phillips Curve apparently had the twin attractions of a strong appearance of evidence and sometimes elegant theoretical parsimony (e.g., Ball and Mankiw 2002). Yet its implicit economic theory was anomalous in at least two ways: First, it attempted to explain a 'real' variable, the unemployment rate, with a nominal variable, the rate of change in a price or wage index. Second, though inflation is essentially ('always and everywhere' according to Friedman 1968) a monetary phenomenon, the Phillips Curve theory did not include any form of money.

Moreover, the Phillips Curve appeared to shift substantially. As Roberts (2006) summarized: 'Since the early 1980s, the U.S. economy has changed in

some important ways: inflation now rises considerably less when unemployment is low, and the volatility of output and inflation have fallen sharply. This paper examines whether changes in monetary policy can account for these changes in the economy. The results suggest that changes in monetary policy can account for most or all of the change in the inflation-unemployment relationship. In addition, changes in policy can explain a large proportion of the reduction in the volatility of the output gap.'

The reduced form of the Phillips Curve used by Roberts (2006) is

$$(\pi_t - \pi_{t-4}) - (\pi_{t-4} - \pi_{t-8}) = \Upsilon_0 + \Upsilon_1(\Sigma_{i=0,3}\, uer_{t-i})/4 \qquad (1)$$

where $(\pi_t - \pi_{t-4})$ indicates the four-quarter percent change in core PCE price inflation and *uer* is the civilian unemployment rate.

Table 1.

The Disappearance of the Phillips Curve

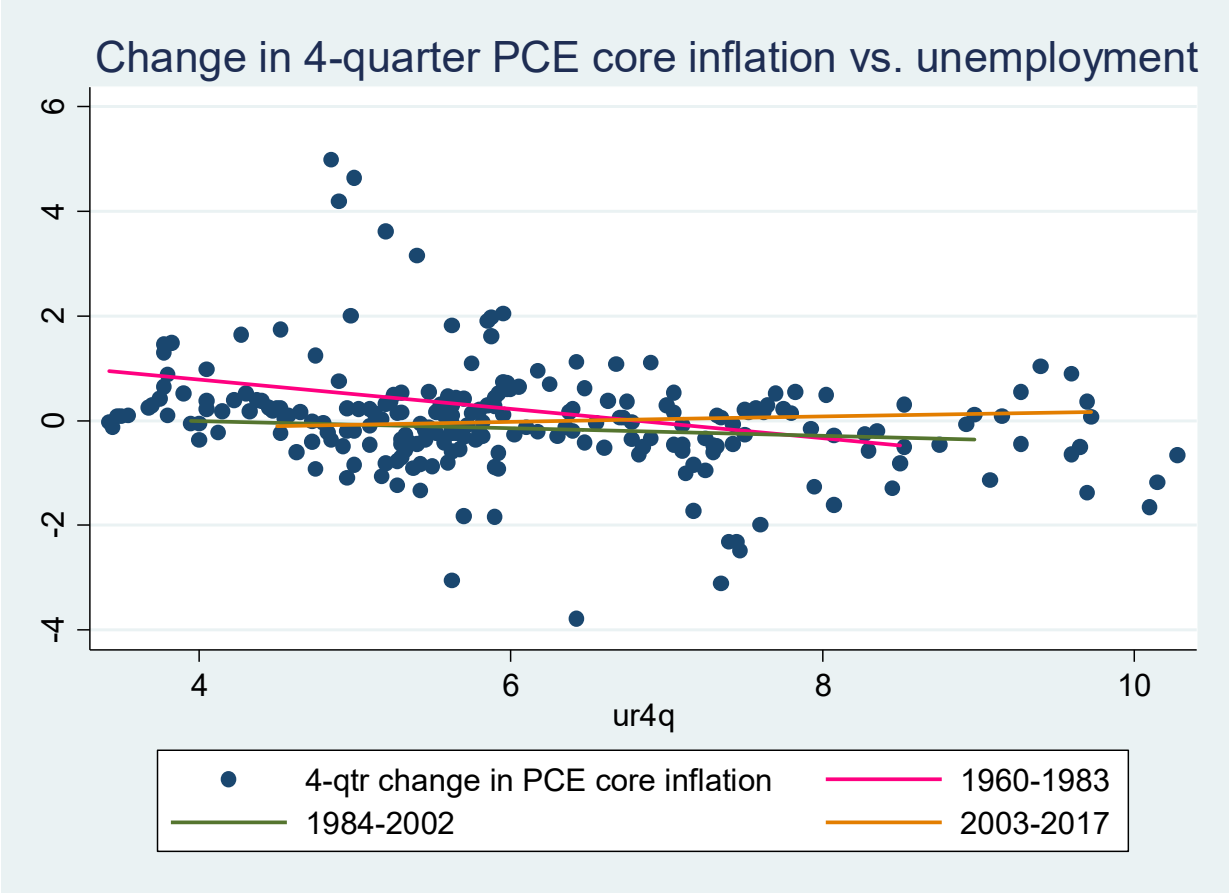
Core PCE deflator	Unemployment Rate	CBO Output Gap
2003:Q1-2017:Q4)	**+.047**	**.318**
	(.05)	**(.078)**
1984:Q1–2002:Q4	**–.072**	**.355**
	(.048)	**(.071)**
1960:Q1–1983:Q4	**–.378**	**.207**
	(.078)	**(.043)**
1960:Q1–1979:Q4	**–.281**	**.355**
	(.115)	**(.071)**

Roberts's measurement began in 1960Q1 and ended in 2002:Q4. But updating the same model yields the results shown in Table I. Rather than merely shifting, the Phillips Curve has disappeared altogether. Instead of a smaller *inverse* tradeoff between inflation and unemployment, in 2003-2017 there was actually a slightly *positive* (albeit not statistically significant) relationship between unemployment and inflation, as shown in Figure 1.

Figure 1

The Phillips Curve's Disappearance

(Updating Roberts 2006)



2. Keynes's Economic Model.

Blaug (1962, 654ff) simply and elegantly presented the core of the Keynesian system as follows:

'The first and still most widely accepted interpretation of Keynes's meaning is the so-called 'income-expenditure model' associated with the names of John Hicks and Alvin Hansen…. If we ignore the government sector and the complications of the balance of payments, this Hicks-Hansen model of Keynes can be represented by five equations:

'The income function: $Y = C(Y,r) + I(Y,r)$. (1)

'The demand for real balances: $D_n = L(Y,r)$. (2)

'The aggregate production function: $Y = f(N)$ *with* $f'(N) > 0$ *and* $f'(N) < 0$. (3)

'The demand for labour: $f'(N) = F(w/\Pi)$ (4)

'The supply of labour: $N = N(w/\Pi)$ when $w \geq w'$. (5)

To explain his notation Blaug added, '*Y* has hitherto referred to total money income. It will simplify the notation in this chapter if we now let it stand for the net national product at constant prices or total money income divided by a price index of goods and services entering into NNP. We have used *C* before to mean fixed capital. But traditional usage demands that we use it now for real consumption. All the other variables have the same meanings as before. Labor is the only variable factor of production and the labor demand schedule is derived by taking the first derivative of the aggregate production function. The demand and the supply of labor are functions of the *real* wage rate, and indeed all the equations are functions of 'real' values...'[1]

[1] I changed Blaug's notation slightly, altering P to Π and p to π to avoid confusion with *p*, which represents payroll taxes in equation 4(a) below.

Blaug helpfully added detailed charts and discussed several different interpretations of what Keynes 'really meant,' before concluding: 'The *General Theory* is simply an untidy book - like Ricardo's *Principles,* Marx's *Capital* and Bohm-Bawerk's *Positive Theory* - that contains not one, not two, but three or four 'models' of the workings of a modem economy.'

From the beginning, both partisans and opponents of Keynes's *General Theory* were bedeviled by difficulty understanding his theory of 'unemployment equilibrium,' and exactly which assumptions he was making. Donald Patinkin took a common-sense approach to argue that unemployment equilibrium ''is an indefensible position. For flexibility means that the money wage falls with excess supply, and rises with excess demand; and equilibrium means that the system can continue through time without change. Hence, by definition, a system with price flexibility cannot be in equilibrium if there is any unemployment'' (1948, 562). Others, perhaps most, like Barro and Herschman (1971), followed Patinkin's lead in seeking to explain the dynamics of unemployment disequilibrium.

But we will ignore these complications for two reasons: first, in order to focus on what Blaug correctly called 'the first and still most widely accepted interpretation of Keynes's meaning.' Second, because Rueff's interpretation that unemployment is compatible with general equilibrium even as described by Patinkin--but for reasons quite different from Keynes's.

We noted above two of Keynes's simplifications (as Blaug paraphrased them): 'we ignore the government sector and the complications of the balance of payments'). Such omissions may be and have been rectified (e.g. as summarized in Mundell 1968 and Mundell 1971) by adding and substituting equations as necessary, while retaining the system's essential simplicity. For example, to include both the government and an open rather than closed economy, the income function is now typically rewritten as

Income function: $Y = C(Y, i) + I(Y, i) + G + B + [(X – M) \equiv] NX$ (1.1)

where *G* is government spending on goods and services (typically financed by an income tax τ), *B* is social benefits distributed to persons (typically financed by a payroll tax *p*), *X* is exports and *M* imports of goods and services, and *X* - *M* is defined as net exports, *NX*.

As Blaug further noted, 'Labor is the only variable factor of production,' even though equation (1) includes investment *I* in another productive factor, so-called nonhuman capital. Thus the production function may be rewritten:

Aggregate production function: $Y=f(K,N)$ *with* $f'(K)>0, f'(K<0, f'(N)>0\ f'(N)<0$. (3.1)

Finally, although equation (2) specifies the demand for real balances, there is no corresponding equation for the supply of real balances, even though, as Blaug noted. Keynes implicitly assumed that 'the money supply [is] an exogenous variable determined by the monetary authorities.' This omission also may easily be remedied by substituting the typical equation for the corresponding 'M' part of the usual Hicksian IS-LM model:

Supply of real balances: $M_N/\Pi = f(Y, i)$ (6).

where M_N is the supply of base money and Π is the index of product prices.

Keynes's model omits logically necessary microeconomic foundations, including the utility function, from which any economic agent's demand curve is derived (as in equations 2 and 5), as well as omitting a function specifying each agent's distribution of income or wealth among him- or herself and other agents: an equation describing personal gifts and/or what Aristotle called domestic or political 'distributive justice.'

Every individual economic agent's utility function should be described as a scale of preference for non-persons k, which is expressed in the familiar neoclassical utility function:

Utility function: $U_i = U(k_1,k_{2,},\ldots,k_n)$ (9)

Though typically omitted in neoclassical theory, every economic agent's distribution function must also be described as a scale of preference, but for persons rather than things, expressed by agent *i*'s distribution of income Y_i between himself, D_{ii}, and other persons D_{ij}:

Distribution function: $D=\sum D(ii..Dij)/Y_i$ (10)

Similarly, in the case of a marriage *M*, fo(10.1)r-profit business partnership *F,* non-profit partnership*, J*, or government *G*, each member shares in determining the joint distribution function of that social unit. The form is the same as in equation (10), except that here decisions are made jointly by the social community rather than by an individual.

Omitting either the utility or distribution function results in the neoclassical model's 'under-determination,' by virtue of containing fewer explanatory equations than variables to be explained, as noted in Kyle (2017). Plemmons and Cline (1972) gave the formal proof. (An under-determined model typically has an infinity of solutions – e.g., one equation x = y with two unknown variables -- while an over-determined model typically has no unique solution.)

Most economists who ignore this show-stopping technical problem substitute more or less erroneous assumptions about distribution: typically a strictly selfish

Distribution function: $D=\sum D(ii..Dij)/Y_i = 1$ (10.1)

for the empirical facts which their models omit. "Judging from some accounts, science is a pyramid with assumptions on the bottom and empirical knowledge sitting precariously on top," Jacques Melitz (1965) observed."….[S]urely it is

fundamentally the facts that support theories, rather than the other way around. If all corroborating evidence for empirical theories were lost, it would seem that theories and their assumptions would soon collapse. On the other hand, the destruction of all assumptions would not negate the previous testimony of our senses."

Nevertheless, by bracketing this handful of logically necessary corrections, Keynes's model may still be simply explained, using what Blaug calls 'the first and still most widely accepted interpretation of Keynes's meaning,' which is also the way Keynes's model is still taught at the graduate and advanced undergraduate levels (though as noted usually omitting equation [10]).

3. Rueff's revision of Keynes's economic model.

Rueff has been called the 'anti-Keynes' (Gregg 2018). But perhaps it is more accurate to say that debating Rueff helped Keynes become Keynes, while debating Keynes helped Rueff become Rueff.

Rueff recast Keynes's model in two simple yet important ways.

First, though Rueff clearly influenced Keynes's treatment of the demand for labor in the *General Theory*, Rueff effectively rewrote equation (4) by recasting the demand for labor in terms of *net unit labor costs* rather than the *gross real wage rate,* as follows:

Rueff's Law of Unemployment: $f'(N) = f(nulc) = f([wL + B - \tau - P)/Y]$ (4.1),

where w is the hourly wage rate, *nulc* is net unit labor costs, N the number of hours worked, B social benefits to workers and their dependents, τ is the income tax, P the payroll tax, and Y net national income (= πQ *[GNP]* – δ), where πQ is total output and δ is total depreciation or capital cost allowances.

Since $wL/\pi Q = (w/\pi)/(Q/L)$, labor's share of total net national income is equivalent to adjusting the average hourly wage rate for both product prices (Π) and labor productivity (Q/L).

We note that equation (4.1) for net unit labor costs results from adding and netting the distributions of economic agents, whether these represent individual persons, for-profit or non-profit partnerships, or governments, as described for an individual in equation (10).

Second, by calling attention to the 'credit duplication' caused by foreign exchange reserves, an innovation which Keynes had long advocated (Keynes 1913), Rueff effectively rewrote equation (6) of the Keynesian model as follows:

$$\text{Rueff's Law of Inflation:} \qquad \pi = f(M_w, N_{mfg}) \tag{6.1}$$

where the inflation rate π is now a function of the world base money in the currency (M_w), which comprises total domestic (M_0) plus foreign official (R) monetary liabilities, and N_{mfg} is manufacturing employment. As we will see, the so-called Triffin Dilemma deindustrializes a reserve-currency country by raising its product price level faster than those of its trading partners. Both of Rueff's changes to Keynes's model require further explanation.

3.1. *Rueff's Law of Unemployment.* The American economist Irving Fisher had already remarked in 1926, more than three decades before Phillips, upon the apparent tradeoff between price changes and the unemployment rate for the period 1861-1957 (Fisher 1926). And not long after Phillips's 1958 article, Milton Friedman used evidence from a nearly identical period in the United States (1867-1960) to advocate targeting the domestic money supply.

But in a 1932 lecture, Rueff noted a key fact which accounted for the regularities noted by Fisher (and later Phillips and Friedman): From the mid-19th to mid-20th centuries, all major economies had metallic currencies. Rueff accordingly diagnosed and corrected Keynes's theory by proposing what the French economist Jean Denuc called 'Rueff's Law of Unemployment' (Denuc 1930).

Rueff showed in 1925 that the unprecedented appearance of chronic unemployment in Britain in the 1920s closely paralleled the rise in the relative price of labor, which he measured by the average wage rate w divided by an index of

product prices, the wholesale price index *p* (Rueff 1925). Rueff further argued that this rise in British real wages was due to the combination of the recently instituted (1911) ‘‘dole,’’ or unemployment benefit, in the face of a fall in the product price level following Britain’s post-World War I return to gold convertibility in 1925 at the prewar gold parity, despite approximately a tripling of the general (GDP) price level. The same relation between the unemployment rate and real wage rate was quickly found to hold in more than a dozen countries and became known as ‘‘Rueff’s Law’’ (Denuc 1930). ‘The astonishing thing is not that this relationship exists,’ Rueff modestly remarked in his memoirs, ‘but that it should astonish anyone’ (Rueff 1977, 96). Keynes refers to Rueff’s empirical relationship between gross real wage rates and the unemployment rate (though without mentioning Rueff) in his appendix to chapter 19 of the *General Theory* [1936].)

Unit labor costs are still typically measured (e.g., by Piketty 2013 and Piketty 2020) in gross terms, that is, before subtracting taxes and adding such transfer payments as social benefits e.g., unemployment insurance. But according to Rueff’s argument, the labor share of national income, or unit labor costs, should be measured in net terms: *after* subtracting taxes and adding such transfer payments as social benefits.

Because consistent quarterly or monthly data for some of the necessary series (particularly taxes paid) do not exist, it is necessary to use annual data to test Rueff’s Law of Unemployment. For the period 1929-2018 there was about an 83% correlation between net unit labor costs and the civilian unemployment rate. But the National Income and Product Accounts also permit us to measure the effect of specific social benefits on the civilian unemployment rate and the labor force participation rate for both men and women, including each separate social benefit program:

$$lfp = f(nulc) \qquad (11)$$

where *lfp* is the labor force participation rate and net unit labor costs are

$$nulc = (wL + B - \tau - P)/Y \quad (12)$$

where *wL* is labor compensation, *B* social benefits, *τ* income taxes and *p* payroll taxes.

Labor force participation rates are calculated for all workers together (*lfp*) but also separately for male and female workers, *lfpm* and *lfpf*. However, as Darby (1976) showed, the BLS series for the U.S. civilian unemployment rate must be corrected for changes in the official definition of unemployment. (During the 1930s, workers receiving public relief through such programs as the Works Projects Administration [WPA] were double-counted as being both employed and unemployed.) Though there is a continuous series for total labor force participation, consistent series distinguishing male from female labor force participation do not start before the 1940s.

The regressions testing equation (6) for both the (corrected) civilian unemployment and labor force participation rates are shown in Table II.

Table 2

Evidence of Rueff's Law of Unemployment

(Standard errors in parentheses)

	(1) uer	(2) uer	(3) lfpm	(4) lfpf	(5) lfp
nulc	0.935				
	(0.0444)				
snap		7.403	-6.107	0.381	-7.023

	(1.563)	(1.666)	(1.705)	(1.737)
uis	4.895	2.291	0.399	-1.955
	(0.756)	(0.806)	(0.825)	(0.840)
uiemrg	1.563*	0.168	1.298	-0.278
	(0.678)	(0.723)	(0.740)	(0.753)
uirr	44.96	-15.64	-57.13	-55.97
	(45.37)	(48.36)	(49.50)	(50.42)
uifed	34.18	23.44	-15.94	-19.54
	(20.35)	(21.69)	(22.20)	(22.62)
bl	-9.983	31.72	-13.14	13.46
	(8.761)	(9.339)	(9.559)	(9.737)
vets	-0.304	-8.343	-22.00	-14.63
	(2.668)	(2.844)	(2.911)	(2.965)
slgen	1.697	7.747	-2.948	0.767
	(4.954)	(5.280)	(5.404)	(5.506)
slwc	1.850	-0.572	-9.548	-6.352
	(10.36)	(11.04)	(11.30)	(11.52)

sldi	7.657	-7.324	-19.11	-17.77
	(16.88)	(18.00)	(18.42)	(18.76)
ssis	-103.9	-0.588	86.83	112.2
	(17.73)	(18.89)	(19.34)	(19.70)
ss	0.951	0.0889	1.862	0.254
	(0.716)	(0.764)	(0.782)	(0.796)
mcr	-1.694	0.294	0.535	1.529
	(0.478)	(0.510)	(0.522)	(0.532)
mcd	-0.742	-0.679	-0.467	-0.0616
	(0.760)	(0.810)	(0.830)	(0.845)
slmedoth	21.94	4.678	-12.32	-18.60
	(11.43)	(12.18)	(12.47)	(12.70)
slnrg	-6.864	-13.29	-11.91	-7.884
	(6.699)	(7.141)	(7.309)	(7.445)
sleduc	-7.064	-13.83	26.17	11.55
	(15.84)	(16.88)	(17.28)	(17.60)

slempt		7.080	20.63	0.198	3.684
		(6.679)	(7.119)	(7.287)	(7.423)
fam		-0.866	6.434*	-9.406	-1.475
		(2.178)	(2.322)	(2.376)	(2.421)
rtcs		0.541	0.117	0.0981	-0.251
		(0.247)	(0.263)	(0.270)	(0.275)
th		0.134	-0.117	-0.109	-0.197
		(0.0749)	(0.0799)	(0.0818)	(0.0833)
_cons	-0.528	0.0103	0.832	0.592	0.702
	(0.0283)	(0.0337)	(0.0359)	(0.0367)	(0.0374)
N	89	41	41	41	41
R-sq	0.836	0.994	0.998	0.998	0.996

(Key to abbreviations: nulc: net unit labor costs; lfpm: male labor force participation rate; lfpf: female labor force participation rate; lfp: total labor force participation rate; snap: food stamps (Supplementary Nutrition Assistance Program); uis: state unemployment insurance; uiemrg: emergency unemployment insurance; uirr: railroad unemployment insurance; uifed: federal unemployment insurance; bl: federal black lung benefits; vets: federal veterans benefits; slgen: state & local general assistance; slwc: state & local workers compensation; sldi: state & local disability insurance; ssis: state supplemental

security income; ss: Social Security retirement pensions; mcr: Medicare; mcd: Medicaid; slmedoth: other state & local medical benefits; slnrg: state & local energy assistance; sleduc: state & local education benefits; slempt: state & local employment and training programs; fam: family benefits; rtcs: refundable tax credits (Earned Income Tax Credit and child credit); th: take-home pay; cons: constant.)

The overall relationship between net unit labor costs and the unemployment rate, covering 89 years of data, is an R^2 of nearly 84%, significant at the 0.001% level.

Yet this approach suffers one significant drawback: it effectively gives equal weight to every dollar of income, implicitly assuming that every kind of tax, social benefit or take-home pay is of equal importance in determining both net unit labor costs and their influence on unemployment and labor force participation rates.

When we include data from each social benefit program separately, we see that Rueff's initial surmise was correct: some social benefits, such as unemployment benefits, which are conditioned upon being unemployed, are much more important than other influences on net unit labor costs. In fact, disaggregation makes it possible to isolate the influence of individual benefit programs and compare them with each other and with the variation in take-home pay as shares of net national income.

Without disaggregation, on balance, each percentage-point increase in net unit labor costs has been associated with about a 1 percentage-point rise in the civilian unemployment rate (and thus about a 1 percentage-point fall in civilian employment). But each percentage point of national income devoted to state unemployment insurance is associated with approximately a 5 percentage-point rise in the unemployment rate and a 2 percentage-point fall in the labor force participation rate. Each percentage-point of national income devoted to the SNAP (food stamp) program is associated with about a 7 percentage point increase in the civilian unemployment rate and a 7 percentage-point fall in labor force

participation. In contrast, refundable tax credits have only a modest (0.5 percentage-point) effect in raising the unemployment rate, while the variation in take-home pay on balance is negligible. Meanwhile, Medicare and Medicaid appear to slightly reduce the unemployment rate while increasing labor force participation. Family benefits appear significantly to increase the labor force participation of men while reducing the labor force participation of women.

Thus, Rueff's Law of Unemployment must be considered as confirmed based on annual data from the United States over the past nine decades, with further confirmation by disaggregation over the past four decades.

Figure 2.

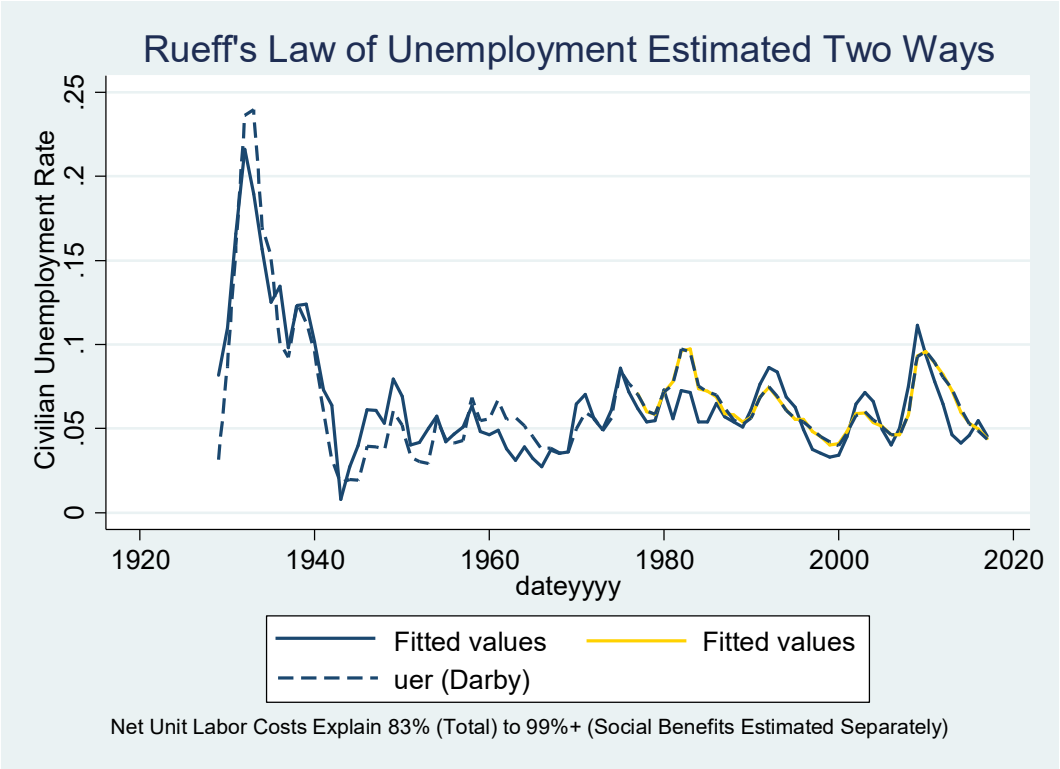
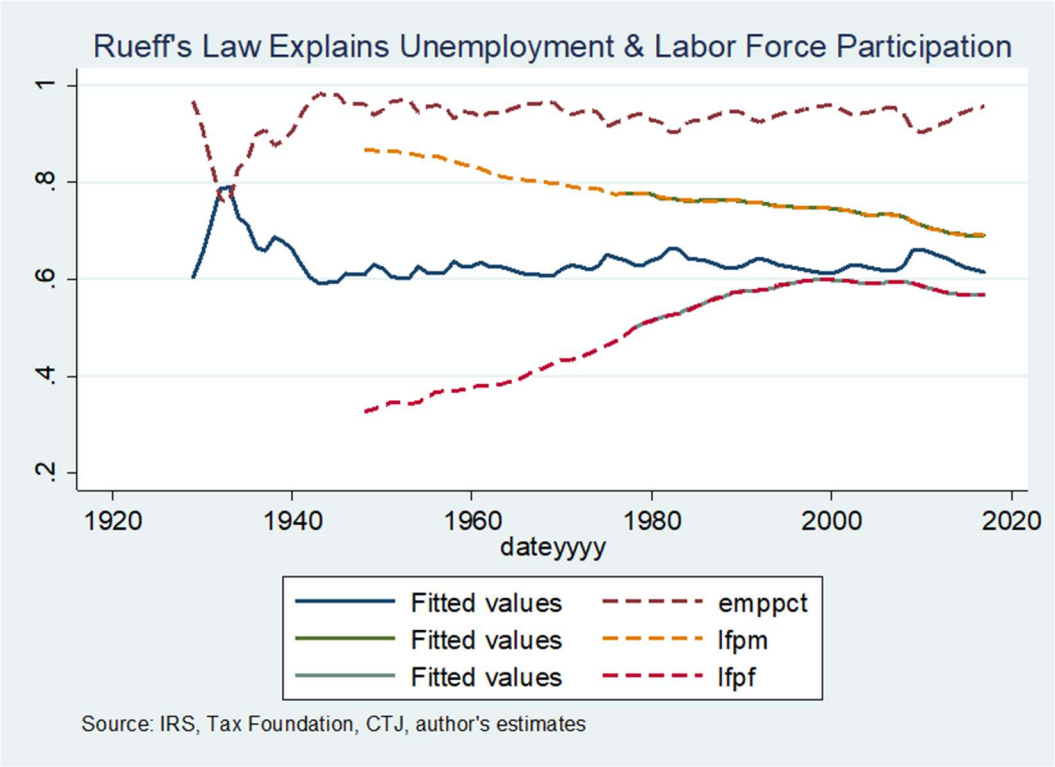


Figure 3.



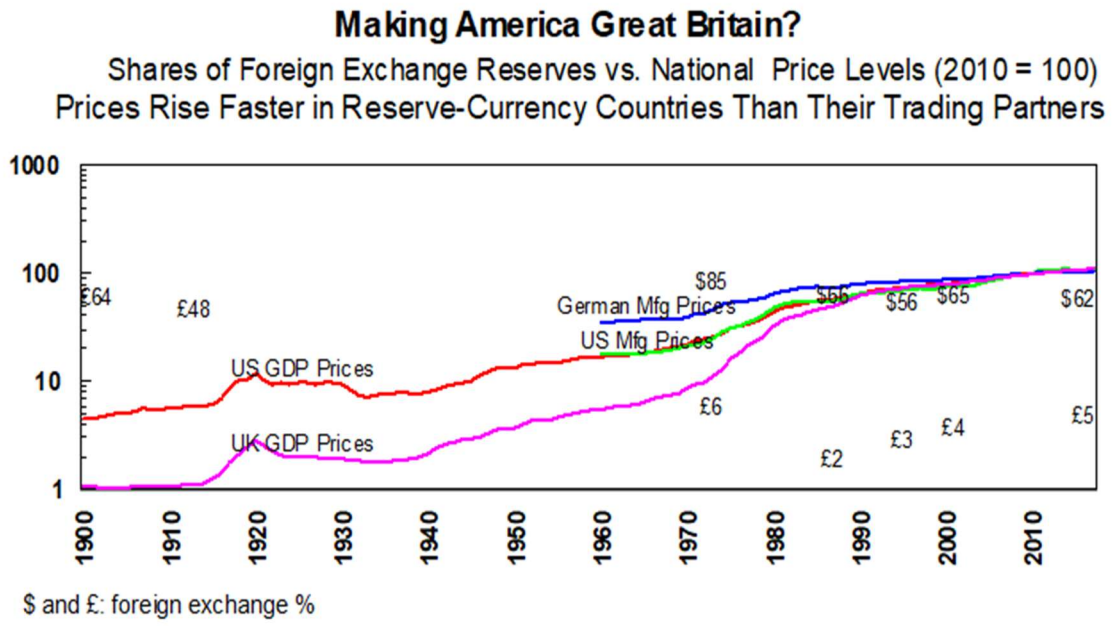
3.2. Rueff's Law of Inflation. Rueff's disagreement with Keynes allows us to speak not only of what Denuc called 'Rueff's Law of Unemployment' but also of 'Rueff's Law of Inflation.' As already noted, the century-long periods surveyed by Phillips in 1958 and Friedman in 1960 were periods of metallic, mostly gold-convertible, currencies in the U.K. and U.S., thanks to which the general (GDP or consumer) price indices were almost exactly the same at the end as at the beginning of the 19th century.

Keynes had been an advocate of the pound sterling's use as an official reserve currency. He argued in 1913 that whether a monetary authority holds gold or foreign-exchange reserves 'is a matter of comparative indifference.' Colonial India's 'gold-exchange standard,' he wrote, 'far from being anomalous, is in the forefront of monetary progress' toward what he called 'the ideal currency of the future' (Keynes 1913, 30, 259, 36). British experts including Keynes, seeking to

forestall redemption of British World War I sterling debts in gold, succeeded in promoting the substitution of foreign exchange for gold as official monetary reserves at the 1922 Genoa Conference. That change ended the international gold standard, which had begun in Genoa in the 1440s after the Hundred Years War. The new gold standard sought explicitly to restore the Roman Emperor Constantine's gold *solidus* (from which the word *soldier* originated, since the coin was used to pay Roman soldiers).

But Keynes was mistaken in his claim that foreign exchange and gold reserves are economically equivalent. Rueff explained in 1932 why the gold-sterling-dollar standard established in 1925 had soon collapsed: With the creation of—for example—dollar reserves, purchasing power 'has simply been duplicated, and thus the American market is in a position to buy in Europe, and in the United States, at the same time' (Rueff 1964 [1932]: 52–53). Hence the purchase of official dollar reserves causes inflation (and the sale of dollar reserves, deflation) for all countries with currencies tied to the U.S. dollar as official reserve currency. Moreover, as Figure IV (from Mueller 2018) shows, the 'credit duplication' makes prices rise *faster* in the chief official reserve-currency country than its trading partners, making its goods more expensive in a common currency (and turning the reserve-currency country from a net international creditor into a net debtor).

Figure 4.



The gold-exchange arrangement was formalized and universalized again in the Bretton Woods agreement of 1944-1971, under which the dollar was convertible into gold while other currencies were convertible into dollar securities. Though the dollar became inconvertible in 1971, and the system of fixed exchange rates ended in 1973, the now-inconvertible U.S. dollar remained the chief official reserve currency.

Moreover, the so-called Triffin Dilemma is explained directly by Rueff's version of the model, since by consolidating and rearranging equations (1a) and (6b) for all countries, $\sum \Delta R_{ROW} = -NX$: any increase in foreign official monetary liabilities must be balanced by an equal cumulative current account deficit in the reserve-currency country.

These facts have important consequences for (forecasting) inflation, especially in the reserve currency country, which is now the United States. On one hand, the 'high-powered' money now comprises not merely *domestic official monetary liabilities* (the U.S. monetary base [$M0], but *all* official monetary liabilities of the reserve-currency country: the World Dollar Base (M_w$: the U.S.

domestic monetary base [$M0] plus foreign official dollar reserves [$R]). Since commodities are priced and transacted in dollars, commodity-price inflation in dollars will depend on lagged growth of the World Dollar Base, as well as changes in supply (including world oil production). At the same time, the faster rise of prices of manufactured goods in the reserve-currency country leads to its de-industrialization, so that the so-called 'core' inflation (excluding commodities) depends not *inversely* upon the *unemployment rate* (as the Phillips Curve would have it), but *positively* upon *manufacturing employment*.

The GDP price level began to rise far more quickly in the United Kingdom than the United States while the pound sterling was, and before the United States dollar became, the world's chief official reserve currency. But how can we determine whether the reserve-currency system advocated by Keynes was the main reason, as Rueff claimed?

In order to avoid using annual averages for empirical testing of inflation, 'Rueff's Law of Inflation' in equation (6) may be restated as

$$(\pi_t - \pi_{t-12}) = \Upsilon_0 + \Upsilon_1 m_{w(t-27)} + \Upsilon_2 oilprod_{(t-1)} + \Upsilon_3 \text{manemp}_{(t-1)} \qquad (6.2)$$

where $(\pi_t - \pi_{t-27})$ indicates the 12-month percent change in the PPI all-commodities price index, $M_{w\ (t-27)}$ is the change in the World Dollar Base lagged 27 months, $oilprod_{t(-1)}$ is world oil production lagged 1 month, and $manemp_{(t-1)}$ is manufacturing employment lagged one month. The Newey-West procedure is used to correct autocorrelation of residuals.

Table 3

Evidence for Rueff's Law of Inflation in the United States:

World Oil Production is Almost or Entirely Statistically Insignificant

Regressions with Newey-West standard errors

	(1) wpic 1913-2019	(2) wpic 1939-2019	(3) wpic 1959-2019	(4) pcndc 1959-2019
L27.mwc	0.181	0.324	0.271	0.222
	(0.0337)	(0.0234)	(0.0233)	(0.0155)
L.manemp		0.00624	0.00952	0.00829
		(0.000741)	(0.00106)	(0.000662)
L.ieawcrs			0.000272*	0.0000802
			(0.000122)	(0.0000784)
_cons	0.0148	-0.0918	-0.164	-0.130
	(0.00358)	(0.0123)	(0.0220)	(0.0142)
N	1235	962	720	719

Standard errors in parentheses.

Note to abbreviations: wpic =12-month change in PPI All Commodities Index (former Wholesale Price Index)

pcndc = 12-month change in Personal Consumption Expenditures price index for nondurable goods

L27.mwc = 12-month change in World Dollar Base, lagged 27 months

L.manemp = U.S. manufacturing payrolls, lagged 1 month

L.ieawcrs = International Energy Agency monthly series for world crude oil production, lagged 1 month.

The PPI all commodities index begins much earlier than the personal consumption expenditure series for nondurable goods (in 1913), but the series for manufacturing payrolls only in 1939. If we drop the manufacturing payrolls variable, the World Dollar Base variable remains highly statistically significant, but the R^2 is cut in half, indicating that manufacturing payrolls are also highly significant. This fact also suggests that official reserve-currency status entails deindustrialization for the United States, as it also did for Great Britain when the pound sterling was the world's chief official reserve currency (the so-called Triffin Dilemma).

The same two variables, the World Dollar Base and manufacturing payrolls, are still more significant in explaining variation in the price deflator for the prices of nondurable goods, such as food and gasoline, than for the broader PPI index for all commodities. The monthly series for PCE nondurable goods series begins in January 1959. The optimum regression, again using the Newey-West procedure, lags the annual change in the World Dollar Base by 27 months and manufacturing payrolls by one month. With t-statistics of about 15, both variables are significant at the 0.0000 level.

The double-digit inflation of the 1970s is typically explained as having resulted from 'supply shocks' attributable for example to the OPEC oil embargo of 1973. Ball & Mankiw (2002) added such a variable to their Phillips Curve equation (without which the equation was statistically insignificant).

To test its influence, world oil production was added to the equation for Rueff's Law of Inflation:

$$(\pi_t - \pi_{t-12}) = \Upsilon_0 + \Upsilon_1 M_{w(t-27)} + \Upsilon_2 \text{manemp}_{(t-1)} + \Upsilon 3\ ieawcrs_{(t-1)} \qquad (6.3)$$

where $(\pi_t - \pi_{t-12})$ is the 12-month change in the personal consumption expenditures price deflator for nondurable goods, $M_{w(t-27)}$ is the 12-month change

in the World Dollar Base lagged 27 months, and *ieawcrs*($_{t\text{-}1}$) is the International Energy Agency's monthly series for world oil production lagged one month. The Newey-West procedure was again used to correct for autocorrelation of residual errors.

The regressions in Table III reveal that when added to Rueff's Law of Inflation, world oil production is barely statistically significant in determining inflation measured by the PPI All Commodities Index, and not at all statistically significant in a regression on the price index for nondurable goods.

Moreover, the stock market is driven by the rate of commodity inflation which, as we have just seen, is driven by the combination of the World Dollar Base and manufacturing employment. Table V shows that the stock market's retained earnings yield [(earnings – dividend)/share price], which moves inversely to the stock market's value, is driven in turn by the rate of commodity inflation, whether measured by the PPI All Commodities Index or the price index for personal consumption expenditures on nondurable goods. The relationships shown in Table III and Table IV are depicted graphically in Figure 5 and Figure 6.

Table 4

The stock market ‘s yield is driven by commodity inflation

	(1)	(2)
	reyld	reyld
wpic	0.125***	
	(0.00817)	
pcndc		0.339***
		(0.0170)
_cons	0.0293***	0.0234***
	(0.000497)	(0.000627)
N	1430	721

Standard errors in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Note: wpic =12-month change in PPI All Commodities Index (former Wholesale Price Index); pcndc = 12-month change in Personal Consumption Expenditures price index for nondurable goods; reyld = Retained earnings yield (earnings – dividends)/price for the Standard & Poor’s 500-stock index

Figure 5

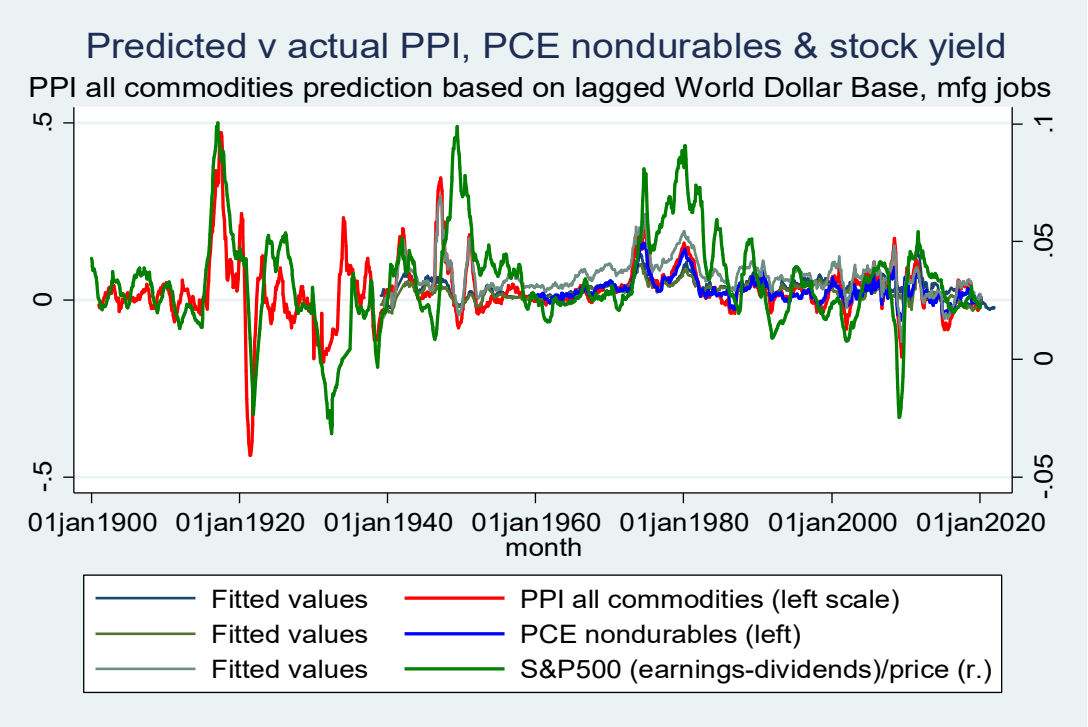
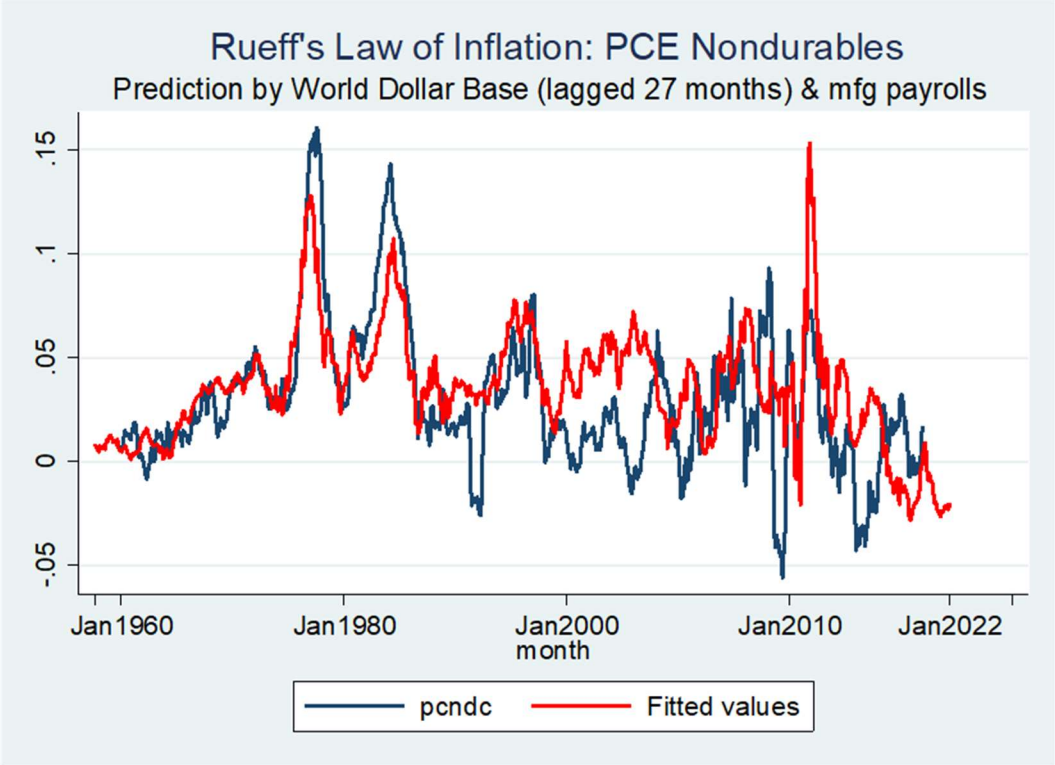


Figure 6



Thus, Rueff's Law of Inflation, like Rueff's Law of Unemployment, receives strong confirmation from empirical data. Moreover, the price moves which have been interpreted as resulting mostly from oil 'supply shocks' appear instead to have been 'demand shocks' resulting from massive purchases (or far less often, sales) of official dollar reserves by national monetary authorities.

4. Policy implications.

This paper was submitted in the midst of the sharp world-wide economic contraction triggered by the 2019 Coronavirus Pandemic. Though it seeks, by applying the 'Rueffian Synthesis,' to explain how national economies are interconnected in a financial system in which U.S. dollar securities are the chief official monetary reserves, at least a brief outline of the policy implications is necessary.

Though the coronavirus was new in 2019, both the economy and financial markets responded as in the past—with and without pandemics—in response to the combined monetary policy of central banks.

The Spanish H1N1 flu pandemic of 1918, which killed 50 million worldwide and 675,000 in the United States, superimposed medical insult at the end of World War I, upon monetary injury. A 50% World War I price inflation, peaking in mid-1917, was followed by a 40% deflation, bottoming in mid-1921 (measured by what then was called the Wholesale Price Index, now the Producer Price All-Commodities Index). But also then as now, such price changes were driven by the previous actions of official monetary authorities, measured by earlier growth of the World Dollar Base ($Mw): the sum of all dollar-denominated securities held by the Federal Reserve and foreign monetary authorities (as well as manufacturing payrolls, which cause the inflation rate to rise or fall commensurately faster, presumably because workers receive higher or lower wages).

These relationships were first explained by Rueff, who during his long career advised both French premier Henri Poincarė in the 1920s and President Charles de Gaulle in the 1950s and 1960s. Also then as now, the stock market reacted to the inflation or deflation caused by central banks, as reflected in the stock market's 'retained earnings

yield': corporate earnings minus dividends, divided by the average share price—a ratio which, like bond yields, moves inversely to security prices.

As we have seen, the stock market is highly sensitive to the inflation rate for products. The market has fallen whenever producer price inflation has risen *o*r fallen sharply, but above all when companies' production costs have risen faster than their product selling prices, causing earnings to fall below dividends paid to investors. That used to happen with alarming frequency before World War II, but only once since then: before the financial crisis of 2008. Until the first quarter of 2020, that is.

While the economic environment was deflationary, the Federal Reserve's actions didn't seem to matter as much as they used to, for two reasons. First, as Rueff explained, foreign official dollar reserves have the same impact on commodity prices as the Fed's own portfolio—but had mushroomed to nearly twice its size, so that it now takes nearly three times the absolute change in the Fed's balance sheet to affect the total World Dollar Base and world commodity prices commensurately. Second, the foreign official dollar reserves had fallen over the previous five years, partly in response to a rising dollar exchange rate, so that the total World Dollar Base was lower in early 2020 than it had been in early 2015.

What should policymakers do? Strange as it may seem, now is an excellent time for the U.S.A. to begin repaying the trillions in foreign dollar reserves with gold reserves, ultimately restoring an international gold standard. There are several reasons.

First, doing so would end the world-wide commodity deflation and give a countercyclical boost to the world economy. A growing stock of monetary gold would give the world a trade surplus with itself equal to the exports of gold-producing countries.

Second, such a plan would give the United States, China, Russia and other major countries a strong incentive to co-operate in rebuilding the world financial order despite mutual distrust, and remove the threat of deflation due to the prospect of liquidating existing dollar reserves, which would cut the price level back to where it was before the dollar securities were purchased.

Third, paying off existing dollar reserves would provide the incentives necessary to restore a U.S. trade surplus and revive American manufacturing. It would end the so-

called ‘Triffin Dilemma’—the fact that any increase in foreign official dollar reserves must match an equal deficit in the U.S. current account (the broadest measure of the balance in international trade).

Finally, readopting honesty as the best economic policy would restore discipline to American federal finances, since restoring a gold dollar would end the practice of financing the federal budget by endless borrowing from the Federal Reserve and foreign monetary authorities. Democrats and Republicans would be forced to co-operate, like it or not.

5. Summary. The ‘Rueffian Synthesis’ provides an alternative to the Keynesian model which is superior because of its inclusion of government taxes and social benefits in net unit labor costs and its inclusion of both domestic and foreign official liabilities reserves in measuring ‘high-powered’ money. This is reflected in the empirical evidence recounted here.

First, as predicted by Rueff’s Law of Unemployment, most of the variation in the civilian unemployment rate, as well as in civilian labor force participation rates, is proportional to net unit labor costs, chiefly driven by social benefit programs.

Second, contrary to the assertion that adroit manipulation of the Phillips Curve by Federal Reserve monetary policy was to thank for ‘the Great Moderation,’ Rueff’s Law of Inflation suggest a sharply different interpretation: The deindustrialization of a reserve-currency country entailed in the Triffin Dilemma, reflected in declining manufacturing payrolls, reduced both the level and volatility of U.S. manufacturing employment, and thereby the level and volatility of commodity inflation, which continues to be determined chiefly by earlier growth of the World Dollar Base and by manufacturing payrolls.

When both variables are included, energy ‘supply shocks,’ as measured by world oil production, are not statistically significant. Inflation (or less often, deflation) results almost entirely from monetary ‘demand shocks.’

Moreover, unlike the Phillips Curve, the empirical measurement of neither Rueff’s Law of Unemployment nor Rueff’s Law of Inflation has shifted appreciably in recent decades. The Phillips Curve doesn’t ‘work’ because it posits an *inverse* relation between the inflation rate and the civilian unemployment rate, when in fact there is a strong *positive*

relation between manufacturing payrolls and the inflation rate, reflecting the so-called Triffin Dilemma, which Rueff was the first economist to explain.

Finally, the Rueffian Synthesis provides a broad plan for re-starting and sustaining world economic development.

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