Why Is Finance Important?

Some Thoughts on Post-Crisis Economics

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Abstract

The global financial crisis around 2008 and the subsequent great recession have forced attention on the relevance of economics. In particular, the core of economic theory suggests that money is neutral (affecting only the price level but not real economic variables) and hence finance and financial crises are not very important. This papers shows that this neutrality is based on the unrealistic institutional assumption of perfect competition. Relaxing this alone (without time lags, price rigidities, menu costs, and other frictions) makes money no longer necessarily neutral and hence makes finance and financial crisis much more important. The presence of increasing returns to scale at the firm level and to specialization at the economy level due to the division of labour also makes finance much more important than suggested by traditional economics. It also makes pecuniary external effects possibly of efficiency relevancy. The reasons for these are explained using simple analyses.

Keywords: Finance; financial crisis; economics; relevance; money.

JEL Codes: G00, G01, E30, E50, D40.

The global financial crisis around 2008 has raised the relevance of orthodox economics (e.g. Phelps 2010 and references cited below). The issues involved are rather complicated and likely include psychological or behavioral aspects (e.g. Akerlof and Shiller 2009, Chiang and Zheng 2012, Hoffmann, Host and Pennings 2013), inequality aspect (e.g. Holt and Greenwood 2012), systematic and institutional aspects (e.g. Bezemer 2011), regulatory aspects (Mugge 2011, Cabral 2013), and beyond. This paper is not ambitious enough to tackle all related important aspects. Rather, it focuses on the point that the orthodox result of the neutrality of money largely implies the unimportance of finance in general and of financial crises in particular, contrary to their obvious importance in the real world. Our economies have evolved into much more complex systems than reflected by the orthodox theory. For one thing, the neutrality result is based on the simple institutional assumption that firms are all perfectly competitive. Perfect competition rules out product differentiation and increasing returns to scale. The omnipresence of these makes perfectly competitive firms almost non-existent in the real world.

Section 1 below shows that the relaxation of perfect competition alone does away with the neutrality of money, making financial crises, changes in money supply and other changes in nominal aggregate demand possibly important for determining real economic variables, both for the short and long runs. It also explains why this is so using the simple diagrams of undergraduate microeconomics of profit maximization. Section 2 shows that the presence of increasing returns [both at the firm level due to scale and at the economy level due to the economies of specialization from the division of labour] makes entrepreneurship and financial intermediaries much more important than suggested by the orthodox economic theory. The extension of economic analysis beyond its traditional core in these directions thus suggests that finance is much more important. Of course, the importance of finance due to the factors discussed in this paper does not rule out other factors that may also make finance important.

Some analyses of macroeconomics with imperfect competition or market power have in fact long been undertaken. However, they still reach the conclusion that, just

the presence of imperfection competition alone does not destroy the neutrality of money in the absence of additional frictions like price rigidity and menu costs (e.g. Blanchard and Kiyotaki 1987, Dixon and Rankin 1994). In Section 1, we see that this is not the case; even without price rigidity and menu costs or other frictions, just the presence of market power alone is sufficient to destroy the neutrality of money. The different conclusions are due to the fact that these other economists implicitly assume a unique equilibrium. They show that with an initial real equilibrium E_1 and money supply M_1, a change in money supply to M_2, the original real equlibrium E_1 may still be an equilibrium. They then conclude that money is thus neutral even under imperfect competition. The next section shows that the change in money supply and the corresponding change in nominal aggregate demand (or the latter change due to other causes such as a financial crisis) may shift the economy from the original equilibrium (which may still be an equilibrium but need not be) to a **different** real equilibrium, making money and changes in nominal aggregate demand possibly non-neutral. Orthodox economists recognize the short-run non-neutrality in the presence of time lags, rigidities and/or frictions, but fail to see that non-neutrality may prevail both in the short and long runs even in the absence of these lags and rigidities, as shown in the next section.

1. **Why Does Non-Perfect Competition Itself Makes Money Possibly Non-Neutral?**

Finance includes the use of money and the lending and borrowing of funds. It is an essential factor in the life or business of individuals, firms, banks and other institutions. Its importance seems obvious in a modern economy. However, if we look at the core of modern economic theory, the importance of finance is very limited. For one thing, a central result in modern economics is the neutrality of money. This says that, ignoring possibly very short-term effects due to time lags, money supply affects only the price level, not real economic variables like aggregate and relative output levels, employment levels, and relative prices. Associated with this neutrality is the classical dichotomy between the real economic sector and the nominal

monetary/financial sector, making these two sectors independent of each other.[1] If things in the financial sector do not affect the real sector, the importance of finance and financial institutions will be greatly reduced. In particular, we should not be too worried about financial crises since they should not be able to cause big reductions in output and cause mass unemployment. However, in the real world, these possible effects cannot be ignored. What cause the big difference between theory and the real world?

If we examine economic models that yield the neutrality (of money) result, they invariably involve the explicit or implicit institutional assumption that firms are perfectly competitive. The reason that, together with other simplifying assumptions such as no time lags and no money illusion, the assumption of perfect competition leads to the neutrality of money may be illustrated with the simple diagram of Figure 1. As all firms are assumed to be perfectly competitive, their situation may be illustrated by one representative one facing a horizontal demand curve for its product at the market equilibrium price p. It can sell any quantity it likes at this price which thus is also its marginal revenue curve. It maximizes its profit by producing and selling at the point q where its upward-sloping marginal-cost curve cuts the horizontal demand curve. At this equilibrium point, the firm does not want to sell more. (One will be hard put to find firms in the real word that do not want to sell more at the same prices. Most firms like to sell more; many incur heavy advertising/promotion costs to sell more. They do not sell more only because they have to decrease prices to sell more. If so, they face downward-sloping demand curves. This shows the rather unrealistic nature of perfect competition.) Confining first to the short run (defined by the given number of firms), the output of the firm (after multiplication with the given number of firms) also indicates the aggregate output of the economy and the price indicates the price level.

Now consider an increase in money supply that increases the nominal aggregate demand. Since firms do not want to sell more at the same prices, this higher demand pushes prices higher. For the firm illustrated in Figure 1, its demand curve moves upward to d'. As this firm represents all firms in the whole economy, this means that

the price level P also increases by the same extent. In the absence of time lags, this increases the costs faced by the firm by the same proportion, shifting its marginal-cost curve from MC to MC'. This is so since labor supply is in accordance to real instead of money wage rates (no money illusion). Thus, the new profit-maximization equilibrium occurs at the same vertical line or the same output level. The output level is unchanged; only prices increase. Money is neutral. This is the microeconomic foundation for the macroeconomic result of the neutrality of money.
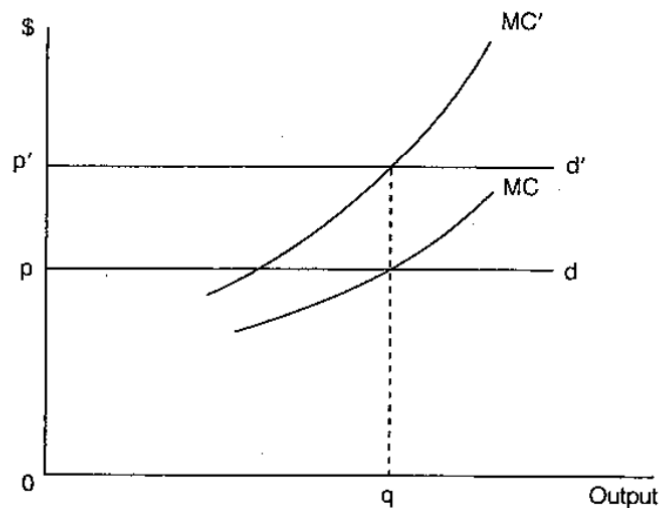

Figure 1 Perfect competition leads to neutrality of money

Even if we retain all other simplifying assumptions like no time lags and no money illusion, the relaxation of perfect competition alone destroys the (necessary) neutrality of money. Money may still be neutral but is no longer necessarily neutral. That money may still be neutral with non-perfect competition is illustrated in Figure 2. (Ignore the two AC curves first.) Using 'non-perfect competition' is preferred to 'imperfect competition' as the former may subsume other market structures like monopolies and oligopolies. The representative firm[2] is initially at the equilibrium point A with MC cutting MR from below. An increase in nominal aggregate demand (as may be the result of an increase in money supply) may just shift its demand curve proportionately vertically upward[3], as illustrated by the demand curve d' in Figure 2. The new equilibrium at B then involves no change in output and an increase in price.
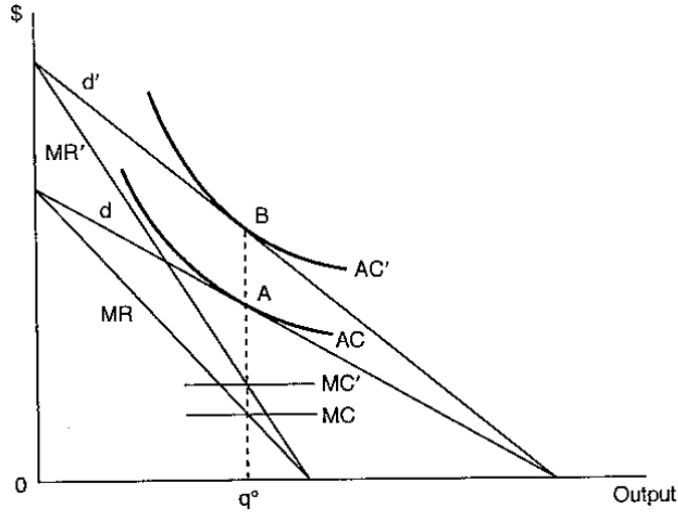
Figure 2 Money may still be neutral under non-perfect competition

However, for this case of non-perfect competition, the opposite (to the above Monetarist case) Keynesian case of no change in price but an increase in output following an increase in nominal aggregate demand is also possible, as illustrated in Figure 3. Here, the firm is originally at equilibrium at the point A. With an increase in nominal aggregate demand, the demand curve, instead of shifting proportionately vertically upward, shifts horizontally rightward and becomes more price elastic at the same price. This makes the value of marginal revenue at the same price (point B at the new demand curve d') higher, allowing it to intersect the higher marginal-cost curve MC' at a higher output level q'. The case of a proportionately rightward shift in the demand curve with no change in the price elasticity of demand at B (same price elasticity at B than at A) is also possible. However, for this case to be a sustainable new equilibrium with no increase in price, the value of the new marginal cost at q' must not be higher than the original marginal cost at q. If the marginal-cost curve does shift upward in response to a higher aggregate output level (as the case illustrated in Figure 3), the marginal-cost curve has to be downward-sloping to offset the positive shift in the whole curve, to ensure that the price does not increase. (A higher aggregate output may push up input prices and hence affect the costs of firms.)

If this offset just mentioned above is only partial so that there is some increase in price, the possibility of a partial increase in output, as may be taken to be possible using just a graphical analysis, is misleading. The increase in price of the representative firm signifies an increase in the general price level. This will shift the demand curve of the firm vertically upward over the relevant range, leading to further increases in price. A final equilibrium is reached only at the unchanged output level with only an increase in price.[4] However, if the cost responses and price elasticity situation are consistent with no increase in price, such as the case illustrated in Figure 3, the Keynesian case of no increase in price but only an increase in output is possible. Our analysis is a general-equilibrium one (though somewhat simplified to abstract away changes in relative prices due to the use of the representative-firm methodology; see endnote 2) taking account of the responses in both the cost side (effects of changes in aggregate output and the price level on the costs of the firm) and demand side (effects of changes in aggregate output, aggregate income/demand and the price level on the demand of the firm), as well as the interaction of the firm with other firms as a whole.
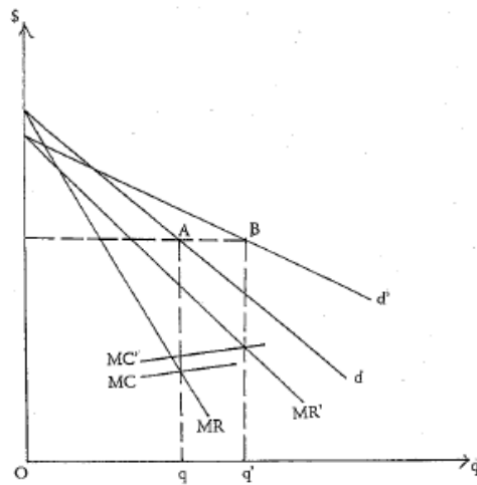

Figure 3 Money may be non-neutral under non-perfect competition

In fact, a case more Keynesian than the Keynesian case is also possible. This is the case of cumulative expansion/contraction. In Figure 3, if MC' intersects MR' to

the right of q', the new profit-maximization price is actually reduced. This reduction in p and hence the price level will shift the demand curve of the firm downward, leading to a further decrease in the profit-maximization price and an increase in the output level. Such a cumulative expansion cannot of course go on forever. When firms have no excess capacity, its MC slopes sharply upward and when the economy is approaching full employment the costs of firms respond sharply to further increases in aggregate output, making the condition for cumulative expansion or even the Keynesian case no longer applicable. However, a decrease in nominal aggregate demand may trigger a cumulative contraction. Unless input prices fall sufficiently in response to a fall in aggregate output, the cumulative contraction may be quite deep, explaining why depressions are possible.

It may be thought that the possibility of the Keynesian result of an increase in output with no change in the price level following an increase in nominal aggregate demand is only possible in the short run. For the long run, we allow free entry and exit and treat the number of firms as a variable. Adding the zero-profit condition, our analysis still shows that the various cases including both the Monetarist and Keynesian cases are still possible. The Monetarist case is already illustrated in Figure 2 with the two AC curves brought back into the picture. The Keynesian case is illustrated in Figure 4. The higher nominal aggregate demand shifts the equilibrium from point A to B with no change in price, only an increase in output. This is possible even in the long run provided that the increase in the marginal cost of the firm from both its own output (from the slope of the MC curve) and the increase in aggregate output (an upward shift of MC to MC') is offset by an increase in the price elasticity of demand (at the point B in comparison to at A due to a higher degree of competition as the number of firms has increased), and the upward shift in the average-cost curve from AC to AC' (from an increase in aggregate output) is offset by the downward-sloping average-cost curve.
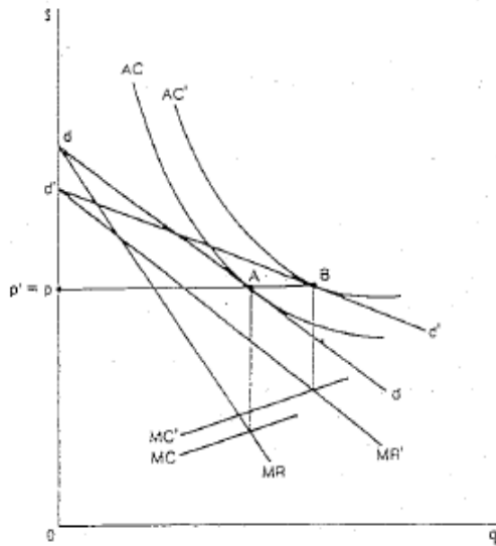
Figure 4 Non-neutrality of money even in the long run

Is the Keynesian case more or less likely to prevail in the long run, in comparison to the short run? Our analysis suggests two opposing considerations. On the one hand, the cost curves of the firm are more likely to respond positively to the aggregate output and hence shift upward more significantly in the long run as aggregate output increases. This suggests that the Monetarist case is more likely to prevail. On the other hand, the entry of new firms increases the degree of competition and makes the price elasticity of demand higher in absolute value, making it less likely to require an increase in price. This makes the Keynesian case more likely in the long run.

What makes the huge difference between the case of perfect competition where money must be neutral (ignoring time lags, etc.) illustrated in Figure 1 and the case of non-perfect competition where both the Monetarist case of neutrality (Figure 2) and the Keynesian case of effectiveness (Figure 3) are possible may be explained. The crux of the difference consists in both the demand side and the cost side. On the demand side, a horizontal demand curve (as necessitated by perfect competition) cannot shift leftward or rightward, it can only shift upward or downward. However, as we are not analyzing the case of a single firm, but a firm representing the whole economy, an upward or downward shift in the demand curve or price line for the firm

signifies a corresponding change in the price level. In the absence of time lags, etc., a change in the price level changes the cost (including the marginal cost) level of the firm by the same proportion, dictating no change in real output but only a change in price, as illustrated in Figure 1. In contrast, for the case of non-perfect competition, the demand curve for the product of the firm is downward sloping. A downward-sloping demand curve may either shift (proportionately) upward and downward (with its intersection point with the horizontal axis, if any, unchanged); it may also shift rightward and leftward (with its intersection point with the vertical axis, if any, unchanged), or some combination of the two or even some irregular shifts. If the demand curve shifts vertically upward as in Figure 2, it favors an increase in price with no change in output; if the demand curve shifts horizontally rightward, it favors an increase in output with no change in price as in Figure 3. Thus, both the Monetarist and Keynesian cases are possible under non-perfect competition.

Which shift in the demand curve will be the case is not arbitrary but is determined by what will happen to the price level that is consistent also with the new cost condition in our simplified general-equilibrium analysis. Roughly speaking, if the new demand and cost situation necessitates a higher price level, it leads to a vertical shift; if the new demand and cost situation allows a higher output level with no change in the price level, it leads to a rightward shift. One further complication is that, in the former case there are only nominal changes and the homogeneity (of degree zero) nature of demand functions prevails, making the vertical shift perfectly proportionate. In the latter case, real output and hence real income levels change and hence may cause a change in the price elasticity of demand.[5]

Another crucial difference between perfect and non-perfect competition concerns the cost side. As the demand curve for the product of a perfectly competitive firm is horizontal, a determinate profit-maximization equilibrium requires that its marginal-cost curve must be upward sloping. This means that the value of marginal cost will increase if output increases, making an increase in output with no increase in price impossible. On the other hand, for a non-perfectly competitive firm, the demand curve is downward sloping, making the marginal-revenue curve usually even more

downward sloping. A determinate profit-maximization equilibrium is then consistent with an either an upward, horizontal, or even downward-sloping marginal-cost curve. This means that an increase in output needs not necessarily increase the marginal cost, making the Keynesian case possible to prevail. This Keynesian case is only possible but not necessarily the case, as the effect through the change in aggregate output on the costs of firms must also be allowed for.

In addition to non-perfect competition, if we have increasing returns both at the firm, industry, and at the economy levels, this makes the marginal-cost curves of firms more likely to be non-upward sloping and the cost curves of firms less likely to shift upward significantly in response to an increase in aggregate output. This makes the non-Monetarist cases[6] more likely to prevail. The next section discusses this as well as the higher importance of finance in such situations.

2. Increasing Returns to Scale and Specialization and the Importance of Finance

If the real world is characterized by the neutrality of money where changes in nominal aggregate demand do not affect real output and employment, then money, finance, and financial crises should not be important, as they affect only nominal variables. The horror of a depression with mass unemployment will not happen. Unfortunately, we do not live in such a world. Before even considering such complications as asset price changes under nominal rigidities, herd psychology, time lags, etc., the previous section shows that the relaxation of the unrealistic assumption of perfect competition alone changes the picture. A change in nominal aggregate demand (including that from a change in money supply) may cause changes in real output and employment. This makes money, finance, and financial crises much more important. A financial crisis typically involves large falls in asset prices and aggregate demand. As these may lead to large and even cumulative fall in output and hence employment, it is not surprising that it is treated as very important in the real world. This also explains why big measures of quantitative easing of money supply and expansionary fiscal policies may be necessary upon the wake of a financial crisis.

The importance of financial matters discussed in the previous paragraph is related to non-perfect competition. There are two important factors making most firms in the real world non-perfectly competitive. On the one hand, product differentiation (including in location if not in other aspects of the product) makes demand curves downward sloping. On the other hand, the almost omnipresence of increasing returns to scale makes the average-cost curves of firms downward-sloping and their marginal-cost curves not necessarily upward sloping. A very common situation is the presence of a large fixed cost. Modern economies consist largely of services including commerce and personal services. Shops/offices providing such services have to be large enough so that customers may come in to inspect goods or to be serviced. Thus a relatively large fixed cost is incurred even if only one unit of the service is to be provided. Up to the full capacity level (when the marginal cost may increase sharply), the marginal cost of providing additional units is typically relatively low and constant. This makes the case of a horizontal marginal-cost curve with a sharply decreasing average-cost curve rectangular to the vertical axis and the horizontal MC curve very prevalent and is analyzed by the well-known Dixit-Stiglitz model (Dixit and Stiglitz 1975). As the demand curve is downward sloping from product differentiation, long-run free entry entails the tangency of the demand curve with the AC curve at the downward sloping section, making the full capacity, upward-sloping MC not within the relevant range. The prevalence of this situation not only partly favours the possible prevalence of the non-Monetarist results, but also makes finance more important, as explained below.

If we use the perfect-competition model with Figure 1 for the firm level and the supply-demand analysis at the industry level, there is little if any need for finance. The equilibrium is determined by the intersection of the (upward-sloping) supply and (downward-sloping) industrial demand curves, with thousands of small firms each producing a minute fraction of the market output.

The situation is even more contrasting when we consider the introduction of new products. If the supply curve is wholly above the demand curve, the product is not supplied and the situation is optimal. As long as the demand curve moves up

and/or the supply curve moves down by just enough to allow an intersection point with any positive output, that optimal level of output could be produced and supplied, even if the quantity transacted is small. As the supply price is below the demand price, positive profits could be made or at least no losses need be incurred; no problem.

Now consider the more realistic situation where a firm is typically faced with a downward-sloping demand curve and downward-sloping AC curve. If the AC curve is completely above the demand curve, production is not feasible. When either the demand curve moves up or the AC curve moves down by sufficiently to yield a tangency or an intersection range, some production is feasible and desirable. However, for this production to be profitable (at least not loss-incurring), the quantity transacted has to be sufficiently high. If we take into the real-world factors like time lags (including the time taken for consumers to know the availability of a new product/firm), a firm typically cannot sell a large amount of its product when it just first introduces it to the market (unless it incurs large advertising/promotion costs which require larger sales to recover). The presence of a large amount of fixed cost or other factors causing increasing returns or downward-sloping AC curve makes the firm typically making large losses in its commencing periods. Using Figure 2 but ignoring all curves with primes, the quantity demanded has to be at least equal to q° at a price equals Aq° for the firm not to make losses. At lower quantities demanded due to time lags, the firm makes large amount of losses. This requires significant amount of financing to allow the firm to overcome the initial periods of loss making even for those cases where firms will eventually be successful and profitable (at least not loss making) and will be producing large amounts of surpluses to consumers. This increases the role of finance or financial intermediaries substantially in comparison of the supply-demand analysis of the previous paragraph.

Increasing returns may also operate at the economy level, particularly through the division of labor that facilitates economies of specialization. This form of increasing returns was emphasized by classical economists particularly Adam Smith as the very crucial factor that causes the wealth of nations. Modern emphases on the importance of this include those from Young (1928), Buchanan & Yoon (1994), and

Sun (2005). A most elaborate analysis with rich insightful results was pioneered by Yang (e.g. Yang & Borland 1991, Yang & Ng 1993; see Cheng & Yang 2004 for a survey). In his tribute to Yang, Buchanan (2004) disclosed that he twice nominated Yang to the Nobel Prize Committee before the sad passing away of Yang at the age of 55 in 2004.

The central tradeoff in Yang's analysis is that between the economies of specialization due to increasing returns at the individual level and the higher costs of transaction. Autarky (at the individual level) does away with transaction costs but does not tape the economies of specialization. The higher is the degree the division of labor, the larger is the set of goods being exchanged in the market, necessitating more transaction costs. An optimum is reached where the marginal gain from increasing the degree of specialization is offset by the additional transaction costs (which are much affected by institutional factors) caused. However, this tradeoff is not continuous. Choices of different occupations, different sets of goods, different institutional arrangements, etc. involve discrete changes. Yang devised an analytical method to compare the different 'corners' of specialization, not only for an individual, but also for the whole economy. As transaction efficiency improves due to better institutions, better transport and communication, etc., the higher is the degree of specialization chosen; more goods are introduced into market transaction. The introduction of previously not marketed goods requires entrepreneurial insight as well as the ability to sustain initial periods of loss. This is especially so as the purchase of the new goods requires other individuals to readjust their degrees and patterns of specialization. In the real world, this must involve substantial time for the readjustment to materialize. The initial periods of losses could be quite long. This again increases (in comparison to the supply-demand analysis) the role of entrepreneurship and finance.

Yang's framework also inclines us to focus on the institutional efficiency of the patterns of division of labor. For example, the indirect network externality through increasing the degree of specialization of the higher transaction efficiency generated by infrastructure improvements may explain the need, on occasions, of encouraging infrastructure investment (Ng & Ng 2007). In the words of Buchanan (2004), 'The

economy of the world, as viewed through the Smithean lenses offered to us by Yang, looks quite different from the world as viewed from the perspective of conventional neoclassical economics … Yang's basic insights … have yet to be widely absorbed and appreciated by the disciplinary orthodoxy.'

The presence of increasing returns also makes financial/pecuniary matters more important in other ways. For example, if we use the traditional analysis of upward-sloping supply and downward-sloping demand curves with no increasing returns and the absence of distortions like external effects, the presence of pecuniary external effects has no efficiency implications. This is shown in Figure 5. An increase in demand for a product shifts the demand curve from D to D', the equilibrium point from E to E', the price from P to P'. Pre-existing consumers of the product lose consumer surplus measured by the area P'PEB. This is a pecuniary external effect as the increase in price makes them worse off. However, this does not cause any inefficiency. The loss in consumer surplus P'PEB is more than offset by the gain in producer surplus measured by the area P'PEE'. The extra area $\triangle$BEE' is the additional surplus of serving the higher demand. The new equilibrium E' is efficient at the new situation, just as the original equilibrium E was efficient at the original situation. This efficiency non-relevancy of pecuniary external effects no longer applies in the presence of increasing returns, even if we allow ourselves to continue using the supply-demand analysis, as shown below. (If the increasing returns are at the industry level, the use of the supply-demand analysis is fine; if they are at the firm level, perfect competition can no longer prevail and the supply-demand analysis is no longer appropriate, strictly speaking. Then, using an analysis focusing on the firm level as in the 4th paragraph of this section may be more appropriate.)

Price

S

E'

B
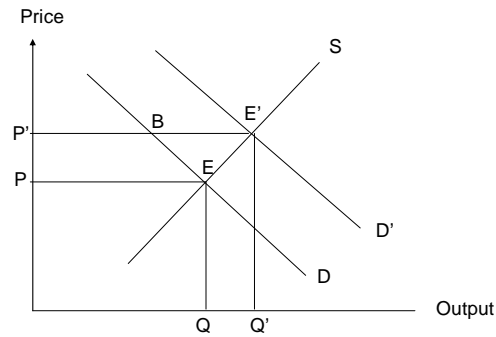
P'

P

E

D'

D

Output

Q   Q'

Figure 5

Figure 5 Efficiency-irrelevancy of pecuniary external effects in the absence of increasing returns

The presence of increasing returns makes the supply curve downward sloping, as shown in Figure 6. Here, an increase in the demand curve from D to D' shifts the equilibrium point from E to E', and **lowers** the price from P to P'. Pre-existing consumers of the product gain consumer surplus measured by the area PP'E'E. This gain in consumer surplus is not offset by any loss in producer surplus. Though the price to producers is also reduced, this is achieved by lowering their average costs of producing the product. They continue to break even at E' as at E, suffering no loss in producer surplus. The presence of pecuniary external effects may have efficiency implications. The new equilibrium point E' may be superior to the original equilibrium point E. In the presence of increasing returns, equilibrium may not be Pareto-optimal (Ng 2009) and pecuniary external effects may have efficiency implications. This again makes pecuniary/financial matters more important. The further analysis of this is however beyond the scope of this paper.
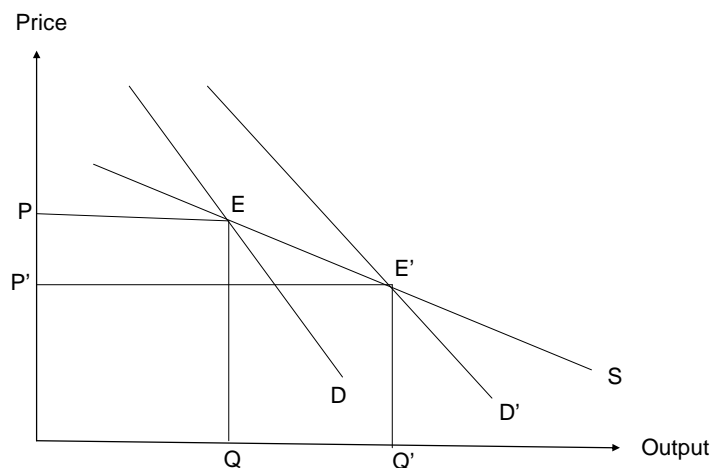
Figure 6

Figure 6 Efficiency-relevancy of pecuniary external effects in the presence of increasing returns

3. Concluding Remarks

This paper explains how the presence of the related non-perfect competition and increasing returns at the firm and economy levels makes money possibly non-neutral and finance (including financial institutions and financial crises) much more important than suggested by traditional economic analysis, especially in its simple version of perfectively competitive firms and supply-demand curves. In the wake of the recent global financial crisis and the related reconsideration of the adequacy of economics, the simple points discussed in this paper, though not covering many other relevant factors, may contribute partially towards a more adequate and complete picture of our complicated economy. Our analysis suggesting the higher importance of finance complements the conclusion that 'economics, if it is to be relevant to reality, should stop neglecting money, wealth and debt' (Bezemer 2011). How to incorporate these financial matters and relevant real-world institutional factors into the core of formal economic analysis will challenge the ability of economists in the foreseeable future.

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[1] The neutrality of money and the classical dichotomy goes together in simple models but in more complicated models, they need not always go together.

[2] Using a fully general-equilibrium analysis, Ng (1986, Appendix 3I) shows: 1. the hypothetical existence of a representative firm whose changes in output and price exactly represent those of the whole economy in aggregate output and the average price for any given exogenous change; 2. the actual existence of a representative firm, defined by a simple weighted average of all (or a representative sample) of firms, whose changes in output and price approximately represent those of the whole economy for any exogenous change that does not result in drastic changes in relative prices.

[3] Taking account of the conditions of cost and demand conditions of firms in the whole

economy and their interaction, the exact conditions determining whether this or other cases can prevail as the new equilibrium are rigorously analysed in mathematical models in Ng (1982, 1986).

[4] To see the complete picture more rigorously, a full mathematical model (Ng 1982, 1986) is needed.

[5] This possible change is abstracted away in Ng (1982) but fully analyzed in Ng (1986).

[6] These include Keynesian and cumulative expansion and the knife-edge in-between case of expectation wonderland where the output depends only on expectation and a purely price-expectational change will be self-fulfilling.