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Some Reflections on Supply-Side Economics and its Theoretical Antecedents

(or)

Some Unrecorded Adventures of Alice in Wonderland

by

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This paper is an attempt at elucidating some theoretical controversies that have governed the development of Macro-Economics, and these controversies have essentially been variations on the great theme set by Keynes in his attack on the Classics. The ideological predilections of so-called Supply-side economics can be traced to those of its parent -- Monetarism -- and its grandparent -- the pre-Keynesian Classical economics. In my opinion, any "fresh" debate on Supply-side economics must necessarily reopen and retrace the older debates between Keynes and the Classics and the neo-Keynesians and the Monetarists. A very broad sketch of these quarrels is furnished in this paper, in the hope that it will serve as a reminder that "new" debates, if any, are founded very much on an old tradition. The sketch, to repeat, is broad; it is very far from being exhaustive or careful in its attention to nuance and detail (in particular, to the detail, as readers will quickly recognize, of precisely what a Supply-sider is); but it is hoped that some at least of the important issues will have been brought to light, and that these will serve as a basis for judging the soundness of the theoretical rationale for confident prescriptions by bodies such as the International Monetary Fund on what economic policies developing countries such as India ought to adopt. I must add that I have taken no trouble to conceal either my own biases or my want of originality in writing this paper, which, by its nature, is a loose survey.

Finally, I must acknowledge, without implicating, my teacher Morris Perlman, a favourite notion of whose -- to the effect that there are few really "new" problems in Macro-economics -- is the presiding spirit of this paper.

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"Off with her head!" the Queen shouted at the top of her voice. Nobody moved. Alice, picking up her skirts, ran for all she was worth and didn't stop until she was far, far away from the palace. Pausing to regain her breath, she realised that she had run faster than light, so that, anticipating Einstein backwards, she was not at all surprised to find herself in the early 1980's. Looking around to find her bearings, her eyes confronted the sight of a huge pie which had "ECONOMICS" written on it in large letters, and underneath that, in smaller letters, the very peculiar statement, "Any possible distribution of me is Pareto-optimal." Alice felt very intrigued and also a little fightened, but more than anything else -- what with having had to run for her life and not having had anything to eat from as far back as she could remember -- she felt extremely hungry. It is amazing how quickly a hungry little girl will finish off a large pie; in no time at all the pie ECONOMICS was inside Alice's stomach. Alice had just begun to release a contented little sigh when a most alarming thing occurred. She started to bloat and bloat, for the pie inside her stomach was sending up all kinds of hot air that inflated her body. Each kind of hot air announced itself as it rose up inside her; one was called Walras' Law, another was called Say's Law, a third was called Under-Full-Employment-Equilibrium, a fourth was called Phillip's-Curve-Trade-off, a fifth was called Liquidity Trap, a sixth was called Balanced-Budget, a seventh was called Natural-Rate-of-Unemployment, an eighth was called Inflation, a ninth was called Rational-Expectations...

Soon Alice lost count, for there were so many different kinds of hot air and they all seemed to be fighting furiously with each other inside her, until she felt quite weak, and tired, and weepy, and finally fell asleep from sheer exhaustion. When she woke up, she was very pleased to see that she had got back to her normal size. She realized that she had bloated up from eating too much too fast and too greedily. During her sleep, she had digested the pie ECONOMICS quite nicely, and she startled herself now by saying out aloud, "Why, what a nice thing Optimal Size is!"

"What was that?" asked a stern voice behind her. Alice was <u>really</u> startled now. She jumped up, bit her tongue in fright and became very cross. Standing just behind her was a very elegant gentleman with a very superior look on his face.

"And who," asked Alice in an irritated voice, "are <u>you</u>, Sir?"

"<u>I</u>", said the elegant gentleman importantly, "am the Supply-Sider".

"And", he added darkly, "I should advice you to be more civil, young lady. You are Alice, I presume."

"How did you know, Sir?" asked Alice meekly.

"Given Wonderland and a rude little girl who is forever asking questions," replied the Supply-Sider loftily, "it is a simple enough matter of Rational Expectations to deduce your name."

"What", asked Alice, ignoring the Supply-Sider's remarks and cleverly changing the subject of conversation, "are the important policy prescriptions of Supply-Side Economics, and what lies at the bottom of them?"

"There you go again, aksing questions", said the Supply-Sider crossly. But for all that he appeared to be cross, he was not disinclined to answer Alice's question. "At the bottom of Supply-Side Economics, "he said," lies a recognition of the importance of private incentives in making the economy function, the importance of carefully studying the micro-foundations of macro-economics".

"And pray what can one hope to learn from that, Sir?"

"One can hope," said the Supply-Sider, "to learn from this perceived view of the world the wisdom of what Supply-Siders would, broadly, recommend, viz --

(a) tax-cuts, serving as incentives for an increased supply of labour and capital, the one from households and the other from firms;

(b) reductions in government spending - necessitated by the requirement in the short run to balance the budget - and also from the principle that expansionary fiscal policy will quite possibly not be expansionary at all and merely succeed in crowding out private investment;

(c) a tight-money policy entailing a restriction in the growth of money supply to a modest, steady rate so as to dampen inflationary pressures within the economy (which - since money is neutral - is the only effect which increases in its supply have); and

(d) deregulation - to remove meaningless disincentives which currently serve to inhibit output and employment."

"What you say," remarked Alice, "fits in very nicely with what Mr.James Tobin (Tobin, 1981) has to say about Supply-Side Economics." Alice (for the pie ECONOMICS was doing strange things to her) proceeded to quote fluently: "'In public political and economic debate, monetarism has become a central part of conservative, that is to say nineteenth century liberal, ideology

These days the other principal elements are most easily summarized as oppositions to Government: to public operation or regulation of economic activities, to redistributions of income and wealth, to collective consumption and investment, and to budget deficits. "Supply-Side economics" is a more positive theme of contemporary right-wing ideology, stressing tax-reductions and deregulations as incentives for work, saving, enterprise and efficiency.' There," concluded Alice triumphantly, her face flushed with the effort of remembering and reciting so many long and hard words.

The Supply-Sider, however, seemed not so pleased with her effort. "If you already know so much," he cried petulantly, "then why ask me, you rude little girl?"

"Oh please Mr Supply-Sider Sir," said Alice contritely, "I didn't mean to offend you. I just thought I would get it straight from the horse's mouth. Not," she added hastily, seeing that she had offended the Supply-Sider again, "that you are a horse. When I say you are a horse, I don't mean you are one. At least, if I meant you were a horse, I wouldn't say it. Oh please Sir, I am getting very confused, and I'm not at all clear that I know either what I mean or what I say."

"Good," said the Supply-Sider, mollified. "That's the first modest admission you have made all day." His good humour quite restored, he added, "Is there anything else you'd like to know?"

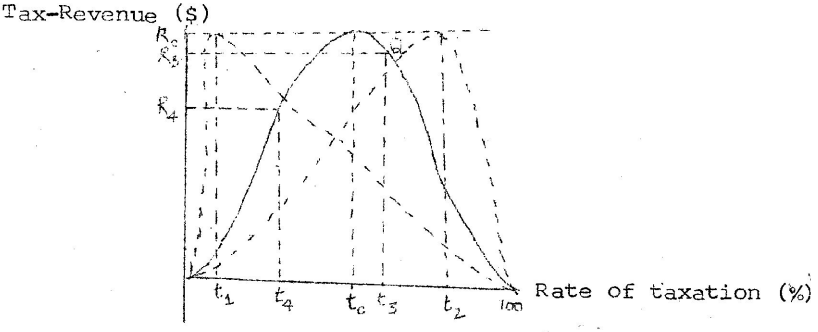
"Heavens, yes!" exclaimed Alice. "I have only just begun. For a first question, what is the underlying rationale for cutting taxes?"

A sort of beatific look suffused the features of the Supply-Sider, "The underlying rationale," he said impressively, "is to be located in nothing less than a work of Art : The Laffer Curve."

"A work of Art," said Alice, who was becoming very pompous indeed (the while shamelessly plagiarizing Albert Camus), "is conceived within the secrecy of a man's heart."

"I don't know about that," replied the Supply-Sider peevishly. "This one was conceived on a paper-napkin in a restaurant. This is how it looks". And the Supply-Sider took out a piece of paper and drew the following diagram (bold lines) :

Figure 1 : The Laffer Curve



"What is it supposed to mean?" asked Alice.

"On the horizontal axis of the Laffer Curve," explained the Supply-Sider, "We plot the rate of taxation and on the vertical axis the tax-revenue. Clearly, when the tax-rate is zero per cent, the tax revenue is also zero; and when the tax-rate is one hundred per cent, again the revenue is zero - since no one will have any incentive to work or produce if his income is going to be completely taxed. In between zero and one hundred per cent tax-rates, tax-revenue will rise with the tax-rate upto a certain point and then decline. The optimal tax-rate is t_o, at which tax-revenue ($= R_o$) is maximized. If the tax-rate exceeds t_o, it obviously makes sense to cut it, for then tax-revenue will increase."

Alice found the Supply-Sider's remarks very persuasive, but she could not resist the temptation of asking questions.

"How," she asked, "can one be sure that the optimal tax-rate is t_o? It could well be t_1 or t_2, depending on whether the Laffer Curve is skewed to the left or to the right." She dotted in the two alternative Laffer Curves (shown in the figure). "How, in other words, Sir, does one know where the Laffer Curve peaks?"

"That," replied the Supply-Sider very stiffly, "is an Empirical Matter".

"Further," said Alice, warming to her theme, "how does one know whether the economy is on the rising or the falling part of the Laffer Curve? When you prescribe a tax-cut, you are implicitly assuming that the economy is on the falling part; if this turns out not to be the case, then a tax-cut will have the opposite impact to the desired one - tax revenue will <u>fall</u> - So please, Sir, where <u>is</u> the economy located on the Laffer Curve?"

"That," replied the Supply-Sider even more stiffly, "is an Empirical Matter."

Alice found her theme opening up new possibilities. "Let us," she conceded magnanimously, "grant for a moment that the economy <u>is</u> after all on the falling part of the Laffer Curve. But so long as we do not know the precise point at which the economy is located, I expect that we shall have to be very, very cautious about the magnitude of the tax-cut we seek to implement. For suppose that the economy is on the point Q of the Laffer curve. If the tax-rate is cut from t_3 to t_4, then the tax revenue will <u>fall</u> from R_3 to R_4. To put all this in more general and formal terms, if we represent tax-revenue by R and the tax-rate by t, then the Laffer Curve - as you have drawn it - could be represented by the quadratic function $R = kt - kt^2$ where k is some positive constant. R is a double valued function of t ; it is maximized at $t = 0.5$ and is symmetric about $t = 0.5$. Now let t_c signify the current tax-rate and t_p the proposed

(reduced) tax-rate. It can then be verified easily that a reduction in t from t_c to t_p will increase R if and only if $t_c > 0.5$ and $t_c + t_p \geq 1$. Thus, for example, if I know that $t_c = 0.7$, then I can make t_p as low as 0.3 without running the risk of reducing R. My question, briefly, is : pray, how big a cut in the tax-rate, Sir, do you think will still accommodate an increase in tax-revenue? - take any economy with which you are familiar."

"That," said the Supply-Sider becoming so stiff this time that Alice feared he might freeze, "is also an Empirical Matter."

"That seems to be a favourite expression of yours," observed Alice. "If Empirical Matters are nasty, low, vulgar things," she proceeded (remembering what the mouse had told her about cats), "then let us leave them alone. But do please tell me, Sir, what does theory have to say about the relationship between the tax-rate and the supply of labour?"

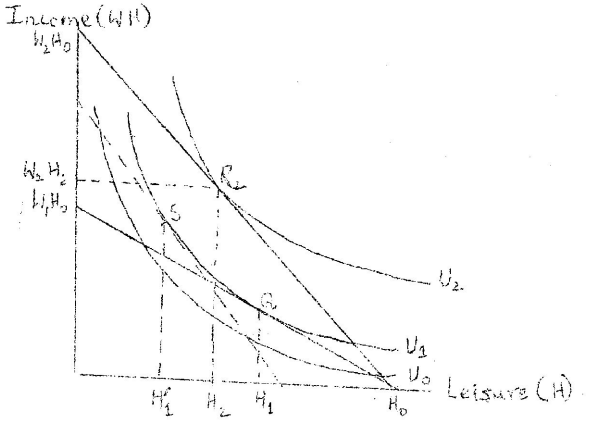
"Consult any standard text-book on price theory," said the Supply-Sider briefly. "Take Jack Hirschliefer (Hirschliefer, 1976), for instance."

"Won't you please explain Sir?" asked Alice humbly -

"Very well," said the Supply-Sider grudgingly, "provided you don't interrupt too much. Well, it's like this," he proceeded in a bored voice. "The supplier of labour is confronted with the problem of an optimal choice between wage-income and leisure. If we let H stand for the number of hours of leisure enjoyed by the individual and W for the (after-tax) wage rate, then his wage income will be given by $I = H (Ho - H)$, where Ho (equal, say, to 24 hours in a day) is the amount of leisure time the individual is endowed with. Thus, suppose W_1 to be the wage-rate to start with; then, if the individual supplies zero hours of labour (i.e. if he

enjoys Ho hours of leisure), he will earn zero income and if he supplies Ho hours of work (i.e. enjoys no leisure at all), he will earn W_1Ho of income - the maximum he can earn. His budget-constraint can then be represented by the line joining W_1Ho and Ho (figure 2). (We are assuming, for simplicity, that the individual has no endowed income). U_o, U_1, U_2,....., represent his map of indifference curves, each of which denotes a given level of utility for various combinations of wage income and leisure. (The utility functions are assumed to have the usual continuity and convexity properties).

Figure 2 : The Income-Leisure Choice Problem

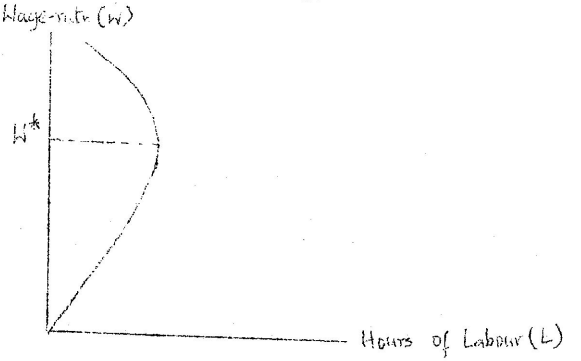


In the standard way, the individual will optimize his utility at the point of tangency of an indifference curve with his budget-line, so as to equalize the marginal rates of substitution in consumption and exchange of leisure for income. The optimum is at the point Ω in figure 2, where the indifference curve U_1 is tangential to the budget-line relevant for a wage-rate of W_1. In optimizing his utility the individual supplies $(Ho-H_1)$ hours of labour and earns $W_1(Ho-H_1)$ of income. Consider now what happens when we have a tax-cut: effectively, the after-tax wage rate rises from W_1 to (say) W_2. The new budget line becomes the one connecting W_2Ho to Ho.

The individual's new optimum will be at the point R - i.e. at the point of tangency of the higher indifference curve U_2 with the new budget line. He will now supply more labour (= $Ho-H_2$) and earn a wage income W_2 ($Ho-H_2$). What you see is nothing but the operation of the substitution effect. When the (after-tax) wage-rate rises, leisure becomes relatively more expensive; leisure being a normal good, less of it is "purchased" when its price rises. Putting it differently, the supply of labour increases due to a tax-cut. There, does that satisfy your curiosity?"

"Ye-es," replied Alice hesistantly. "But you have completely ignored the income effect, haven't you Sir? I'm sure the poor thing will feel very offended. For clearly the move from H_1 to H_2 hours of leisure following upon an after-tax wage-increase from W_1 to W_2 is constituted of a substitution effect and an income effect. The pure substitution, or income-compensated, effect can be measured by the distance $H_1 H_1'$ in figure 2. The income effect is in the opposite direction and can be measured by the distance $H_1' H_2$; leisure being a normal good, more of it will be purchased when the individual experiences an increase in his income. Whether more or less labour will be supplied with an increase in the after-tax wage rate will depend on whether the substitution effect swamps the income effect, or vice versa. At very low wage rates, I suppose, one can expect the substitution effect to bully the income effect into submission, but then, at higher wage-rates, you can't expect to keep a good income effect down, can you? It is quite conceivable then that the labour supply-curve will be backward bending beyond some wage-rate W^* -So:

Figure 3 : The Labour Supply Curve



The efficacy of a tax-cut in bringing forth an enhanced supply of labour will then depend very much on most people not being on the back-ward bending part of their labour-supply curves. Before going ahead with a substantial tax-cut, then, I suppose one will have to verify where most people are on their labour-supply curves: surely, Sir, that's an important Empirical Mat--". Alice stopped herself being tactless in time. But she was so engrossed in what she was saying that very soon she forget that she was being audibly stupid again. "What it amounts to," she said slowly, "is that the Laffer Curve approach to tax-cuts has little empirical support, while its theoretical content is quite ambiguous."

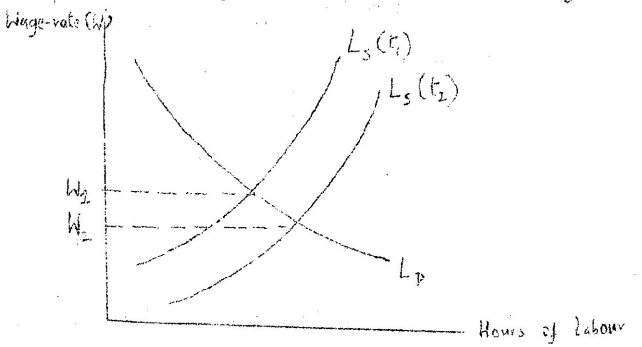
The Supply-Sider promptly turned his back on her and started sulking.

"Dear me, there I go again," said Alice, admonishing herself very severely. "I didn't mean to offend you Sir, I truly didn't. Can't we continue our conversation now, if I promise to try very hard not to be rude?"

"Oh alright," said the Supply-Sider ungraciously. "Provided you ask sensible questions."

"Oh thank you Sir," said Alice. "There's just one other thing. Assuming that a cut in the tax-rate will bring forth an increase in labour-supply, will it not be true that eventually the labour-market will clear at a lower wage-rate than what prevailed before the tax-cut? This is brought out very clearly in the figure I will now draw." (See figure 4) "In this figure", continued Alice, "L_D represents the demand-for-labour curve and L_s (t_1) the supply-of-labour-curve, drawn for a tax-rate of t_1. The labour-market clears (what a gross expression, to be sure!) at a (gross-of-tax) wage rate W_1. If the tax-rate is cut from t_1 to t_2, then in accordance with what you say the labour-supply curve will shift outward to L_s (t_2), causing the labour-market to clear at the lower wage rate W_2. Will not labour be worse off as a consequence?"

Figure 4 *Effect of a tax-cut on the market wage-rate.*



"Of course not, silly girl," said the Supply-Sider peevishly. "You tie yourself up into all kinds of knots from not differentiating the money wage-rate from the real wage-rate. Now W_1 and W_2 in figure 4 refer to the gross-of-tax money wage rates. As you point out, a fall in the tax-rate will result in an excess supply of labour at the original gross-of-tax money wage W_1 - leading to a fall in this wage-rate to W_2. But consider what happens in the goods market.

Excess supply in the labour market leads to excess supply in the goods market : this causes the price level to fall. Prices will fall proportionately to gross-of-tax money wages - say from P_1 to P_2. The gross-of-tax real wage rate before the tax-cut ($= W_1/P_1$) is then precisely equal to the gross-of-tax real wage rate after the tax-cut ($= W_2/P_2$). However, the net-of-tax real wage rate after the tax-cut is obviously, higher than that before the tax-cut. Clearly, the supplier of labour will base his decision on how much labour to supply on the strength of the post-tax real wage he receives-which, as I have just demonstrated - will increase with a cut in the tax-rate. And now I shall close my eyes for a little while and thank you not to intrude on my thoughts."

"If you could please trouble yourself to think with your eyes open, Sir," pleaded Alice, "then perhaps you'll tell me whether you are a believer in Wage-Price Flexibility, as I very strongly suspect you are."

"Excepting for the fact that I do not fancy old-fashioned terms, indeed I am a believer in Wage-Price Flexibility," said the Supply-Sider proudly, adding disapprovingly, "you suspicious little girl".

"Oh," said Alice.

"And what is more," proceeded the Supply-Sider smugly, "it is precisely because I believe in Markets that Clear that I am able to assert that changes in money-supply have no real effects (the underlying rationale for a tight-money policy) and to assert also that wage-price flexibility is sufficient to guarantee the automaticity of full-employment equilibrium. And before you can ask me how employment can increase with a cut in the tax-rate if the economy is always at full-employment equilibrium, I hasten to protect myself from any further questions of that type from you by drawing your attention to the fact that full-employment, in the sense in which I use it, is inconsistent only with involuntary

unemployment, not voluntary unemployment - so that for different tax-rates we can have different full-employment rates." Here the Supply-Sider had to stop since he had run out of breath and his face had become very red. Before he had quite recovered his breath, however, he was off again, to forestall any questions Alice might ask. "A brief explanation of the dynamics of money-Supply changes in an economy with flexible wages and prices: suppose the economy to be in initial (full-employment) equilibrium. Consider now an increase in the nominal quantity of money. This will lead to excess liquidity - an excess of the real supply of money over the demand for it. People, in order to maintain their optimal allocation between bonds and money, will seek to exchange their excess money for bonds, thereby bidding up the price of bonds and so driving down the rate of interest. The fall in the interest-rate will stimulate investment. The demand for labour will increase, putting upward pressure on the money wage rate. At the same time, the increase in investment expenditure will lead to a situation of excess aggregate demand in the goods market. Excess demand will be choked off with a rise in prices which will contract the real supply of money and so raise the interest-rate by precisely the extent to which it had initially fallen. At the same time, the rise in the price-level will, being proportional to the rise in the money wage-rate, ensure constancy of the real wage-rate, so that employment and output will also fall back to their (original) full-employment levels.

At the end of this sequence of events then, the interest rate, the real wage-rate, the level of employment and output - in a word all real variables in the system - remain at the levels which are consistent with full-employment equilibrium. Only the price-level rises - increases in the nominal quantity of money are neutral with respect to all real variables; worse, they are inflationary. Flexible wages and prices ensure this result, as also the automaticity of full-employment equilibrium. Having anticipated your questions and clarified your doubts, I take it that I can now expect some respectful silence from you?"

"Indeed not," replied Alice very firmly, for she was beginning to get tired of the Supply-Sider's rudeness, "because you haven't anticipated my questions. All I had planned to say, before you interrupted me with your wrong anticipations of my interruptions-," here Alice had to stop for the sentence was becoming very complicated, so that she had to begin again - "all I had planned to say is that your two propositions about the neutrality of money and the automaticity of full-employment equilibrium with continuous market-clearance in the absence of wage-price rigidities are standard Pre-Keynesian or Classicial propositions."

"And what's wrong with that?" asked the Supply-Sider, bristling.

"Only the fact," retorted Alice," that if you take account of empirical embarassments (my, that's a nice alliteration now) like trade-unions and monopolies, than these render flexible wages and prices a trifle difficult to swallow. With fixed money wages, neutrality of money doesn't follow as easily as falling off a log which is as easily as you seem to suggest it follows. And in any case, Mr. Keynes has demonstrated that wage-price flexibility is not sufficient to ensure automaticity of full-employment equilibrium. So there."

"Explain yourself," said the Supply-Sider, folding his arms across his chest and looking very severe.

"Consult any text-book in Macroeconomic Theory," retorted Alice with spirit, "such as Morris Perlman (Perlman, 1976)."

"Being rude again, are you?" asked the Supply-Sider. "I am going right away, and shan't ever speak to you."

"Oh please do stop, Sir, and I'll explain", cried Alice, capitulating. "Mr. Keynes' demonstration of the

insufficienty of wage-price flexibility for ensuring full-employment equilibrium runs somewhat along the following lines. Assume the economy (characterised by wage-price flexibility) to be in initial full-employment equilibrium. Suppose now that peoples' preferences run in the direction of saving more. Then we will have an excess of full-employment saving (output) over investment (expenditure). Since prices are flexible, the price level will fall to remove the discrepancy between aggregate supply and aggregate demand in the goods market. But precisely how does the fall in prices initiate the movement towards equilibrium? As follows. The fall in the price level, given a fixed nominal quantity of money, causes the real supply of money to expand and exceed the demand for it. The interest rate falls and keeps falling until investment, in response, has increased sufficiently to catch up with saving. The saving-investment discrepancy is removed and full-employment equilibrium is restored. This would be the Classical Story. If we examine the story carefully, we will find that it is not so much price-flexibility as interest-rate flexibility which performs the equilibrating task. The price-level merely signals disequilibrium : it is the fall in the interest-rate which executes the actual operation of restoring the economy to equilibrium. But what now if for some reason the interest-rate should become inflexible downward? The 'some reason' which Mr.Keynes identified was, precisely, the Liquidity Trap. We may take the aid of Mr.Tobin (Tobin, 1958) in explaining the notion of the liquidity trap. Suppose the interest rate on a bond of price unity to be r. Let r_e^j $(>r)$ be the expected rate of interest on the bond, from the point of view of some individual j, a year hence. Then individual j's capital loss from holding the bond will be $(r/r_e^j)-1$. The net yield to j from the bond - equal to the algebraic sum of the expected interest income from it and the capital loss - will be furnished by $r + (r/r_e^j)-1$. Let $r = r_*^j$ be that rate of interest for which the net yield to j is exactly zero. Then,

by solving for r_*^j in the equation $r_*^j + (r_*^j/r_e^j) - 1 = 0$, we obtain $r_*^j = r_e^j/(1 + r_e^j)$. r_*^j is that rate of interest at which individual j is indifferent as between holding bonds and holding money. If the interest rate falls below r_*^j, the net yield to j of holding the bond will become negative. Now, in a community of n individuals designated by the running index $1, 2, \ldots, j, \ldots, n$, we have an n-tuple of 'critical' rates of interest $(r_*^1, r_*^2, \ldots, r_*^j, \ldots, r_*^n)$. Define $r_*^{min} \equiv \min_j \{r_*^j\}$. It is then clear that if the interest rate falls to r_*^{min}, than no one in the community of n individuals will want to hold bonds. Consequently, the interest rate will be prevented from falling below r_*^{min} by peoples' tendency, at this interest rate, to hold all their assets in the form of money. In other words, the demand for money becomes perfectly elastic at an interest-rate of r_*^{min} -- which, as it were, is a Liquidity Trap. Putting it differently, the interest rate is inflexible downwards at r_*^{min} ——"

"Yes, yes, yes, yes, yes," said the Supply-Sider testily, "but where is all this leading us?"

"I was coming to that", replied Alice indignantly. "As I said, price flexibility is only a necessary condition for ensuring full employment equilibrium. A necessary and sufficient condition, in addition to price-flexibility, is interest-rate flexibility. And I have just finished telling you that the Liquidity Trap phenomenon makes for inflexibility of the interest-rate below r_*^{min}. A special (and inarguable) case of the liquidity trap arises at $r_*^{min} = 0$: clearly, the interest-rate cannot fall below zero per cent. So, if the interest-rate is required to fall below zero per cent to stimulate investment sufficiently to equate it to saving, the excess of full-employment saving over investment cannot be fully eliminated by wage-price flexibility alone. This is the essence of Mr.Keyne's refutation of the classical proposition that wage-price flexibility is sufficient for the automaticity of full-employment equilibrium."

Alice stopped here, afraid lest she should have trodden on the Supply-Sider's toes. Conceive her amazement then at the sight which met her eyes - which was that of a Supply-Sider grinning at her very much like the Cheshire Cat.

"I was just leading you on, you misguided child," said the Supply-Sider, with a terrible smirk on his face. "I fear I shall now have to spring the Pigou or Real Balance Effect on you," and he sounded very ominous indeed.

"Oh, don't think you can frighten me," said Alice, emboldened by anger, "by unleashing that horried thing, whatever it may be."

"Oh yes, I will," thundered the Supply-Sider, "for you deserve to be punished, you naughty, interfering, obstreperous little girl. And now for the Pigou Effect," he proceeded, as Alice waited, half in nervousness, half in indignation. "Pigou examined more closely the implication of Keynes' demonstration of the possibility of an excess of saving over investment at a zero rate of interest. Now what can provoke an individual to save at a zero rate of interest? Certainly not the time-value of money. If an individual does not save with a view to investing his saving (or wealth) for a positive pecuniary return, it follows that he must be saving in order to consume out of his wealth. To be more formal, the Keynesian consumption function $C=C(Y)$ tells only half the story; for it is not just income (Y) but also wealth (W) which enters as an argument in the consumption function. The implication of that is quite profound. Let us review what happens when there is an excess of full-employment saving over investment. As you pointed out, the price-level will fall. Given a fixed nominal quantity of money, a fall in the price level will expand the real quantity of money. The real quality of money is a component of wealth which therefore increases. Consumption, as we have just seen, is an increasing function of wealth; the former will consequently increase to bridge the excess of supply over demand in the goods sector of the economy. No

matter that investment cannot increase due to the existence of a liquidity trap at a zero rate of interest; consumption will increase by the necessary amount to restore full-employment equilibrium. The Classical proposition of automaticity of full-employment equilibrium with wage-price flexibility is rescued from Keynes' criticism thanks to the Pigou, or Real Balance, or Wealth Effect. Note that if Keynes' 'refutation' is valid i.e. if people do save at a zero rate of interest -- then the wealth effect must hold; and if the wealth effect holds, Keynes' 'refutation' cannot, so to speak, be valid. Putting it differently I shall leave you to ponder (in silence) over the fact that if Keynes is right must be wrong."

"Oh", said Alice in a small voice; thinking that if one believed in right wrongness (or was it wrong rightness?), one might as well believe in sane madness, or in crooked straightness -- or even in real Mock Turtles. There was a brief silence, as Alice wondered. Then suddenly the pie Economics came to her rescue by putting her in mind of something she had quite forgotten.

"Dear me," said Alice, "how very silly of me not to have remembered. That was a very clever argument of Mr.Pigou's, Sir. But while as you say, the wealth effect rescues The Classical proposition under review, it quite spoils the other Classical proposition, that pertaining to the neutrality of money. Mr.Lloyd Metzler (Metzler, 1951) has shown very convincingly that if we accept the wealth effect, then we cannot but concede that a Monetary Disturbance of the First Type will have real effects."

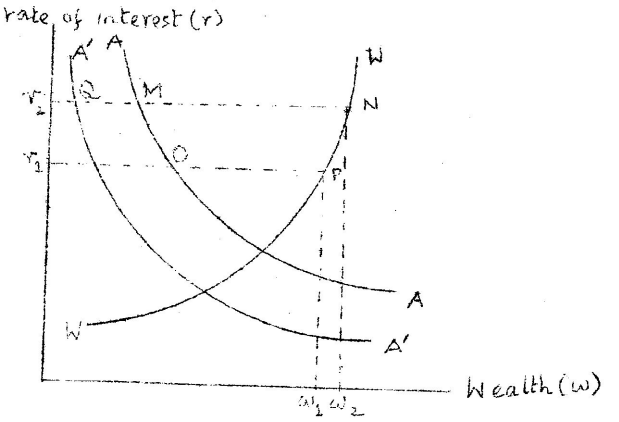
"I am acquainted," said the Supply-Sider suddenly, "with a Feminine Disturbance of the Alice Type, but what an earth is a Monetary Disturbance of the First Type, and why should the wealth effect make such a disturbance non-neutral?" "Well," said Alice, deciding to ignore the Supply-Sider's rudeness," it is quite a long story and I expect it

should take some time. Let me begin with Mr.Metzler's distinction between what he calls a 'monetary disturbance of the first type' and 'a monetary disturbance of the second type.' The former (the one we are interested in) is one which changes the quantity of money in the economy while simultaneously changing the quantity of other privately held assets by an equivalent amount. A monetary disturbance of the second type is one in which a change in the quantity of money is not accompanied by any offsetting change in the quantity of other privately-held assets. An example of a monetary disturbance of the first type would be an open-market operation conducted by the Government: if the Government purchases bonds, it increases the quantity of privately-held money while simultaneously reducing the quantity of privately-held bonds by an equivalents amount. It is Mr.Metzler's contention that the inclusion of wealth in the consumption function has the effect of making a monetary disturbance of the first type alter the equilibrium rate of interest. His argument can be developed along the following lines.

Supposing, to begin with, that full-employment saving and investment are in equilibrium at some interest-rate r_1, and for some level of wealth w_1. If the rate of interest is now raised to r_2, then investment will fall and we will have an excess of full-employment saving over investment : disequilibrium will ensue. To restore equilibrium at the higher interest rate r_2, saving would have to fall; given the inverse relationship between saving and wealth (the wealth effect), equilibrium can be restored by increasing the level of wealth. Let w_2 be the level of wealth required to reduce saving sufficiently to equate it once more with investment at the full-employment level. Briefly, as the interest rate rises from r_1 to r_2, wealth also would be required to rise (from w_1 to w_2) in order to preserve full-employment equilibrium. Various combinations of r and w therefore exist, at which full-employment saving and investment are equal.

The locus of these various combinations of r and w (which, as explained above, are positively related) for which equilibrium in the goods sector holds, can be plotted in the WW curve which I draw below (figure 5).

Figure 5 : The AA and WW schedules



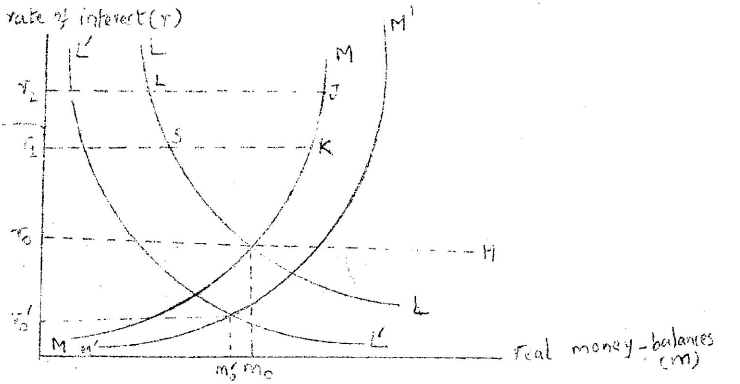
Mr.Metzler calls WW a "wealth-requirement schedule": for different interest-rates, it presents the amounts of wealth required to ensure equilibrium in the goods sector.

Assume now that wealth can be held in only two forms - money and securities. Let the relationship between the interest rate and the value of privately - held securities be represented by the AA schedule (figure 5). The downward slope of the AA schedule signifies that since the interest rate is equal to the fixed income from the security divided by the value of the security, as the value of the security rises the interest rate must fall.

Now the total quantity of privately held wealth, at any given interest rate, is the sum of privately held securities and privately held money. At the interest r_2, for example, the total quantity of wealth required to ensure equilibrium in the goods sector is r_2N (figure 5), of which

the total quantity of securities is r_2M. It follows then that at an interest rate of r_2 the total quantity of privately-held money required to ensure equilibrium in the goods sector is MN. In identical fashion, the real money-balance required to ensure equilibrium at an interest rate of r_1 is OP. If we then plot various combinations of equilibrium - preserving rates of interest and real money-balances, we can generate the MM schedule (figure 6) which Mr.Metzler calls the "money-requirement" schedule.

Figure 6 : The LL and MM Schedules



Note that, by construction, the distance r_2J in figure 6 is the same as the distance MN in figure 5, the distance r_1 K in figure 6 the same as the distance OP in figure 5 and so on.

The MM curve embodies the interest-rate-real-money-balances combinations that guarantee equilibrium in the goods sector. We need, likewise, a schedule which will embody interest-rate-real-money-balances combinations that will guarantee equilibrium in the securities market. This is represented quite simply by the standard downward sloping liquidity preference schedule LL (figure 6) - derived as follows. Suppose people wish to maintain a ratio of money balances to securities of r_2 Q to r_2 M at an interest rate

of r_2 (figure 5). Then the distance r_2 L in figure 6, which measures the distance r_2 Q in figure 5, represents the amount of money balances people will wish to hold at an interest rate of r_2. If at a lower rate of interest r_1, people wish to hold as much in money balances as in securities, they will wish to hold money balances equal to r_1 S (in figure 6), where r_1 S = r_1 O (in figure 5). The justification for liquidity increasing as the interest-rate falls is the following. When the rate of interest falls, the (opportunity) cost of holding money balances falls, so that the optimum ratio in which people wish to hold money-balances and securities will increase. At the same time, as the rate of interest falls, the value of securities will rise; if the money-balances to securities ratio is to increase with a fall in the interest rate, and if the value of the denominator in this ratio (the value of securities) declines with the interest-rate, then clearly the numerator (money balances) must increase as the rate-of interest declines. Wherefore the logic of the downward sloping LL schedule.

It is now clear from figure 6 that there is a unique combination of r and m - namely (r_o, m_o) for which equilibrium obtains simultaneously in both the securities market and the goods market. It might appear therefore that there is a unique rate of interest r_o associated with full-employment equilibrium. However, Mr.Metzler contends that the equilibrium rate of interest is unaltered only by a monetary disturbance of the second type.

Such a disturbance would arise, for example, if the real money-balances that are privately held were to be arbitrarily doubled (point H in figure 6). Now the money-balances-interest-rate combination for which the point H will be an equilibrium point in the goods-sector can be read off from the MM schedule. However, from the LL schedule we can note that the interest rate required for equilibrium in the goods sector requires, for equilibrium

in the securities market, a quantity of real money balances which is considerably less than what actually obtains. People will therefore tend to substitute bonds for money, the price of securities will rise and the rate of interest will decline. Investment will increase and exceed saving- leading to disequilibrium in the goods sector. Consequently prices would have to rise too - resulting in a contraction of real money balances. The interest-rate, which had originally fallen will begin to rise again toward r_o as the real money balances begin to contract towards m_o. Briefly, the process is initiated whereby all real variables in the system begin to be restored to their original values. At the end of the equilibrating process, the only variable which changes is the price-level-which doubles. No real variable is affected. All this is entirely in consonance with the classical proposition of the neutrality of money.

The situation however is quite different when a monetary disturbance of the first type occurs. Consider an open-market operation whereby the Government increases the supply of money by purchasing privately - held securities. The effect of this will be to shift the AA curve in figure 5 leftward to $A'A'$, where the horizontal displacement measures the extent to which securities have been purchased by the Government. The total requirement of wealth for ensuring equilibrium in the goods sector, remains, for any given rate of interest, unaltered. Hence, since the quantity of privately-held securities has declined, the amount of real-money balances required for equilibrium in the goods sector increases at each interest-rate. The MM curve, in other words, shifts rightward to $M'M'$ (figure 6) to the extent that the AA curve has shifted leftward to $A'A'$ (figure 5).

It should be noted now that the optimal ratio of money-balances to securities which people would like to maintain at each interest-rate, will remain unaltered; however, since the quantity of privately held securities has declined, the

quantity of money which people will want to hold of each rate of interest will decline so as to maintain the optimum portfolio balance. In other words, the LL curve will also shift leftward, to L'L' (figure 6).

Figure 6 tells us that the interest-rate-real-money-balances combination at which equilibrium now obtains simultaneously in both the securities and goods-markets is (r'_o, m'_o). The equilibrium rate of interest is thus altered by a change in the quantity of money - it falls from r_o to r'_o when the quantity of money held by people is increased via an open-market operation undertaken by the Government. The dynamics of the change can be briefly explained as follows. When the Government purchases securities, the price of securities is bid up with a consequential decline in the interest-rate. The fall in the interest rate stimulates investment. At the same time the capital gains accruing to people due to the appreciation in the value of their securities increases the quantity of wealth, as a result of which savings declines. The increase in investment and the decline in savings causes full-employment investment to exceed savings. This calls forth a rise in prices and hence a contraction of real money balances. The ensuing reduction in wealth increases savings until the latter is brought again into equilibrium with investment - but at a permanently lower interest rate and smaller real money-balance. Briefly, the Government does have the ability to alter the equilibrium interest-rate by undertaking an open-market operation : the latter alters the quantity of privately held wealth, which affects savings and hence the rate of interest. Thus, while the Pigouvian rebuttal of the Keynesian argument preserves the Classical proposition concerning the automaticity of full-employment equilibrium with wage-price flexibility, it destroys the other Classical proposition that any type of monetary disturbance will leave the equilibrium interest-rate unchanged. Would you then, Sir," concluded Alice, who was beginning to feel tired at the end of her long speech," "agree that if the

Classics are right, then the Classics must be wrong?" By way of answer, Alice got a gentle snore, and looking up, she found the Supply-Sider quite fast asleep!

"You have'nt heard a word of what I've said," cried Alice in vexation. The Supply-Sider woke up at the sound of her raised voice, said, "Eh?", and rubbing his eyes, asserted very vehemently, "of course I heard you. Every word. And even if I didn't hear you, it doesn't matter at all, since I am quite familiar with Metzler's argument, thank you, The only reason I asked you to tell me the Metzler story is that it is a long story, and the longer the story, the fewer the questions I have to answer." "Is that all you have to say, after the trouble I have gone to to show that the Pigou effect isn't really-well-effective?" asked Alice, who was getting angrier and angrier with the Supply-Sider's provocative remarks. "Certainly not," said the Supply-Sider decidedly. "I have some advice to give you."

"What?" asked Alice, curiously.

"Read footnotes carefully. Always read footnotes carefully."

"But what," asked Alice in hopeless confusion," has reading footnotes to do with what I have been saying?"

"Everything," said the Supply-Sider sternly. "In a general way, reading footnotes is a good cure for haste and carelessness. In particular, if you had read the Metzler paper carefully, you would have observed that in a footnote he indicates that when the Government increases the supply of money through an open-market transaction involving the purchase of Government securities by the Government from private asset-holders, these latter (the erstwhile security-holders) are assumed to be compensated for their loss in disposable income in the form of deprival of interest payments

on the Government securities they have traded for money, by means of a stream of tax-reductions in their personal income. Capital market imperfections will then ensure that the change in the quantity of privately-held Government securities will be perceived as a reduction in the net wealth of erstwhiles security-holders. Remove capital-market imperfections, and you will no longer have any wealth-effect following upon an open-market transaction. The 'Metzler effect' is neutralized by the 'Mundell effect' (Mundell, 1971)."

"You are not being the least bit clear," protested Alice, for she could make nothing of the Supply-Sider's cryptic remarks.

"And you," said the Supply-Sider angrily, "are not being the least bit patient. Nothing will be clear so long as you refuse to listen patiently or to read footnotes. So kindly pay attention while I explain. Consider again what happens in the course of a Metzler-type monetary disturbance. The purchase of Government securities by the Government, in the first instance, would effect a reduction in wealth equal to the value of securities purchased. The subsequent stream of personal income-tax reductions to offset the loss in interest-payments suffered by the erstwhile security-holders would however not offset the wealth lost in the form of the value of Government securities purchased by the Government. And this is because, in an imperfect capital market, streams of what one might call 'human income' are not capitalizable: there is no ready market for the purchase and sale of claims to a stream of personal income-tax reductions. It is precisely for the reason that an open market transaction of the type under consideration reduces the quantum of wealth with private asset-holders, and so-through the wealth effect-affects the equilibrium rate of interest. The Metzler phenomenon, on the other hand, would not arise if, as Mundell suggests, the Government were to compensate security-holders by reducing the rate of corporate taxation. For although there is in the first

instance a fall in the value of Government securities due to the Government's purchase of these, the subsequent reduction in corporate taxes to offset the loss of interest payments suffered by erstwhile security-holders is reflected in increased dividend payouts - which, thanks to the existence of a share-market - are fully capitalizable. In other words, the adverse wealth effect on Government securities is precisely offset by the favourable wealth-effect on corporate securities.

"To put all this more formally, let Y_f stand for full-employment income, z for the fraction of corporate profits in income (and so (1-z) for the share of non-profit income), t for the rate of corporate taxation, τ for the rate of personal income taxation, D for dividend payment (= post-tax profit = $z\,Y_f(1-t)$) and G for the yield, or interest payment, on Government securities. Consider first the situation where G is financed entirely by personal income taxes, so that $G = (1-z)\,Y_f\tau$. The total value of privately held wealth is then given by

$$W = \frac{G}{r} + \frac{D}{r}, \text{ where r is the rate of interest.}$$

Substituting $G = (1-z)Y_f\tau$ and $D = zY_f(1-t)$, we have

$$W = \frac{(1-z)Y_f\tau}{r} + \frac{zY_f(1-t)}{r}$$

Suppose now that Government interest payments change by dG. Given that $G = (1-z)Y_f\tau$, the required off-setting change in τ is furnished by

$$d\tau = \frac{-dG}{(1-z)Y_f}$$

The effect on private wealth of a change in Government interest payments with an off-setting change in the rate of personal income-taxation is then given by

$$dW = \frac{dG}{r} + \frac{dD}{r}, \text{ or}$$

$$dW = \frac{-(1-z)Y_f\, d\mathcal{C}}{r}, \text{ or}$$

$$dW = \frac{-(1-z)Y_f\, dG}{r(1-z)Y_f}, \text{ or}$$

$$dW = -dG/r.$$

In the above scheme of things, than, wealth changes by exactly the value of securities purchased. But now consider a situation where G is financed entirely by corporate taxes, so that $G = zY_f t$. The total value of privately held wealth is then given by

$$W = \frac{zY_f t}{r} + \frac{zY_f (1-t)}{r}$$

As before, imagine a change in Government interest payments of dG, which is compensated by a change in the rate of corporate taxation by $dt = \frac{-dG}{zY_f}$. Then the effect of this change in Government interest payments with an off-setting change in the rate of corporate taxation is given by

$$dW = \frac{dG}{r} + \frac{dD}{r}, \text{ or}$$

$$dW = \frac{-zY_f dt}{r} + \frac{zY_f dt}{r}, \text{ or}$$

$$dW = 0.$$

In the second situation, then, open-market transactions have no wealth effects. To be brief, the moral of the Metzler story is quite unwarranted."

"Well," said Alice, "I am not quite sure that the moral of the Mundell story is so very warranted, either. For, if the Government were to purchase (a part at least) of Government securities from people who do not possess corporate

securities and if it were to proceed to effect an off-setting tax reduction on corporate profits, then the Government would certainly thereby be balancing its budget - but at the (re-allocative) cost of, so to speak, robbing Peter to pay Paul, would it not? In any event, all Mr.Mundell says is that the Government can render a monetary disturbance of the first type neutral; but then by symmetric (Metzlerian) reasoning, the Government can render such a monetary disturbance non-neutral, simply by appropriate choice of the tax-rate (personal income rather than corporate) that it will reduce. Of course, I realise that assuming a perfect capital market altogether removes the difficulty - and such an assumption would be quite is consonance with your faith in Markets that Clear; after all, if the goods market clears and the labour-market clears, there is no reason why in your scheme of things the capital-market should not clear. But then, at some stage, should one not, Sir, pause to contemplate the Empirical Plausibility - please don't be offended - of perfect capital markets and perfect foresight?"

"I have," replied the Supply-Sider busily, "no time to pause and contemplate. Beside, I don't need the time. And if you think that's being rude to Time, let me tell you that I am being a good deal more polite then you, who - so the Mad Hatter informs me - are accustomed to beating Time, which is a poor enough excuse for playing the piano. But there you go, making all kinds of irrelevant remarks, holding me from my work."

"Am I making irrelevant remarks or are you?" cried Alice in indignation "You."

"Don't interrupt," said the Supply-Sider. "You have diverted me from what I was going to say, which is that if the Mundell effect doesn't appeal to you, it doesn't matter, even though the only reason it doesn't appeal to you is that you are a difficult, fussy girl with a polysyllabic vocabulary of nonsense words that include Empirical Plausibility and, I

wouldn't be surprised to hear, Jabberwocky and galumphing. But to the point. The reason why the 'Mundell effect' is not crucial to me is that that I have an entirely independent justification for asserting that Government securities are not net wealth - a justification due to Robert Barro (Barro, 1974). According to Barro, '....within the context of an overlapping-generations model....finite lives will not be relevant to the capitalization of future tax liabilities so long as current generations are connected to future generations by a chain of operative integenerational transfers.....' Since the absence of such a connection is not - to borrow your theme - Empirically Very Plausible - one can conclude that Government bonds are not net wealth. That, I think, settles the matter quite nicely."

"Apart from the fact," and Alice is exasperation, "that 'operative integenerational transfers' is no less polysyllabic than 'Empirical Plausibility', I am afraid that you are not, once more, being the last bit clear."

"You don't read enough footnotes, you are too impatient and you interrupt too much to be able to understand anything," said the Supply-Sider decisively. "And if you were a little more polite, perhaps I could explain Barro's argument, as follows. As I have already stated, Government bonds will not constitute net wealth so long as current generations are connected to future generations by a chain of operative integenerational transfers - by which is meant, so long as the optimum solution for the amount of bequests to be transferred across consecutive generations - is a strictly interior solution. This notion can be formalised along the following lines. In what follows, we shall take account of two consecutive generations - generation 1 and generation 2. Each generation is assumed to live two periods - a 'young' period and an 'old' period. The old period of generation 1 overlaps with the young period of generation 2. Initially, wealth (or earning assets A) is assumed to be held in the form of only one asset -

equity capital (i.e. corporate securities).

For generation 1, when old, define the following variables:

A_o^o = bequest of generation 0 to generation 1.

A_1^y = asset holding of equity capital by generation 1 when young.

A_1^o = asset holding of generation 1 when old.

Given the above, the budget constraint for generation 1 when old can be written as

(A.1) $$A_o^o + A_1^y + rA_1^o = C_1^o + A_1^o, \text{ or}$$

$$A_o^o + A_1^y = C_1^o + (1-r)\, A_1^o.$$

For generation 2, define the following variables:

A_2^y = asset holding of generation 2 when young.

A_2^o = asset holding of generation 2 when old.

W = wage income of generation 2 when young (wages are assumed to be received in the 'young' period).

C_2^y = consumption of generation 2 when young.

C_2^o = consumption of generation 2 when old.

Given the above, the budget constraint for generation 2 when young can be written as

$W + rA_2^y = C_2^y + A_2^y$, or

(A.2) $$W = C_2^y + (1-r)A_2^y$$

and the budget constraint for generation 2 when old can be written as

$A_2^y + A_1^o + r_2\, A_2^o = C_2^o + A_2^o$ or

(A.3) $A_2^Y + A_1^O = C_2^O + (1-r)\ A_2^O$.

(It should be noted that wage and interest payments are assumed to be received at the beginning of the relevant period).

Suppose now that generation 1 has some concern for the consumption of generation 2. This concern can be taken into account by entering as an argument into the utility function of generation 1, the maximum attainable utility of generation 2, U_2^*, which will depend on generation 2's endowment ($=A_1^O$) and the relative prices r and W. Generation 1's utility function U_1 can then be written as $U_1 = U_1(C_1^O, U_2^*(A_1^O, r, W))$.

The problem confronting generation 1 when old is then to choose its own 'old-period' consumption and the amount of bequest for generation 2 in such a way as to maximize utility, subject to its budget constraint and to non-negativity constraints imposed an C_1^O and A_1^O.

Formally, the problem can be stated at:

$$\underset{C_1^O,\ A_1^O}{\text{Maximize}} \quad U_1 = U_1(C_1^O, U_2^*)$$

subject to

$$A_0^O + A_1^Y = C_1^O + (1-r)A_1^O$$

$$C_1^O,\ A_1^O \geq 0$$

Let $(C_1^{O*},\ A_1^{O*})$ be the optimal solution to this problem.

Assume that A_1^{O*} is positive, i.e. that A_1^{O*} is a strictly interior solution.

Suppose at this stage that the Government issues bonds of the value of B to generation 1 and finances the interest payments on these by taxing generation 2 when young and the repayment of the principal by taxing generation 2 when old. Then the budget constraint for generation 1 becomes:

(A.4) $A_0^O + A_1^Y + B = C_1^O + (1-r)\ A_1^O$.

The budget constraint for generation 2 when young is

(A.5) $W = C_2^Y + (1-r)\ A_2^Y + rB,$

where rB is the tax to finance interest payments on bonds.

The budget constraint for generation 2 when old is given by

(A.6) $A_2^Y + A_1^O = C_2^O + (1-r)\ A_2^O + B,$

where B is the tax to finance repayment of the principal. Combining (A.5) and (A.6) gives

$$W = C_2^Y + rB + (1-r)\ (C_2^O + (1-r)\ A_2^O + B - A_1^O), \text{ or}$$

$$W = C_2^Y + rB + (1-r)\ C_2^O + (1-r)^2\ A_2^O + B - rB - (1-r)A_1^O, \text{ or}$$

$$(A.7)\ W + (1-r)\ A_1^O - B = C_2^Y + (1-r)C_2^O + (1-r)^2\ A_2^O.$$

The expression $(1-r)\ A_1^O - B$ on the LHS of (A.7) may be regarded as the 'net bequest' of generation 1 to generation 2. The optimization problem confronting generation 1 can now be stated formally as

$$\text{Max } U_1 = U_1\ (C_1^O,\ U_2^*\ (\ (1-r)\ A_1^O - B,\ r, w)\ )$$
$$C_1^O,\ A_1^O \quad \text{subject to}$$
$$A_o^O + A_1^Y + B = C_1^O + (1-r)\ A_1^O$$
$$C_1^O,\ A_1^O \geq 0.$$

Let the optimal solution be (C_1^{O*}, A_1^{O*}). The point which Barro makes is that since by assumption $A_1^{O*} > 0$, it will be the case that $A_1^{O*} = (1-r)A_1^{O*} - B$ and $C_1^{O*} = C_1^{O*}$. If the initial solution for A_1^O was a strictly <u>interior</u> solution, i.e. if the non-negativity constraint $A_1^O \geq 0$ was not binding, then the introduction of Government bonds would in no way alter the optimal net bequest to generation 2. Further, any change in B would be offset by an equivalent change in A_1^O so as to preserve the before-the-change-in-B

value of the net bequest $A_1^o(1-r)-B$. In other words, the quantity of the bequest will remain invariant, although its composition might change: prior to the issue of Government bonds, the bequest was entirely in the form of equity capital, whereas after the bequest it could be in the form partly of equity capital and partly of Government securities.

All this follows from the fact that, by assumption, the initial optimal solution for A_1^o was interior. The logic involved is that prior to the issue of Government securities generation 1 had the option of leaving no bequest to generation 2, i.e. had the option of a corner solution for A_1^o. The fact that it chose an interior solution indicates that it considered a corner-solution suboptimal at the margin. The introduction of Government bonds now does not in any relevant sense expand generation 1's opportunity set : to choose a different solution for the net bequest now would be irrational. On the other hand, if generation 1 had initially chosen a corner solution, then the introduction of bonds would indeed expand its opportunity set : typically the introduction of bonds would now be considered an increase in net wealth, consumption would increase and generation 1 would leave a net debt to the next generation. The increase in generation 1's consumption would alter the equilibrium rate of interest; the real effects predicted by Metzler would happen.

This logic could be more simply expressed diagrammatically. We assume, for the sake of the diagrammatic exposition, that generation 1's utility function is defined over its own consumption and generation 2's consumption. We assume also that the rate of interest is zero. Then from (A.1) we have

$$C_1^o = A_o^o + A_1^y - A_1^o. \qquad (A.8)$$

Combining (A.2) and (A.3) gives

(A.9) $$C_2 = C_2^Y + C_2^O = W - A_2^Y + A_2^Y + A_1^O - A_2^O = W + A_1^O - A_2^O$$

From (A.4) we have

(A.10) $$C_1^O = A_o^O + A_1^Y + B - A_1^O$$

and from (A.7),

(A.11) $$C_2 = C_2^Y + C_2^O = W + A_1^O - A_2^O - B.$$

From (A.8), (A.9), (A.10), (A.11) it is clear that <u>before</u> the issue of bonds, when $C_1^O = 0$, $C_2 = W + A_o^O + A_1^Y - A_2^O$ and

when $A_1^O = 0$, $C_2 = W - A_2^O$, while $C_1^O = A_o^O + A_1^Y$;

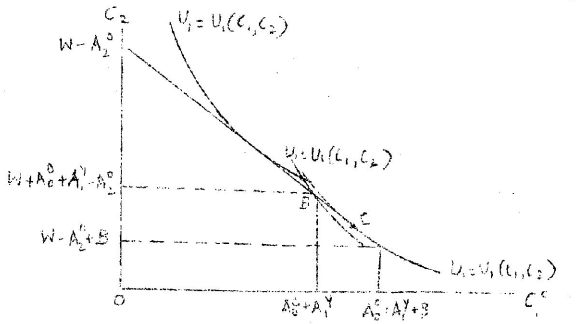
and <u>after</u> the issue of bonds,

when $C_1^O = 0$, $C_2 = W + A_o^O + A_1^Y + B - A_2^O - B = W + A_o^O + A_1^Y - A_2^O$ and

when $A_1^O = 0$, $C_2 = W - A_2^O - B$, while $C_1^O = A_o^O + A_1^Y + B$.

Given the above information, the budget constraint (reflecting the combinations of C_1^O and C_2 that are possible) drawn in the figure below becomes self-explanatory. The indifference curve reflects generation 1's constant - utility combinations between its own consumption and that of the next generation. It is quite clear from figure 7 that if the initial solution for C_1^O is interior (i.e. at the point A), then the introduction of bonds does not expand generation 1's opportunity set.

Figure 7 : <u>Generation 1's optimal choice of net beguest</u>



However, if the initial solution is a corner solution (point B), the introduction of bonds does enhance the generation's opportunity set and the new optimum would be at C.

I have made no references at all to imperfect capital markets. I trust I have demonstrated that the absence of corner solutions for the optimal bequests from generation to generation (an Empirically Attractive condition) is a sufficient condition for Government bonds to be not net wealth. And with that vanishes Metzler's argument. All this talk has made me quite sleepy again."

"Oh please don't go to sleep just yet, Sir," said Alice, "for though it has taken us a long time we have just finished examining the rationale underlying the prescription for a tight money policy - which is that money is neutral. And the neutrality of money, if I have understood you right, requires as a corrlary that Government bonds be not net wealth."

"Yes, you have understood me right," replied the Supply-Sider, "but what more can you possibly wish to know?"

"Why, Sir," said Alice, "you haven't told me yet why fiscal policy, far being expansionary, could well be contractionary, and in any event will only succeed in crowding out private investment."

"I should have imagined," said the Supply-Sider "that any even reasonably intelligent person should have guessed the answer to that question fairly easily by now. It is just my luck, I suppose, that I should be stuck with an inquisitive, unintelligent little girl."

Alice's vanity was pricked, and she did not much like the sensation. "Very well, then," she said, "if you won't answer the question and will insist on being rude and

unfriendly, I'll guess the answer for myself. I suppose your reason for believing fiscal policy to be ineffective in changing the equilibrium level of income is that Say's Law will prohibit it. With flexible wages and prices, income will always remain at the full-employment level: Government expenditure will simply be a substitute for private expenditure, and will not in any way affect the equilibrium level of employment or income". "Precisely," said the Supply-Sider. "You are more intelligent than I gave you credit for."

"But then that explanation does not suffice to demonstrate that 'expansionary' fiscal policy can, in fact, be contractionary", objected Alice. "Short run changes in income in either direction are ruled out within the context of full-employment equilibrium. For let us consider the effect of expansionary fiscal policy in an economy characterized by wage-price flexibility. An increase in Government expenditure will initially increase aggregate demand, in response to which the interest rate will rise. Meanwhile, excess demand in the commodities market will call forth an increase in the price-level until the excess demand is eliminated. Briefly, equilibrium is re-established at a permanently higher price level and rate of interest, but at the same level of income. This much is true for the short-run when the stock of capital is fixed. If the supply of capital is a function of the interest rate, then the change in the latter will certainly affect the former in the long-run. But confining ourselves only to the short run, the most we can assert is that expansionary fiscal policy will crowd out private investment, dollar for dollar. At worst, then, fiscal policy is superfluous - unless you regard the crowding out of private investment through Government intervention as a Bad Thing In Itself. In which case, of course, it is simply a question of your Value Judgement against mine - which would call for independent justification of our respective positions involving a separate discussion on our notions of Liberty and Justice - and So On."

"You are a tiresome girl," said the Supply-Sider angrily. "Am I to blame that you should find your own explanations unsatisfactory? It is obvious that in a flex-price, full-employment context it is impossible to assert that expansionary fiscal policy can reduce the equilibrium level of income. Therefore, it is equally obvious that my proposition holds good in an under-full-employment context with price-rigidities - that is to say, in your own Keynesian world."

"The only explanation," said Alice, "which I can now see accounting for Government expenditure crowding out private investment completely is the old Classical (and new Monetarist) faith in a vertical LM function. If the interest elasticity of the demand for money is zero, then the preliminary increase in income following upon increased Government expenditure will raise the interest rate to fully the extent required to crowd out private investment so as to precisely neutralize the effect of the increase in Government spending."

"The old superstition of a vertical LM function is simply not relevant," said the Supply-Sider irritably. "Don't you ever read the literature carefully? Professor Friedman himself (Friedman, 1966) has this to say'..... (No)..... "fundamental issues" in either monetary theory or monetary policy hinge on whether the estimated elasticity (of demand for money will respect to the rate of interest) can .....be approximated by zero or is better approximated by - 0.1 or -0.5 or -2.0, provided it is seldom capable of being approximated by $-\infty$ '".

"Then how," asked Alice "can you demonstrate the ineffectiveness of fiscal policy if you grant both money-wage rigidity and a non-zero slope for the LM function?" "Am I to have no peace?" asked the Supply-Sider bitterly. Then, resigning himself to his fate, he resumed. "Note, to begin with, that in the presence

of wage-price rigidities, Government spending financed entirely by new money creation (what you would call a monetary disturbance of the second type) will be effective. The sort of "crowding-out" effects I shall discuss relate to bond-financed Government spending (or Government spending financed by a monetary disturbance of the first type).

Consider figures 8 and 9 below in turn now.

Figure 8 : Government spending sans wealth effects

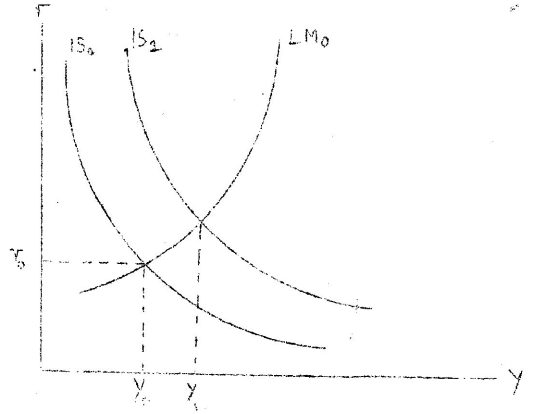
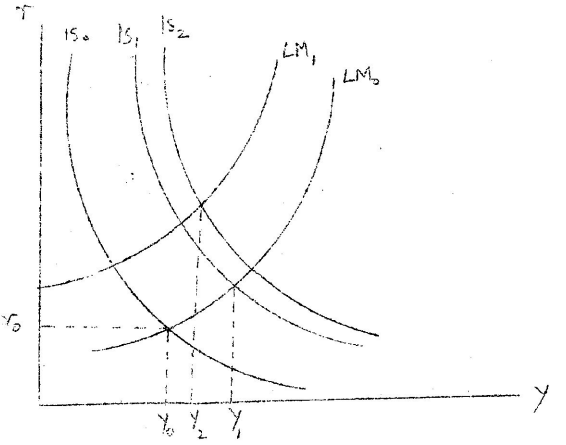


Figure 9 : Government spending with wealth effects

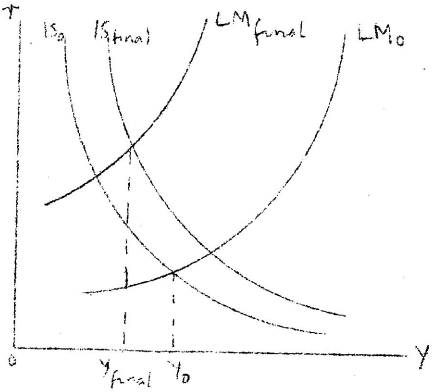


In figure 8, ISo and LMo describe the IS and LM curves in some initial situation where the equilibrium rate of interest is r_o and the equilibrium level of income is y_o. Suppose now that Government expenditure is undertaken and is financed by the issue of bonds. If we ignore all wealth effects of the issue of bonds, then the effect of the Government expenditure will be represented by a rightward shift of the IS function from IS_o to IS_1 - the extent of the shift measuring the Keynesian multiplier times the increase in Government expenditure. The expansionary effect of fiscal policy is represented by the increase in income from Yo to Y_1.

I will now, however, invoke the wealth effects of the issue of bonds. If bonds are preceived as net wealth by the households, and if consumption and the demand for money are increasing functions of wealth, then two things will happen. In addition to the immediate, or first-round effect of a shift in the IS function, ISo to IS_1, we will have second and subsequent-round impacts. The IS function will shift further outward from IS_1 to IS_2 (figure 9) - reflecting the response of consumption to increased wealth. At the same time, the demand for money will increase, reflected in a leftward shift of the LM function to LM_1. The question of whether, at the end of the second round, income will be greater or less than Y_1 will depend on the relative magnitudes of the shifts in the IS and LM functions. This is a matter for Empirical Verification, but I believe that in all probability the leftward shift of the LM function will exceed the rightward shift of the IS function. At the end of the second round, then, income will be Y_2 ($< Y_1$). Further, these shifts in the IS and LM functions will continue so long as the budget deficit exists, and so long as bonds continue to be issued. The long-run equilibrium when finally the budget is balanced again, will be characterised by a level of income smaller than the initial equilibrium income Y_o (see figure 10 below):

briefly, the net 'expansionary' effect of fiscal policy will in fact be contractionary."

Figure 10 : The final effect of 'expensionary' fiscal policy



The more and more Alice listened to the Supply-Sider, the more and more it occurred to her that what he was saying sounded very familiar. A final effort of memory, aided by the Pie ECONOMICS, brought it all back to her. "Oh, but it is precisely your argument, Sir," she cried, "which Mr.Solow and Mr.Blinder (Solow and Blinder, 1973) examine rather more carefully than you seem to have done. Let me give you an abbreviated version of a part of their argument. The propositions which you make can be examined in the context of a simple IS-LM model in which we allow for wealth effects. Consider the following equations of the model.

$$(B.1) \qquad P\,[\bar{G} + B - \underline{T}] = \dot{M} + \frac{\dot{B}}{r} .$$

Equation (B.1) above represents the Government's budget constraint - namely that the nominal budget deficit is equal to the sum of the changes in the quantity of money and the quantity of bonds. The Government's outflows is G + B, where G is Government expenditure and B is the interest payment on bonds. Assuming that there are B bonds outstanding of face-value unity each, and assuming that each bond promises to pay

a dollar in perpetuity, the Government's "annual" interest payment is B. T denotes the tax revenue to the Government. If P is the price-level, then $P(G+B-T)$ signifies the nominal budget deficit of the Government (the LHs of equation (B.1)). On the RHS of this equation, $\dot{M}$ represents the change in the quantity of money; if r is the rate of interest, then $\frac{B}{r}$ is the present value of the bonds, so that $\frac{\dot{B}}{r}$ measures the change in the quantity of bonds, measured at their market value. As for the remaining equations of the model, we employ fairly standard terminology which does not call for any particular explanation. Consumption is expressed as a function of personal income (equal to disposable income (Y-T) plus the households' receipt of interest payments B) and of wealth W; likewise, the demand-for-money-function includes wealth W as an argument. The following equations are self-explanatory. (To preclude the possibility of confusion, an expression of the type X(.) would indicate a functional dependence, while an expression of the type $X/./$ would indicate the product operation).

(B.2) $Y = C + I + G$ (Equilibrium in the commodities market).

(B.3) $C = C\ (Y + B - T, W)$ (Consumption function).

(B.4) $I = I(r)$ (Investment function).

(B.5) $T = T(Y + B)$ (Tax function)

(B.6) $M^d = L\ (Y,\ r,\ W)$ (Demand-for-money function)

(B.7) $M^S = M$ (Supply-of-money function)

(B.8) $M^D = M^S$ (Equilibrium in the monetary sector)

(B.9) $W = M + \frac{B}{r} + K$ (Definition of wealth, with K = stock of capital)

Now consider the budget constraint.

$$P/G + B - T/ = \dot{M} + \frac{\dot{B}}{r}$$

In a long-run steady state equilibrium, we will have $\dot{M} = \frac{\dot{B}}{r} = 0$, signifying that the budget is balanced. It follows then that

$$G + B = T(Y + B).$$

Taking total differentials on both sides of the above equation yields

$$dG + dB = T'[dY + dB], \text{ or}$$

$$dG + dB[1 - T'] = T'dY, \text{ or}$$

$$1 + \frac{dB}{dG}[1 - T'] = T'\frac{dY}{dG}, \text{ or}$$

$$\frac{dY}{dG} = \left\{1 + \frac{dB}{dG}[1 - T']\right\}/T' \qquad (B.10)$$

Expression (B.10) is, precisely, the long-run Government-expenditure multiplier. When the deficit is financed by the creation of money, clearly $\frac{dB}{dG} = 0$ in expression (B.10), so that (B.10) can be written as

$$\frac{dY}{dG} = 1/T' \qquad (B.11)$$

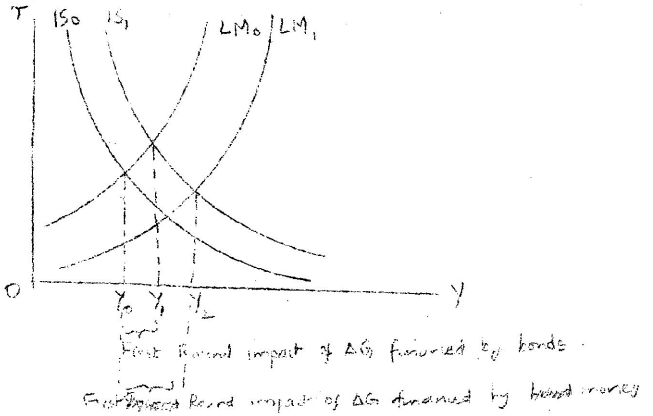
When , however, the deficit is financed by bonds, then clearly $\frac{dB}{dG} > 0$, so that (B.10) can be written as

$$\frac{dY}{dG} = 1/T' + \frac{dB}{dG}/T' - \frac{dB}{dG} = \frac{1}{T'} + \frac{dB}{dG}\left[\frac{1}{T'} - 1\right] > \frac{1}{T'} \text{ since } T' < 1 \qquad (B.12)$$

In other words, the long-run multiplier, when the Government expenditure is financed by bonds, in <u>larger</u> than when it is financed by money-creation. Consequently, fiscal policy is not only expansionary but <u>more</u> expansionary when Government spending is financed by bonds rather than by money-creation. The economic explanation for this rests on the following reasoning. The immediate or impact effect of a

money-financed increase in Government expenditure is greater than that of a bond-financed increase in Government expenditure. (The first is accomponied by a righward-shift in the LM function while the second is not (see figure 11 below)).

Figure 11 : The first-round effects of money-financed and bond-financed Government spendings:



Consequently, the first mode of financing induces a larger initial tax-receipt by increasing income more in the first-round. Conversely, where the second mode of financing is concerned, income must needs increase by more in second and subsequent rounds than under money-financed spending. Also, the larger the quantity of bonds issued, the greater the interest payments which the Government has to make : under bond-financed spending, since the budget deficit is so much harder to bridge, it calls forth so much more large-sized increases in income during second and subsequent rounds. There is no call for Empirical Verification here: on purely theoretical grounds one can see that your assertion of the contractionary effect of fiscal policy financed by interest-bearing securities is quite misplaced. It is however importan to issue certain qualifying comments, the details of which you might want to work out from the Solow-Blinder paper. It is only if the steady-state long-run equilibrium is a stable one that the result I have derived obtains. When the steady-state

long-run equilibrium is unstable, either bond-financed Government expenditure is contractionary (in which case you would be right), or it is insufficiently expansionary so that the budget deficit is never bridged. What is a matter for Empirical Verification, then, is as to which type of steady-state equilibrium will obtain. Happily, Mr.Solow and Mr. Blinder have demonstrated that the condition for stability is a mild and Empirically Very Plausible one - so that it appears that fiscal policy is indeed likely to be expansionary whatever the mode of financing of Government expenditure.

If you will please bear with me for a moment more, Sir, I will come to the heart of the matter - and one which puzzles me a good deal. To assert the neutrality of money in a Flex-price, full-employment context, you went to a good deal of trouble to demonstrate that Government bonds are not net wealth. But very soon afterwards, to demonstrate the 'contractionary' effects of expansionary fiscal policy financed by bonds in a fix-price, under full-employment context, you have had to assert that Government bonds are net wealth. Please, Sir, aren't you contradicting yourself? If a thing is such-and-such, how can it not be such-and-such too?"

"I never said that if a thing is such and such, it cannot be such-and-such too. All I have said is that if Government bonds are net wealth, Government bonds cannot be net wealth. There is surely a difference between such-and-such and Government bonds, as also between such-and-such and net wealth. Even you can see that, surely, stupid?" sneered the Supply-Sider.

Poor Alice felt so confused that she dared not ask any more questions on that issue, lest she be accused again of being stupid. Instead, after, a pause, she enquired timidly:

"Please Sir, if monetary policy is merely inflationary and fiscal policy is ineffective, then how can one explain the existence of a trade-off between inflation and unemployment?"

"Why," asked the Supply-Sider peevishly, "must one explain any such thing?"

"Why, Sir", replied Alice quickly, "because such an inverse relationship between inflation and unemployment has been observed. It was observed by Mr.A.W. Phillips (Phillips, 1958) when he examined the data on the rate of change of money wages and of unemployment in England for the years. This inverse relationship is embodied in the so-called Phillips Curve."

"If you believe you are being very lucid," said the Supply-Sider scornfully, "you are not."

"Let me try and explain the notion of the Phillips Curve, then", said Alice humbly. "Suppose the economy to be in initial equilibrium at some level of employment L_f, which is, however, compatible with some (no-zero) rate of 'frictional' or involuntary unemployment. Suppose now that an expansion in aggregate demand leads to excess demand in the labour-market. This might be expected to lead to a fall in the unemployment rate, since, owing to excess demand in the labour market, some of the factors responsible for frictional unemployment might be expected to be mitigated: employers would now be less particular about the skills they required, and the acquisition of information, and labour mobility would be rendered less costly. Briefly, the extent of excess demand for labour may be expected to be inversely related to the rate of unemployment. Now the excess demand for labour will also put upward pressure on the money wage rate. Given that the rate of change of money wages is directly related to the excess demand for labour, and that the latter is inversely related to the rate of unemployment, it follows that the rate of change of money wages is inversely related to the rate of unemployment. This describes the basic Phillips-curve relationship. To be somewhat more formal, let Ls denote the supply of labour, L_d the demand for labour,

$\frac{dW}{W}$ the rate of change of money wages and U the rate of unemployment. Then

$$L_e \equiv \frac{L_d - L_s}{L_d} = f(U), \frac{df}{dU} < 0.$$

The equation I have written says that the excess demand for labour (Le) is a decreasing function of the rate of unemployment. We also have

$$\frac{dW}{W} = g\left(\frac{L_d - L_s}{L_d}\right), \frac{dg}{d\left(\frac{L_d - L_s}{L_d}\right)} > 0.$$

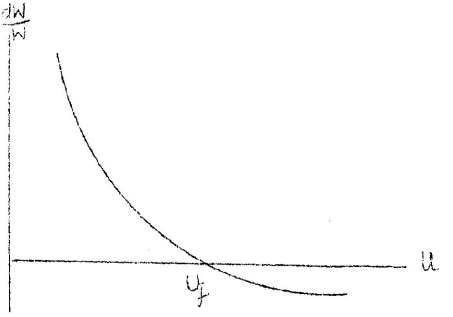
The second equation I have written says that the rate of change of money wages is an increasing function of the excess demand for labour. Combining the two equations yields

$$\frac{dW}{W} = g(f(U)), = \text{(say) } l(U), \text{ whence}$$

$$\frac{dl}{dU} = \frac{dg}{df}\,\frac{dg}{dU} < 0, \qquad \text{since } \frac{dg}{df} > 0 \quad \frac{df}{dU} < 0$$

$\frac{dW}{W}$ is then a decreasing function of U, which relation is plotted in the graph below:

Figure 12 : The relation between the rate of change of money-wages and the rate of unemployment



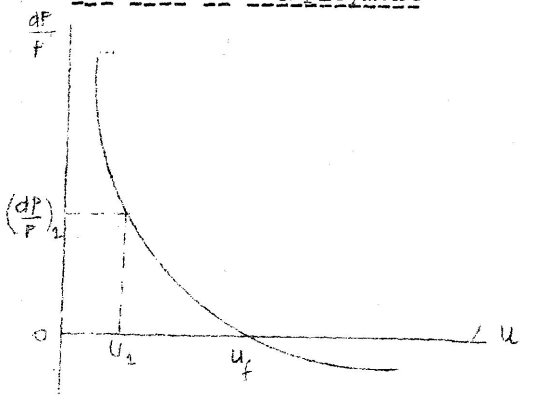
Note that U_f refers to the "full-employment" rate of unemployment. Since at this rate of unemployment there is neither excess demand for nor excess supply of labour, the rate of change of money wages is zero. For $U < U_f$, we have excess demand in the labour-market and so rising money wages, while for $U > U_f$ we have excess supply of labour and so falling money wages.

Suppose now that we relate the rate of change of money wages to the rate of change of prices. Assuming that in equilibrium the real wage rate is equal to the marginal product of labour M, we have

$\frac{W}{P} = M$ (where P is the price level), whence

Log W - Log P = Log M, and taking total differentials and rearranging, $\frac{dP}{P} = \frac{dW}{W} - \frac{dM}{M}$. This equation states that the rate of inflation is an increasing function of the rate of change of money-wages and hence a declining function of the rate of unemployment. This inverse relationship is plotted in the figure I now draw.

Figure 13 : The relation between the rate of inflation and the rate of unemployment



The Phillips-curve I have drawn embodies the possibility of effecting a trade-off between inflation and unemployment. It suggests that if the Government undertakes 'stabilisation policy' to induce an inflation at the rate of $\left(\frac{dP}{P}\right)_1$, it can succeed in curtailing unemployment to the rate U_1. Now recollect that we had obtained the equation $\frac{dP}{P} = \frac{dW}{W} - \frac{dM}{M}$.

Assuming that the marginal product of labour remains constant, we have it that the rate of inflation coincides with the rate of change of money-wages. In other words, the real wage-rate associated with the unemployment rate of U_1 is the same as the real wage rate associated with the "full employment" rate of unemployment U_f. The fall in the unemployment rate with no restrictions on the real wage-rate then demonstrates the possibility of existence of underfull-employment equilibrium, contrary to Classical/Monetarist propositions!" Alice stopped here, feeling rather pleased with her explanation. It transpired, however, that the Supply-Sider shared no part of her pleasure, for he promptly said:

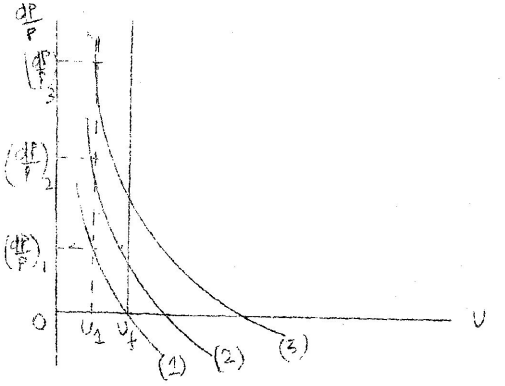
"What a misguided view of the world, to be sure. Let us examine the nonsense you have been uttering a little more closely. Your muddle-headed assertion of the possibility of a 'fall in the unemployment rate with no restrictions on the real wage-rate' can only be attributed to inflation-illusion on the part of suppliers of labour. In other words, an increase in money-wages-with no regard to a rise in the price level and its effect on the real wage-rate -- is a necessary and sufficient condition for the supply of labour to increase; that is, workers persistently suffer from the illusion that a rise in money wages is a symptom of a relative not an absolute price-rise. Having assumed that you can fool all the people all the time, it is simple enough to go on to demonstrate long-run Phillips-curve trade-offs between inflation and unemployment.

Now I maintain the impossibility of any long-run trade-off between inflation and unemployment. With Professor Friedman (Friedman, 1968), I shall begin by designating U_f as the 'natural rate of unemployment' - which is the rate of unemployment that is consistent with a continual supply-demand equilibrium in the labour-market, ensured by Walrasian tatonnement procedures. To be sure, the 'natural rate' is compatible with a certain order of voluntary unemployment - due, for example, to 'search' activities (see Alchian in Phelps et al, 1970). It is precisely this kind of 'search unemployment' which generates short-run Phillips curves and which you have mistaken for a long-run trade-off. Let me explain what I mean by way of a brief, eclectic exposition of this alternative interpretation of the Phillips curve problem.

Let us see what happens when we attribute the unemployment associated with the 'natural rate' to search unemployment. To be specific, in a complex labour market, information is always inadequate on the wage-rate prevailing in alternative jobs. Some fraction of the labour force, at any given time, therefore voluntarily quits employment in the expectation of getting a higher-wage job from search. Supposing now that as a consequence of excess demand in the labour market money wages and prices rise. Labour, initially, suffers from two kinds of 'inflation illusion': first, it tends to interpret the rise in the price of its factor as a relative price-rise rather than an absolute price-rise; second, those unemployed in the cause of search for higher wage-jobs experience a dimunition in the difference between their 'aspiration' wage and the wage currently ruling: they tend to believe that the rise in money wages is a localized phenomenon confined to the job at hand, and one which has not infected other jobs elsewhere in the labour-market. The net result is that first, these already employed and contemplating quitting, on in their jobs; and second, those unemployed in the cause of search terminate their search and take on the job on hand. We are

thus left with a dimunition in the rate of unemployment following upon an underestimation of the rate of inflation. Wherefore, now, a momentary Phillips curve which permits of the compatibility of some rate of inflation (say) $(\frac{dP}{P})_1$ with a rate of unemployment U_1 ($< U_f$). The Phillips curve you have drawn I draw again now, and label (1).

Figure 14 : A long-run vertical Phillips Curve



Now, I am not Keynesian enough to believe that the 'inflation illusion' will last for ever. In course of time people get over their illusion, they become accustomed to the actual prevailing rate of inflation and they reverse the labour-supply decisions which they had made while in a state of deception as to the actual rate of inflation. The rate of unemployment, at the enhanced inflation rate of $(\frac{dP}{P})_1$, tends to slip back to the 'natural rate' U_f. To maintain unemployment at the rate U_1, prices and money wages again have to rise. Allowing the Government the role you have assigned it, it will have to induce an inflation at the rate of $(\frac{dP}{P})_2$ to maintain the unemployment-rate at U_1 (see figure 14). These monetary disturbances will, because of their being unanticipated, help in generating a series of momentary Phillips-curves - and

so help in short-run reductions in the rate of unemployment from its 'natural rate'. But people cannot be continually fooled. If, as part of its exercises in stabilization, the Government recurrently undertakes to increase money-supply, its activities will come to be anticipated by people who - since they will make rational expectations - will cease being seized by surprise (that is what I call a good pun). Short run deviations in the rate of employment from its 'natural rate' - and therefore short run deviations in the rate of output from its 'capacity' rate - can be attributed to discrepancies between anticipated and actual rates of inflation. But, given rational expectations, Government-policy-induced inflations will be powerless to alter the vertical shape of the long-run Phillips curve along which expected and actual rates of inflation will coincide."

"Please Mr.Supply-Sider, Sir, before you continue with an explanation of what kinds of animals Rational Expectations are," said Alice, who was beginning to feel quite overwhelmed, "there are one or two things I should like to say, if I may. It was not very right of you to suggest that I have some theory of 'inflation illusion' to explain the possibility of a fall in the unemployment rate with no constraints on the real wage rate. Mr.Keynes should certainly not be credited with any such notion, as Mr.Tobin (Tobin, 1971) forcefully argues. The phenomenon I speak of is explained by the Keynesian labour-supply function - i.e. by the notion that the supply of labour is a function of relative real wages rather than absolute real wages. In other words, wage-bargains are fixed in the money denomination for finite lengths of time; so long as the money wage does not fall, workers will be willing to supply more labour even at reduced real wages provided the reduction is a generalized phenomenon affecting all labour markets. So please do note that not only do I rule out an 'inflation illusion' of the first type you described (i.e. a confusion between a relative and absolute price rise), but I also rule out an 'inflation illusion' of the second type (i.e. an erroneous

perception that money wages are increasing solely in the localized confines of one's immediate labour-market environment).. Quite to the contrary. Indeed, it is you, Sir, who have to depend so heavily on 'inflation illusion' - thereby rendering yourself vulnerable to Mr.Tobin's (Tobin 1981) charge of a "...far-fetched specification of imperfections and asymmetries in the information available to various economic agents".

"If you have finished interrupting," said the Supply-Sider impatiently, "perhaps I can continue to explain more fully how a rational-expectations Walrasian equilibrium renders Government stabilization policy ineffective. But first, a brief explication of the notion of Rational Expectations. Rational Expectations (a concept due to John Muth (Muth, 1960)) are essentially, as Brian Kantor (Kantor, 1979) has pointed out, "profit maximizing expectations." Agents in the economy will use all the available information and the relevant theory to predict the value of the variable they are interested in."

Here Alice could not help interrupting. "But what is the relevant theo - "she began, when the Supply-Sider said in a very decisive tone, "Hold your tongue. One more interruption, and I shall stop. Where was I, now? Oh yes, agents in the economy will use all the available information and the relevant theory to predict the value of the variable they are interested in - which, in the context of our discussion of the Phillips curve, is the rate of inflation. The Rational Expectations hypothesis says that the subjective expectation of the inflation-rate in time t + 1 formed in time t, and denoted by ${}_{t+1}P^{*}_{t}$, is precisely the same as the objective expectation formed in time t, which is an optimal expectation that is contingent on all the information (Θ_t) required and available to make the expectation and is founded also on the appropriate economic theory. That is,

$$ {}_{t+1}P^{*}_{t} = E_t (P_{t+1}/\Theta_t) . $$

Further, rational expectations would require that the prediction error $P_t - E_t(P_{t+1} / \theta_t)$ be statistically independent of θ_t - implying that agents will not be <u>systematically</u> wrong in their predictions, errors being induced only by random or stochastic shocks that can upset agents' calculations.

"The direction I am taking is, I trust, beginning to be clear. Before you started interrupting in that uncivil way you have, I said that "short-tun deviations in the rate of employment from its 'natural rate' - and therefore short-run deviations in the rate of output from its 'capacity' rate - can be attributed to discrepancies between anticipated and actual rates of inflation." But with rational expectations, such discrepancies can arise only from stochastic shocks - and not from any systematic monetary policy pursued by Government, for any sustained use of monetary policy by Government will lead to these systematic parts of policy being included in the set θ_t on the strength of which agents found their expectations regarding P_{t+1} : when agents Except Rationally, you cannot expect a recurrent use of monetary policy to recurrently lead them astray in their expectations.

The stage is now set for a demonstration of my assertion that changes in the rate of money supply have no real effects (the super-neutrality of money), while fiscal policy can at best alter the real rate of interest. A more elegant statement of these propositions would be after the fashion of Thomas Sargent's two-fold assertion (Sargent, 1973), namely that

(a) 'a natural rate of output exists in the sense that the deviation of output from its normal level is statistically independent of the systematic parts of monetary and fiscal policies....,' and

(b) '.....the real rate of interest is independent of the systematic part of the money supply.....' (though not of fiscal policy) - i.e. changes in the nominal rate of interest caused by changes in money supply are accounted for fully by

(expectations - verifying) changes in the rate of inflation, leaving the real interest-rate unaltered.

"In establishing these propositions, I shall rely heavily on Sargent (op.cit.), and begin with a basic description of the economy with the following equations.

(C.1) $y_t = k_t + \gamma[p_t - {}_{t-1}p^*_t] + U_t$

(C.2) $y_t = k_t + c[i_t - ({}_{t+1}p^*_t - p_t)] + dz_t + \varepsilon_t$ (Aggregate Supply function)

(Aggregate demand, or IS-function)

(C.3) $m_t = p_t + y_t + bi_t + \eta_t$ (LM function)

where

y_t = logarithm of the real output at time t

k_t = logarithm of the 'capacity' or 'natural rate' output at time t

p_t = logarithm of the price level at time i

${}_tp^*_{t+1}$ = subjective expectation of the logarithm of the price level at time t+1 formed at t

i_t = nominal rate of interest at time t

z_t = vector of fiscal policy variables (including Government spending, tax-rates, etc., at time t).

m_t = logarithm of the nominal money supply at time t.

$\gamma(>0)$, $c(<0)$ and b (≤ 0) are parameters and d is a vector of parameters whose transpose has the same dimensionality as z.

U_t, ε_t, and η_t are normally distributed random error variables with zero means.

"If you are wondering why I am using logarithms everywhere, consider, for example, the natural-number equivalent version of equation (1) - ignoring the stochastic term - where I shall employ capital letters such as Y_t to signify that $\log Y_t \equiv y_t$:

$$\log Y_t = \log K_t + \gamma (\log P_t - \log {}_tP^*_{t-1})$$

Then, differentiating this equation through with respect to t, and holding the factors (such as tastes and technology) which affect the 'capacity' output constant, we have

$$\frac{1}{Y_t}\dot{Y}_t = \gamma\left[\frac{1}{P_t}\cdot\dot{P}_t - \frac{1}{{}_tP^*_{t-1}}\cdot{}_t\dot{P}^*_{t-1}\right] \quad \text{(where for any variable } x,\ \dot{x}_t \equiv \tfrac{dx}{dt}\text{)},$$

which equation asserts that the proportionate rate of change of output from its capacity level is directly proportional to the discrepancy between the expected and actual rates of inflation. Equation (C.1) then implies precisely my earlier explanation of the 'expectations-augmented' Phillips curve.

"Equation (2) is an IS - function, showing the proportional rate of change of aggregate demand from its capacity level to be accounted for (i) inversely by the change in the real rate of interest, itself equal to the change in the nominal rate of interest less the expected change in the rate of inflation, and (ii) by changes in the fiscal policy variables. Again, writing equation (C.2) in terms of natural numbers (after ommiting the stochastic term) should make this clear :

$$\log Y_t = \log K_t + \alpha\left[i_t - \log\left({}_{t+1}P^*_t / P_t\right)\right] + dZ_t$$

Again, differentiating throughout with respect to time and holding K_t fixed yields:

$$\frac{1}{Y_t}\dot{Y}_t = \alpha\left[\dot{i}_t - \left({}_{t+1}\dot{P}^*_t / {}_{t+1}P^*_t - \dot{P}_t/P_t\right)\right] + d\dot{Z}_t$$

"Finally, equation (3) is an LM function reflecting equilibrium in the money sector : the real supply of money equals the real demand for it. Note that the demand-for-money-function can be written as $\log M_t = \log P_t + \log Y_t + br_t$, or $\log \left(\frac{M_t}{P_t}\right) = \log Y_t + br_t$,

which shows the real demand for money to be an increasing function of real income and a declining function of the nominal rate of interest.

I now incorporate the rational expectations hypothesis embodied in (C.4) below, according to which, as I have said, the subjective expectation of the price-level at time t+1 formed in time t is precisely the same as the objective expectation formed in time t and founded on all the information required to make this expectation:

(C.4) $_{t+1}p^*_t = \mathop{E}_{t}\, p_{t+1}$

I now need to specify the behaviour of all the exogeneous variables and disturbance terms in the model on which the objective expectation in (C.4) is contigent. I assume that the supply of money is governed by a 'linear feed-back system' and is defined by a linear combination of distributed lags in all the exogeneous variables and disturbance terms in the model (this will constitute the 'systematic part' of monetary policy); in addition, money-supply will be affected by a random or stochastic component reflected in the non-autocorrelated disturbance term ζ_m, distributed with zero mean:

(C.5) $m_{t+1} = \sum_{i=0}^{\infty} \alpha_i m_{t-i} + \sum_{i=0}^{\infty} \beta^1_i k_{t-i} + \sum_{i=0}^{\infty} \beta^2_i z_{t-i} + \sum_{i=0}^{\infty} \beta^3_i v_{t-i} + \sum_{i=0}^{\infty} \beta^4_i \varepsilon_{t-i} + \sum_{i=0}^{\infty} \beta^5_i \eta_{t-i} + \zeta_m$

The other exogeneous variables and disturbance terms in the model - k, z, v, ε, η - are assumed to be generated by

auto-regressive processes:

$$
\begin{aligned}
k_{t+1} &= \rho_k k_t + \varepsilon_{k,t+1} \\
z_{t+1} &= \rho_z z_t + \varepsilon_{z,t+1} \\
u_{t+1} &= \rho_u u_t + \varepsilon_{u,t+1} \\
\varepsilon_{t+1} &= \rho_\varepsilon \varepsilon_t + \varepsilon_{\varepsilon,t+1} \\
\eta_{t+1} &= \rho_\eta \eta_t + \varepsilon_{\eta,t+1}
\end{aligned}
\tag{C.6}
$$

where the ε_j's are mutually uncorrelated and separately non-autocorrelated normally distributed random variables with zero means, and $\rho_k K_t = \sum_{i=0}^{\infty} \rho_{k,i} k_{t-i}$, etc.

We can now define the set of variables on which the objective expectation in (4) is contingent:

$$
{}_{t+1}P^*_{t+2} \equiv E\left[P_{t+1} / m_t, m_{t-1}, \ldots; k_t, k_{t-1}, \ldots; z_t, z_{t-1}, \ldots; u_t, u_{t-1}, \ldots; \varepsilon_t, \varepsilon_{t-1}, \ldots, \eta_t, \eta_{t-1}, \ldots\right]
$$

or, representing the information-set $(m_t, \ldots, \eta_t, \ldots)$ by θ_t, we have

$$
{}_{t+1}P^*_{t+2} = E(P_{t+1} / \theta_t) \tag{C.7}
$$

We are now all set to prove Sargent's two propositions. Define, to begin with, the prediction error F_t as

$$
F_t \equiv P_t - {}_{t-1}P^*_t = P_t - E(P_t / \theta_{t-1})
$$

Taking mathematical expectations on both sides of this equation contigent on θ_{t-1}, we have

$$
E(F_t / \theta_{t-1}) = E\left[\left\{P_t - E(P_t / \theta_{t-1})\right\} / \theta_{t-1}\right] = E(P_t / \theta_{t-1}) - E(P_t / \theta_{t-1}) = 0 \tag{C.8}
$$

Equation (C.8) verifies a property of rational expectations I have alluded to earlier - namely that the regression of

the forecast error on θ_{t-1} is zero. Now write equation (C.1) as

$$y_t - k_t = \gamma\left[p_t - t\dot{p}^*_{t-1}\right] + u_t = \gamma\left[p_t - E\left(p_t/\theta_{t-1}\right)\right] + u_t = \gamma F_t + u_t$$

Taking mathematical expectations conditional on θ_{t-1} on both sides of this equation, we have

$$E\left[(y_t - k_t)/\theta_{t-1}\right] = \gamma E\left(F_t/\theta_{t-1}\right) + E\left(u_t/\theta_{t-1}\right) \quad \text{which, using (C.8) yields}$$

$$E\left[(y_t - k_t)/\theta_{t-1}\right] = E\left(u_t/\theta_{t-1}\right) = E\left(u_t/u_{t-1}, u_{t-2}, \ldots\right), \text{ or, given (C.6),}$$

$$\text{(C.9)} \quad E\left[(y_{t-k_t})/\theta_{t-1}\right] = \rho_u u_{t-1} = \sum_{i=0}^{\infty} \rho_{u_i} k_{t-1-i}$$

It is immediately clear from equation (C.9) that deviations in the level of output from its capacity level depend only on past values of u_t; $(y_t - k_t)$ is therefore not affected by the systematic parts of monetary and fiscal policy. This proves proposition (a).

Now write equation (C.2) as

$$i_t + (\mu + \beta)\dot{p}^*_t - p_t = \frac{1}{c}(y_t - k_t) - \frac{d}{c} z_t - \frac{1}{c}\varepsilon_t$$

Once more taking mathematical expectations contingent on θ_{t-1} on both sides of this equation, we have

$$E\left[\{i_t - E(\dot{p}_{t+1}/\theta_t) + \beta\dot{p}_t\}/\theta_{t-1}\right] = \frac{1}{c}E\left[(y_t - k_t)/\theta_{t-1}\right] - \frac{1}{c}E\left(\varepsilon_t/\theta_{t-1}\right) - \frac{d}{c}E\left(z_t/\theta_{t-1}\right)$$

which, using (C.9), reduces to

$$E\left[\{i_t - E(\dot{p}_{t+1}/\theta_t) + \beta\dot{p}_t\}/\theta_{t-1}\right] = \frac{1}{c}E\left[u_t/\theta_{t-1}\right] - \frac{1}{c}E\left[\varepsilon_t/\theta_{t-1}\right] - \frac{d}{c}E\left(z_t/\theta_{t-1}\right),$$

or, employing (6) again, we have

$$\text{(C.10)} \quad E\left[\{i_t - E(\dot{p}_{t+1}/\theta_t) + \beta\dot{p}_t\}/\theta_{t-1}\right] = \frac{1}{c}\sum_{i=0}^{\infty}\rho_{u_i}k_{t-1-i} - \frac{1}{c}\sum_{i=0}^{\infty}\rho_{\varepsilon_i}\varepsilon_{t-1-i} - \frac{d}{c}\sum_{i=0}^{\infty}\rho_{z_i}z_{t-1-i}$$

Equation (C.10) asserts that the expected value of the real rate of interest, while it does depend on the fiscal policy variables embodied in the vector z_t, is statistically independent of the systematic parts of monetary policy: changes

in the nominal rate of interest induced by changes in the supply of money will be absorbed fully by changes in the expected rate of inflation, leaving the real rate of interest unchanged. Proposition (b) is also proved.

The core of the Classical/Monetarist/Supply-Side propositions - call it what you will - has finally been stated and proved. Surely even you cannot have any objections now?"

"Well," replied Alice, "Ordinarily I could not, but now that I have a rather extra-ordinary pie inside me, it provokes me to say that your very impressive discussion has assumed the form of taking the fact that the sun does not rise in the West as a given and then proving most elaborately and painstakingly that the sun, after all, rises in the East."

"If you must talk nonsense," said the Supply-Sider crossly, "the least you could do is to talk it sensibly."

"Since I cannot," said Alice, "let me do it through the words of Professor Hahn (Hahn, 1980(b)): 'In recent years some economists have taken up a rather odd, not to say paradoxical, position vis-a-vis Government macro-policies. The oddity consists of the fact that these policies are discussed in the context of a model where no such policies are needed. In particular, the debate has been conducted in the context of a Walrasian economy in rational expectation equilibrium. Such an economy can plainly be subject to fluctuations in real variables such as employment and output. But all agents are fully adjusted to those features of the economy of which they form part, and in particular there is at no date any involuntary unemployed or indeed any quantity constraints on agents: there is thus no need for Keynesian policies even if they could be used effectively. Nor is there any 'a priori ground for wanting the Government to iron out the equilibrium fluctuations.'"

"Well, I find it even odder that you should be suggesting - if indeed that is what you are suggesting - that Keynes and Walras do not get on, speaking metaphorically. And if so, you have a good deal of explanation ahead of you." And after that the Supply-Sider lapsed into a moody silence while Alice took a deep breath and plunged into the folliwng lengthy explanation:

"But that is exactly what I do mean, Mr.Supply-Sider, To quote Professor Clower (Clower, 1965): '..... either Walras' law is incompatible with Keynesian economics, or Keynes had nothing fundamentally new to add to orthodox economic theory. This may seem an unnecessarily brutal way to confront one sacred cow with another. But what other conclusion is possible?.....Keynes himself made tacit use of a more general theory, ..., this more general theory leads to market excess demand functions which include quantities as well as prices as independent variables and, except in conditions of full employment, the excess-demand functions so defined do not satisfy Walras' Law.'

The crucial formal difference between Mr.Keynes and the Classics (and so their intellectual heirs) is well expressed by Professor Hahn (Hahn 1980 (a)) when he says: 'I.....do not think that you can be Keynesian on the basis of a Walrasian world, and I do not think that you can be Monetarist,....., on the basis of a non-Walrasian world.' I shall now seek to explore the motivation for this remark, and in doing so shall rely heavily on Professor Clower (op.cit) and Mr.Barro and Mr.Grossman (Barro and Grossman, 1971).

Let us begin by noting that the Classical paradigm for the analysis of determination of equilibrium is one in which all markets are in continuous supply-demand equilibrium. Such a paradigm draws sustenance from the notion that any transient discrepancy between supply and demand in any market calls forth an immediate market-clearing price adjustment. Mr.Keynes would

have neither instantaneous price adjustments nor Walrasian recontracting arrangements: to the contrary: he explored the determination of equilibrium in a world where agents could and did experience a non-transient discrepancy between quantities supplied and demanded. An immediate consequence of the Classical and Keynesian positions is that the Classical economics is one of equilibrium states only, while the Keynesian economics is one of disequilibrium states which permits of an analysis of the 'spill-over' effect of disequilibrium in one market or another. (The term 'disequilibrium' - with its connotation of being a momentary and unsustainable phenomenon - is somewhat misleading, so it would perhaps be more correct to say that the Classical economics is one of Walrasian equilibrium, while the Keynesian economics is one of non-Walrasian, quantity - constrained equilibria). In essence, the Classical macro economics is one of full-employment equilibrium - 'full-employment equilibrium' to be understood in the Walrasian sense of an equilibrium incompatible with any involuntary unemployment. Such an equilibrium is, however, only a special case of the Keynesian macro-economics which is fully compatible with under-full employment equilibrium (i.e. with involuntary unemployment). At this stage one might ask: are a Classical Walrasian equilibrium and a Keynesian non-Walrasian equilibrium simply two opposed world-views founded on arbitrary assumptions - so that you can take whichever-appeals better to your fancy? It would seem not, because the Keynesian position resolves certain embarassements to which the Classical position is prone. In particular, an implication of the Classical position is that involuntary unemployment can only be caused by any 'excessive' real wage-rate-due perhaps, to arbitrary rigidities in the money-wage rate: in this scheme of things, the level of employment is a declining function of the real wage-rate, consequently cyclical variations in employment must be associated with contra-cyclical variations in the real wage-rate. This notion however accords ill with empirical findings. For another thing,

the Classical framework, in which Walrasian supplies are always matched by Walrasian demands, must imply that the consumption and savings functions do not include income as an argument - and yet such excess demand functions are posited by them. As Professor Hahn remarks, 'They (the Monetarists)..... use excess demand functions like IS and LM which have income as one of their arguments. But this is not true of any of the excess demand functions that make up a Walrasian equilibrium.....' These issues should become clearer as I proceed.

I begin with a very general statement of the problem, drawing on Professor Clower, and focus thereby on the 'crucial formal' difference between Mr.Keynes and the Classics. In what follows, I make use of the following definitions.

$(S_1, \ldots\ldots\ldots, S_m)$ = a vector of firm supplies of m commodities.

$(d_{m+1}, \ldots\ldots\ldots, d_n)$ = a vector of firm demands for n factors.

$(S_{m+1}, \ldots\ldots\ldots, S_n)$ = a vector of household supplies of n factors.

$(d_1, \ldots\ldots\ldots, d_m)$ = a vector of household demands for m commodities.

Let $\underline{P} = (P_1, \ldots\ldots, P_m; P_{m+1}, \ldots\ldots\ldots, P_n)$ denote the vector of prices of the m commodities and n factors.

The production function faced by firms and the utility function faced by households (assumed identical for all households) can be represented by, respectively,

$$T(S_1, \ldots, S_m; d_{m+1}, \ldots, d_n) = 0.$$

and

$$U = U(d_1, \ldots, d_m; S_{m+1}, \ldots, S_n).$$

(Production and utility functions are assumed to have the usual convexity and differentiability properties).

Let π stand for the profit earned by firms.

Then the problem confronted by firms can be stated to be one in constrained optimization of the type

Maximize $U = U(d_1, \ldots, d_m, s_{m+1}, \ldots, s_n)$
$(d_1, \ldots, d_m, s_{m+1}, \ldots, s_n)$

subject to

$$T(s_1, \ldots, s_m; d_{m+1}, \ldots, d_n) = 0$$

Form the Lagrangian function $\mathcal{L} = \sum_{i=1}^{m} p_i s_i - \sum_{j=m+1}^{n} p_j d_j + \lambda T(s_1, \ldots, s_m; d_{m+1}, \ldots, d_n)$.

where λ is the Lagrange multiplier.

Then the first-order condition for profit maximization requires

$$\frac{\partial \mathcal{L}}{\partial s_1} = 0 \rightarrow p_1 + \lambda \frac{\partial T}{\partial s_1} = 0;$$

$$\vdots$$

$$\frac{\partial \mathcal{L}}{\partial s_m} = 0 \rightarrow p_m + \lambda \frac{\partial T}{\partial s_m} = 0;$$

$$\frac{\partial \mathcal{L}}{\partial d_{m+1}} = 0 \rightarrow p_{m+1} + \lambda \frac{\partial T}{\partial d_{m+1}} = 0;$$

$$\vdots$$

$$\frac{\partial \mathcal{L}}{\partial d_n} = 0 \rightarrow p_n + \lambda \frac{\partial T}{\partial d_n} = 0;$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 0 \rightarrow T(s_1, \ldots, s_m; d_{m+1}, \ldots, d_n) = 0.$$

Briefly the <u>desired</u> demand for factors and the <u>desired</u> supply of commodities by firms are given by the <u>notional</u> demand and supply functions implied by the above set of equations - and these are the solutions to the optimization problem of firms - viz., the functions $\bar{d}_j\ (\underline{P})\ \{j = m+1, \ldots, n\}$, and $\bar{s}_i\ (\underline{P})\ \{i = 1, \ldots, n\}$.

Looking at the other side of the picture, the problem confronted by the households can now be stated as

Maximize $U = U(d_1, \ldots\ldots, dm; S_{m+1}, \ldots\ldots, S_n)$

$(d1, \ldots, dm; S_{m+1}, \ldots, S_n)$

Subject to

$$\sum_{i=1}^{m} P_i \cdot d_i - \sum_{j=m+1}^{n} P_j S_j - \pi = 0$$

(Note: here π is regarded parametrically by households)

Once more forming the Lagrangian function

$$\mathcal{M} = U(d_1, \cdots, d_m; S_{m+1}, \cdots, S_n) + \mu \left[\sum_{i=1}^{m} P_i d_i - \sum_{j=m+1}^{n} P_j S_j - \pi \right], \text{ we}$$

~~are~~ obtain the first-order condition for utility-maximization as:

$$\frac{\partial \mathcal{M}}{\partial d_1} = 0 \rightarrow \frac{\partial U}{\partial d_1} + \mu P_1 = 0;$$

$$\vdots$$

$$\frac{\partial \mathcal{M}}{\partial d_m} = 0 \rightarrow \frac{\partial U}{\partial d_m} + \mu P_m = 0;$$

$$\frac{\partial \mathcal{M}}{\partial S_{m+1}} = 0 \rightarrow \frac{\partial U}{\partial S_{m+1}} + \mu P_{m+1} = 0;$$

$$\vdots$$

$$\frac{\partial \mathcal{M}}{\partial S_n} = 0 \rightarrow \frac{\partial U}{\partial S_n} + \mu P_n = 0;$$

$$\frac{\partial \mathcal{M}}{\partial \mu} = 0 \rightarrow \sum_{i=1}^{m} P_i d_i - \sum_{j=m+1}^{n} P_j S_j - \pi = 0$$

The desired demand for commodities and the desired supply of factors can then be expressed by the notional demand and supply functions which are obtained from the above set of first-order-condition-satisfying equations - by the functions

$\bar{d}_i \ (\underline{P}) \quad \{i=1, \ldots, m\}$ and $\bar{S}_j \ (\underline{P}) \quad \{j=m+1, \ldots, n\}$.*

---

*As a matter of detail, all the notional supply and demand functions include π also as an argument, which we have ommitted, without contextual loss of information, for convenience.

Now if we accept the underlying assumption pervading all orthodox Classical theory, namely that households can purchase all the commodities they desire and sell all the factors they desire at the going prices, and that likewise firms can purchase all the factors they desire and sell all the commodities they desire at the going prices, then it will be true that any excess supply in a given market will be precisely offset by excess demand in some other market, so that Walras' Law would hold strictly, namely:

$$\text{(D.1)} \qquad \sum_{i=1}^{m} P_i\left[\bar{d}_i(P) - \bar{s}_i(P)\right] + \sum_{j=m+1}^{n} P_j\left[\bar{d}_j(P) - \bar{s}_j(P)\right] = 0$$

Equation (D.1) is a useful way of stating the Walrasian rule that in a system of n markets if (n-1) markets are in equilibrium then the n^{th} market must also be in equilibrium. By implication then if there is one market in disequilibrium, then there must be (at least) one other market in disequilibrium - with the disequilibria in the two markets being in 'opposite directions'. That is to say that if the market for a particular commodity happens to be characterized by excess demand then there will be upward pressure on the price of this commodity so as to propel its market towards clearance; simultaneously, even as the excess demand for the commodity in question is being corrected by a rise in its price, there must be some other commodity market the excess supply in which is being corrected by a fall in the price of this latter commodity. The value of all excess demands (in terms, say, of some numéraire commodity), summed over all markets must be zero - wherefore equation (A.1).

Here is where Mr. Keynes departs from the Classics. Suppose that households are not able to supply all the factors they desire to supply - say due to paucity of effective demand for their factors. Suppose in fact that their actual supply is $S_j^* \{j = m+1, \ldots, n\}$ which is less than their notional supply $\bar{S}_j$. Then their realized

income $\sum_{j=m+1}^{n} P_j S_j^*$ will be less than their desired

income $\sum_{j=m+1}^{n} P_j S_j$: with their realized income less than

their desired income, their effective demand for commodities will be less than their desired demand $\bar{d}_i(\underline{P}) \{i = 1, \ldots, m\}$

In other words, their effective demand functions will drop out of the optimization exercise

Maximize $U = U(d_1, \ldots, d_m, S^*_{m+1}, \ldots, S^*_n)$

(d1, ..., dm)

Subject to

$$\sum_{i=1}^{m} P_i d_i - \sum_{j=m+1}^{n} P_j S_j^* - \pi = 0$$

The solution to this problem will yield the effective, or constrained demand functions for commodities:

$\hat{d}_i(\underline{P}, Y) \{i = 1, \ldots, m\}$ where by definition,

$$Y \equiv \sum_{j=m+1}^{n} P_j S_j^* + \pi$$

Noting that $\hat{d}_i(\underline{P}, Y) \leq \bar{d}_i(\underline{P}) \{i = 1, \ldots, m\}$,

and combining this fact with (D.1), it is immediately clear that

$$(D.2) \quad \sum_{i=1}^{m} P_i [\hat{d}_i(\underline{P}, Y) - \bar{S}_i(\underline{P})] + \sum_{j=m+1}^{n} P_j [\bar{d}_j(\underline{P}) - \bar{S}_j(\underline{P})] \leq 0$$

Walras' Law will hold if $\hat{d}_i = \bar{d}_i, \forall i = 1, \ldots, m$, or, equivalently, only if there is no excess supply of factors. In other words, it is only under conditions of full employment (incompatible with any involuntary unemployment) that Walras' Law holds. In conditions of under-full-employment, excess

supply in the factor market need not be offset by excess demand elsewhere in the 'goods' market, as equation (D.2) reflects. Full employment equlibrium is then seen as only a special case of the Keynesian macro-economics which is fully compatible with under-full-employment equilibrium.

Mr.Barro and Mr.Grossman (op.cit) carry the story further by demonstrating the possibility of under-full-employment equilibrium through an analysis of the effect of excess supply in the goods market on the factor market and a reverse-direction effect of excess supply in the factor market on the goods market. For what follows, define the following:

y = quantity of commodities

x = quantity of labour supplies

m = increment to real money balances

M = nominal initial stock of money

π = real profit accruing to firms

w = real wage rate

P = price level.

The utility function of households will be taken to be represented by $U = U(x^S, y^D, \frac{M}{P} + m^D)$, where x^S denotes the desired or notional supply of labour, y^D the notional demand for goods and m^D the notional demand for incremental real money-balances. The choice problem of households, as before, can be stated as

Maximize $U = U(x^S, y^D, \frac{M}{P} + m^D)$
x^S, y^D, m^D

Subject to
$\pi + wx^S = y^D + m^D$

In what follows, it would be convenient to assume some specific form of the utility function satisfying

$$\frac{\partial u}{\partial x^S} < 0, \quad \frac{\partial u}{\partial y^D} > 0, \quad \frac{\partial u}{\partial m^D} > 0.$$

Specializing the utility function to $u = x^{S-1} y^D + y^D\left(\frac{M}{P} + m^D\right) + x^{S-1}\left(\frac{M}{P} + m^D\right)$, the households' utility-maximization problem can be stated as

$$\underset{x^S,\, y^D,\, m^D}{\text{Maximize}} \quad x^{S-1} y^D + y^D\left(\frac{M}{P} + m^D\right) + x^{S-1}\left(\frac{M}{P} + m^D\right)$$

$$\text{Subject to} \quad \pi + w x^S = y^D + m^D$$

It is a routine matter to verify that the optimal solution yields the notional supply and demand functions

$$x^S = \left(\frac{M}{P} + \pi\right)/(2\pi + w);$$

$$y^D = \pi\left(\frac{M}{P} + \pi\right)/(2\pi - w); \text{ and}$$

$$m^D = \pi\left(\frac{M}{P} + \pi\right)/(2\pi - w) - \frac{M}{P}.$$

The important feature of the above three equations is that x^S, y^D and m^D are each functions of w, π and $\frac{M}{P}$. For convenience, we shall assume x^S to be a function only of w.

The consumption and saving functions (y^D and m^D), it may be noted, do not include income as an argument - and these functions can be regarded as the 'Classical' demand functions.

The implicit assumption underlying the foregoing analysis is that households are able to supply as much of their factors as they desire at the going price, and to purchase as much of the commodities as they desire at the going price. Suppose in fact that this is not the case. In particular, suppose that due to a paucity of effective demand for labour, and given tha quantities transacted are determined by the 'short-side' of th

market, that households are able to sell only $x(< x^S)$ of their labour. Then their factor income is $wx(< wx^S)$; with their realized income less than their desired income, their effective demands for consumption and saving will now be given by $y^{D'}$ $(< y^D)$ and $m^{D'}$ $(< m^D)$. The quantity of labour supplied by households must now be viewed parametrically rather than as a control variable. The choice problem of households must therefore now be stated as

$$\underset{y^{D'},\, m^{D'}}{\text{Maximize}} \quad x^{-1}y^{D'} + y^{D'}\left(\frac{M}{P} + m^{D'}\right) + x^{-1}\left(\frac{M}{P} + m^{D'}\right)$$

$$\text{Subject to}$$

$$\Pi + wx = y^{D'} + m^{D'}$$

It is again easily verified that the optimal solution to this problem is furnished by

$$y^{D'} = \frac{1}{2}\left(\Pi + wx + \frac{M}{P}\right), \text{ and}$$

$$m^{D'} = \frac{1}{2}\left(\Pi + wx - \frac{M}{P}\right)$$

Noting that $\Pi + wx \equiv y$ (income), the important feature of these two equations is that the effective demand functions are of the form $y^{D'} = y^{D'}\left(y, \frac{M}{P}\right)$ and $m^{D'} = m^{D'}\left(y, \frac{M}{P}\right)$. In other words, it is only if we assume explicitly factor excess-supply - i.e. it is only in the context of a non-Walrasian equilibrium - that we can obtain the usual Keynesian consumption and saving functions with income as an argument; income enters as a variable because effective demand is constrained by excess supply in the labour market. Note that $y^D > y^{D'}$.

Thus far our analysis has been of a partial equilibrium variety. We have considered the effect of excess supply in the labour market on effective demand in the commodity market. To complete the picture we must consider the effect of excess supply in the commodity market on effective demand in the labour

market. Suppose, to begin with, that firms preceive they can sell the quantity of commodities they wish to at the going price and purchase the quantity of labour they wish to hire. Let y^S denote their notional or desired supply of commodities, and likewise let x^D denote their notional demand for labour. Then the profit-maximizing problem of firms can be stated as

$$\text{Maximize} \quad \Pi = y^S - wx^D$$

$$y^S, \; x$$

Subject to

$$y = F(x)$$

where $F(x)$ is the production function satisfying $F'(x) > 0$, $F''(x) < 0$. Specializing the production function to the convenient form $F(x) = x^{1/3}$ it can be checked that the solution to the firm's optimization exercise implies that

$$w = \frac{1}{3}(x^D)^{-2/3} \quad \text{(or, in general, } w = F'(x)\text{), so that}$$

$$x^D = (3w)^{-3/2} \quad \text{(or, in general, } x^D = x^D(w)\text{).}$$

The results $w = F'(x)$ and $x^D = x^D(w)$ conform precisely with the Classical propositions that the real wage rate equals the marginal product of labour and that the demand for labour (and hence level of employment) is inversely related to the real wage-rate. These results follow immediately from the assumption that firms' actual transactions conform to their planned transactions.

Suppose however that this is not the case and that in particular, owing to insufficient effective demand in the commodity market, firms are not able to sell their notional supply y^S, but are able to sell only $y(< y^S)$. Once more then the quantities of commodities supplied must be treated by firms as a given - and their choice problem reduces to

Maximize $y - x^{D'}$
$x^{D'}$

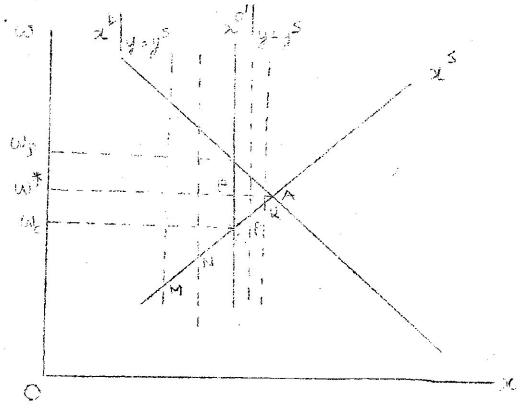
Subject to

$y = F(x)$;

where $x^{D'}$ is the effective or constrained demand for labour. Note that with firms unable to make the profit they would have desired to, they are also unable to hire the amount of labour that they would have desired to. It is a simple matter to confirm that solving this new choice problem of firms yields the following demand for-labour function (when $F(x) = x^{1/3}$) : $x^{D'} = y^3$ - which is of the general form $x^{D'} = F^{-1}(y)$. Clearly, $x^{D'} \leq x^D$ and $\lim_{y \to y^S} x^{D'} = x^D$.

It is no longer true that the effective demand for labour is uniquely related with the real wage rate. Given a general disequilibrium system, then, in which excess supply in the commodities market precipitates excess supply in the labour market, it is perfectly plausible that involuntary unemployment can coexist with a real wage-rate that is not subject to any variation. This is illustrated in the figure I now draw.

Figure 14 : A quantity-constrained equilibrium



In this figure I plot the labour-supply function x^S (increasing in the real wage rate w) and the labour-demand function x^D (declining in w). x^S and x^D are, of course, the notional supply and demand functions. If $y = y^S$ (i.e. if the firms' actual transactions coincide with their planned ones in the sense of their being able to supply all the commodities they desire to), then $x^{D'}$ will coincide with x^D. Suppose this to be the case. Then the point A represents a general, full-employment Walrasian equilibrium, compatible with a wage rate of w^* (and some price level of, say, P*). Suppose now that a paucity of effective demand characterizes the commodities market. Then the effective labour-demand function $x^{D'}$ is independent of the real wage rate and less than the desired demand x^D. As can be seen from figure 14, at the full-employment real wage rate of w*, involuntary unemployment (measured by AB) is precipitated. This has happened with no constraint on the real wage-rate - which directly contradicts the Classical proposition of a unique and inverse relationship between employment and the real wage-rate. Now, a corollary to this Classical proposition is that any temporary disequilibrium can be eliminated by a change in the real wage rate in the appropriate direction. But if in fact the wage rate falls from w* to w_c in response to the excess supply in the labour - market, involuntary unemployment will indeed be eliminated: but voluntary unemployment to the extent of AB will be precipitated. The only way in which the unemployment can be eliminated is by undertaking expansionary policy aimed at stimulating demand in the commodities market. In other words, as policy is undertaken to propel y towards y^S, the effective demand schedule $x^{D'}$ tends towards the notional demand schedule x^D.

I have demonstrated how excess supply in the factor market results in excess supply in the commodities market, and vice-versa. Walrasian adjustments of excess supply in the one market eliciting excess demand in the other have been shown to be non-inevitable. The possibility of a quantity-

constrained, Non-Walrasian equilibrium (which is necessary for a derivation of the Keynesian consumption and saving functions) characterized by involuntary unemployment does leave room for Government monetary and fiscal policies: Mr.Sargent's two-fold assertion which you referred to earlier does not hold in a Non-Walrasian World."

"But what about Rational Expectations?" cried the Supply-Sider indignantly. "It is all very well for you to keep going on and on and on about non-Walrasian equilibria - without once mentioning Rational Expectations which are so important in demonstrating the super-neutrality of money. What about that, I ask, what about Rational Expectations?"

"Oh, but Mr.Supply-Sider, Sir," replied Alice "without seeming to be rude to Rational Expectations, I must say that they are quite irrelevant - which is precisely the point of my entire discussion on non-Walrasian equilibria. If the economy is in a quantity-constrained equilibrium, then it is not only prices but also quantities which serve as signals for decisions by agents as to how much labour to supply. Thus a (systematic) expansion in money supply by Government in such a situation, with a fully anticipated price-impact of such intervention, will undeniably still serve to relax the quantity constraints under which agents in the economy are operating; and since agents base their decisions on quantity-signals as well as price-signals, changes in the level of employment and income following upon Government activity cannot be denied. I must emphasize again that agents are undeceived. Rational Expectations ensures that the Government's expansion of money-supply causes no divergence between actual and expected rates of inflation; yet we do have real effects."

"Well, I stick to it," replied the Supply-Sider obdurately," that quantity constraints evoke instantaneous price adjustments. Anything less than instantaneous price-adjustments constitutes, in Mr.Barro's words, '..... an ad-hoc non-theory' (Barro, 1978)."

"I certainly don't see why that should be the case," retorted Alice with spirit. "What you say is in the spirit, as Mr.Keynes has suggested, of Euclidean geometers forcing Euclidean geometry on a non-Euclidean world. In other words, there could be good reasons why involuntary unemployment need not be automatically eliminated by a fall in the real wage-rate - and these reasons are frequently 'institutional' in nature: consider an involuntarily unemployed individual, who offers to work at a lower real wage than the going rate. Is it readily conceivable then that an employer will be able to offer him a differential wage and thereby substitute an existing employee with this individual? Surely, as Professor Hahn points out, institutional realities should prohibit this kind of relative price adjustment - instantaneous or otherwise. For another thing, the fact that an individual might be willing to work for a lower wage-rate if a job is offered to him (Keynes' test of involuntary unemployment) does not necessarily imply that that individual will indeed offer to work for a lower wage-rate. There is nothing paradoxical in this proposition. The individual would be behaving perfectly rationally, if he were an 'expected-income-maximizer', in being unprepared to offer his labour at a lower real wage-rate: specifically,, if he is right in his conjecture that the probability of his getting a job at a lower real wage multiplied by this lower wage is less than the probability of his getting a job at the going wage multiplied by the going wage, then the quantity-constrained equilibrium could, in Professor Hahn's terminology, be called a rational-conjectural non-Walrasian equilibrium. In other words, Hahnian rational conjectural, rational expectations quantity-constrained non-Walrasian equilibria should not be rebuked for existing just as parallel lines should not be rebuked by Eucledean geometers for meeting.

If all this displeases you, Sir, let us assume that a quantity constrained equilibrium with involuntary unemployment does indeed, as you require, dissolve with infinite rapidity into a Walrasian equilibrium with only voluntary unemployment.

In terms of figure 14, this would require a fall in the wage-rate to w_c - which would transform the involuntary unemployment of AB at a real wage of w* to voluntary unemployment of AB at a real wage of w_c. The point C would then represent a Walrasian equilibrium. But note now that depending on the precise position of the constrained demand-function $x^{D'}$ (see the various dotted alternative schedules in figure 14), we could have Walrasian equilibria at several points - such as M,N,P,Q, etc. In principle, then, there can be an <u>infinite</u> number of Walrasian equilibria! And yet you have always tended to speak in terms of a <u>unique</u> Walrasian equilibrium. As Professor Hahn (Hahn, 1981(a)) says, 'the habit of thinking in terms of <u>the</u> natural rate of employment and <u>the</u> natural level of income serves the Monetarists badly simply because the model that they favour, the Walrasian one, does not allow such thinking to go unpunished.'

But let us leave all this alone. Let me grant you everything - namely, the existence of a unique long-run rational expectations Walrasian equilibrium. <u>How then can you have a Keynesian savings function with income as an argument</u>? Note that your prescription of tax-cuts rests ultimately in the notion that saving is an increasing function of disposable income (the standard Keynesian saving function). But as I have already demonstrated at some length, a Walrasian equilibrium is <u>not</u> compatible with an excess-demand function like the Keynesian saving function: the latter would necessarily require a non-Walrasian, quantity constrained equilibrium. Our theoretical discussion, I believe, must ultimately be geared to the formulation of internally consistent policies. So Mr.Supply-Sider Sir, you have an option : will you choose a theory of Walrasian equilibrium and forfeit the prescription of tax-cuts, or will you choose a theory of non-Walrasian equilibria and forfeit the prescriptions of limited monetary and fiscal interventions by Government? I really do believe that it is time you offered your critics a chance to pin you down to some wholly

internally consistent set of views. And so," continued Alice before she could stop herself, "will you, won't you, will you, won't you, won't you offer a chance?"

During this long speech of Alice's, it was very clear that the Supply-Sider was becoming angrier and angrier. When she finally stopped speaking, he said with a good deal of heat: "You seem to learn very little from the cautionary poems you know, young lady. I - unlike Father William - have answered not three, but what must be close to three hundred questions. I believe that it is time you were reminded of the consequences of too much inquisitiveness:

> "I have answered three questions, and that is enough,/ said his father; "don't give yourself such airs!/ Do you think I can listen all day to such stuff?/ Be off, or I'll kick you downstairs."

And with that the Supply-Sider gnashed his teeth and glared at Alice.

This last piece of rudeness proved too much for Alice's patience. All her resolves for forbearance and civility quite melted away in a moment. "You really are the rudest, most contrary and illogical creature I have ever met," she cried. "And I will prove it you. You began with your Laffer-curve approach to justify your prescription for tax-cuts, and became quite unbearably rude when I pointed out the empirical insufficiency and theoretical ambiguity governing this approach. Next, in order to assert the neutrality of money you posited a world of wage-price flexibility, which in your view also guranteed the automaticity of full-employment equilibrium. When I confronted the latter proposition with Mr.Keyne's liquidity trap phenomenon you sought to get out of the difficulty by presenting the Pigou Effect. But this only landed you in Mr.Metzler's trap : Mr.Metzler demonstrated that money-creation through open-market operations had wealth effects

in the form of Government bonds and that consequently, in a world of wage-price flexibility and Pigou effects, the 'neutrality of money' could not be sustained. The next convulsive gesture was quite forseeable: you invoked Mr.Mundell and Mr.Barro to demonstrate that Government bonds are not net wealth. Having done so, you contradicted yourself the very next moment by asserting that Government bonds are net wealth in order to demonstrate the ineffectiveness of fiscal policy in a fix-price world. Anyway, when next I sought an explanation of the Phillips-curve phenomenon which has a quite straightforward rationale in a world of Keynesian, under fullemployment equilibrium, you sought a far-fetched explanation of short-run trade-offs and no long-run trade off between inflation and unemployment in the context of a world characterized by a long-run, rational expectations Walrasian equilibrium. I next pointed out the crucial formal difference between Mr.Keynes and the Classics as being constituted in the notion that the Keynesian system is essentially characterized by quantity constrained non-Walrasian equilibria. You rejected this and insisted at the same time in having Keynesian excess-demand functions - the two being logically mutually incompatible. All this apparently causes you no embarrassment. Your system is like a foot-ball with a dent in it - every time you correct it, a dent appears elsewhere; and yet you insist on seeing the football as wholly spherical instead of seeing it as shot through with ugly depressions. Truly, you ought to be ashamed of yourself. You really have tried my patience and I shan't waste a moment longer to stay and talk with a tiresome, uncivil, inconsistent man like you." And with that Alice marched off in high dudgeon. But no sooner had she taken a few steps than the Supply-Sider cried out,

"Here! come back! I have something to say to you!"

Alice hesitated for a moment, torn between curiosity and anger. The struggle was resolved in favour of curiosity She turned back, walked towards the Supply-Sider, and asked, "Well? What do you have to say?"

"Only this," said the Supply-Sider. "Remember Keynes said that in the long-run we are all dead? Well, this is the long-run, and Keynes is dead, just you remember that. And don't bite off more pie then you can chew. That's all. Goodbye." And on that note, the Supply-Sider turned smartly on his heel and started marching off rapidly.

"Oh!" exclaimed Alice in mortification - "Oh!" Then gathering her wits and her voice, she took a long breath and yelled as loudly as she could after the retreating figure of the Supply-Sider who was already only just a blurred dot on the herizon:

"Mr.Keynes might be dead, but his ghost will surely haunt you!"

Alice's shout was so loud that it dislodged all the leaves on the branches of the tree beneath which she was standing, and they came fluttering down upon her..... she gave a little scream, half of fright and half of anger, and tried to beat them off, and found herself lying on the bank, with her head in the lap of her sister, who was gently brushing away some dead leaves that had fluttered down from the trees on to her face.....

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