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Money and Inflation: A Taxonomy

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Abstract

This paper reviews the various explanations for inflation and the relation between inflation and money aggregates. Two analytical distinctions are useful to understand different explanations of inflationary processes of all types. First, and more importantly, theories can be seen as cost-push or demand-pull theories of inflation. Second, the distinction between exogenous and endogenous money supply is important for a proper taxonomy of inflation theories. This second analytical cut results from the fact that there is a clear empirical connection between inflation and monetary stock measures. A tentative taxonomy is presented at the end, allowing an evaluation of the dominant view on money and inflation and the main counter points from a heterodox perspective.

Introduction

John Maynard Keynes once said that according to Lenin there is no surer way of overturning a society than to degrade its currency. Inflationary processes, it is clear, can be very disruptive in the short run, even if they do not cause revolutions. But they also have long lasting effects. Fernand Braudel believed that price revolutions represented the strongest secular pattern in modern history. In fact, over the past eight centuries, the world economy has experienced four major price-revolutions whose inflationary forces ultimately transformed economic and social structures. These four price-revolutions took place approximately in the late medieval period, from 1180 to 1350, after the age of great discoveries in the sixteenth-century, from 1470 to 1650, during the Industrial Revolution era, from 1730 to 1815, and during the twentieth century, from the 1890s to the 1980s (Hackett Fischer, 1996).

Not only inflationary processes come in long waves of steady and low inflation, but also every so often bouts of high inflation and hyperinflation occur. In other words, there are several types of inflationary processes. However, high inflation and hyperinflation are relatively rare events associated with severe crises, wars and situations where the State apparatus collapses.

Two analytical distinctions are useful to understand different explanations of inflationary processes of all types. First, and more importantly, theories can be seen as cost-push or demand-pull theories of inflation. The former theories emphasize the role of wage and input increases, that is, supply forces, in generating inflation, while the latter imply that scarcity and demand forces are the main cause of inflation. Second, the distinction between exogenous and endogenous money supply is important for a proper taxonomy of inflation theories. This second analytical cut results from the fact that there is a clear empirical connection between inflation and monetary stock measures.

This paper will deal with the various explanations for inflation and the relation between inflation and money and a tentative taxonomy is presented at the end.[1] The rest of the paper is divided in four sections. The following sections deals with the historical record, both related to long term trends (i.e. price revolutions) and the short lived (from a *longue dureé* perspective) but devastating hyperinflations. The two following sections discuss the major theoretical explanations of inflationary phenomena using as the two analytical distinctions discussed above. Finally we pull the results together for an evaluation of the dominant view on money and inflation and the main counter points from a heterodox perspective.

Inflationary Processes in Historical Perspective

Price Revolutions are often neglected by economists, but have been central for economic historians. The conventional wisdom among economists is that monetarist views are the dominant interpretation of those long term processes. This is particularly the case about the 16th Century Price Revolution, which is the one associated with the first clear expositions of the Quantity Theory of Money (Arestis and Howells, 2001-2). But in general historians stress the real causes of inflation based on neo-Malthusian models that emphasize demographical forces, in which money is endogenous.

Price Revolutions begin in periods of prosperity, and end in periods of crises. The classic demographic or real model is essentially based on a Malthusian insight, was developed by Postan (1973) and used to explain the behavior of the later-medieval western European economy, and in particular the behavior of price movements. Postan argued that population growth and a relatively static agrarian technology led unavoidably to diminishing returns. Diminishing returns, in turn, drove grain prices up during the long thirteenth century (1180-1350), at a rate estimated by Postan to be around 0.5 percent per year. Symmetrically, population decline during the fourteenth and fifteenth centuries, caused by terrible famines, epidemics and wars, led to a fall in grain prices. In Postan's framework monetary changes played no role in late-medieval price movements or in any of the changes that the economy underwent during the late middle-ages for that matter.

Hackett Fisher (1996, p. 72) argues that the prime mover in the following Price Revolution was the "revival of population growth, which placed heavy pressure on material resources." Monetarist inclined authors emphasize the silver and copper mining boom in Central Europe in the 1460s – before the discovery and inflow of American bullion – as a major factor ending the European bullion famine (e.g. Munro, 2003). Hence, monetary factors would be central to explain the sixteen century inflation. The Price Revolution of the sixteen century is well known among economists, and Earl Hamilton's (1934) is the classic interpretation, putting emphasis on the effects on prices of American gold and silver inflows. When the price revolution became evident several explanations were developed. Jean Bodin and the authors of the Salamanca School – Martin de Azpilcueta and Tomás de Mercado more prominently - are usually credited with formulating the first clear version of the Quantity Theory of Money (QTM).[2]

Hackett Fisher (1996, p. 84) suggests that the great inflation created such demand for monetary medium that even "old mines were reopened at heavy expense." Arestis and Howells (2001-2) emphasize the role of endogenous money in the realist neo-Malthusian

tradition. In the neo-Malthusian view bad harvests, famine, disease and war – in particular the Thirty Years War (1618-48) – led to a reversion of demographical trends and led to the end of the second price revolution.

The price revolution of the eighteen century started in the 1730s. The flow of the recently discovered Brazilian gold in Minas Gerais to London via Lisbon is seen by bullionists as the initial cause of rising price trends (Vilar, 1960). It is in this period that David Hume (1752) produces his famous defense of the quantity theory of money, and the specie flow mechanism, according to which inflation resulted from increases in gold inflows related to trade surpluses. On the other hand, population trends – a decline in age at marriage and a subsequent increase in the fertility ratios – suggests that demographical forces were also at play. However, the eighteen century price revolution is ultimately famous for the debates that it provoked in England in the late eighteen century and early nineteen century, known as the Bullionist debates.

David Ricardo is usually described as the main bullionist (defenders of the 1810 Bullion report) author and a champion of the view that inflation was caused by the overissue of bank notes by the Bank of England during the suspension period (1797-1821) – in which bank notes were not convertible to gold. Green (1992) notes that the classical authors believed in some variation of the labor theory of value and, hence, concluded that the price of commodities depended on technical conditions of production (labor embodied or commanded) for a given wage level (subsistence). Hence, the price of gold – the *numeraire* – would also be determined by the technical conditions of production in that sector.

However, if the relative price of gold is determined in that way, the prices of all other commodities in terms of gold cannot be determined by the quantity of gold. Prices in terms of the standard (gold) must be determined by the costs of production of gold, so that causality is reversed and the quantity of money is endogenously determined. Green (1992, p. 56) refers to this classical view of endogenous money as the Law of Monetary Circulation. According to the Law of Monetary Circulation, even though in the long run money supply is endogenously determined, in the short run – when market prices deviate from normal prices – exogenous changes in the money supply may affect prices.

The main opponent of the bullionist view of the eighteen century inflation was the economist and price historian Thomas Tooke – the leader of the Banking School. According to Tooke (1844, p. 123) "the prices of commodities do not depend upon the quantity of money indicated by the amount of bank notes, nor upon the amount of the whole of the circulating medium; but … on the contrary, the amount of the circulating medium is the consequence of

prices." Prices increased, still according to Tooke, as a result of bad harvests, the depreciation of the external value of the currency that increased the price of imported goods, and higher interest rates, which led to higher financial costs. Reversal of these trends in the post-Napoleonic War period, hence, explains the deflationary forces in action, and the end of the price revolution.

The last price revolution starts with the end of the Great Depression (1873-1896), the year of William Jennings Bryan Populist bid for the presidency in the US, based on his attack on the Gold Standard, and his defense of a bimetallic monetary system. While conventional views would emphasize the role of the discovery of new sources of bullion in South Africa, alternative views would emphasize the importance of distributive conflicts in the inflationary process. Adherence to the Gold Standard, and the demonetization of silver, meant that money was scarce, and led to deflationary forces, which in turn hurt debtors (mid-western and southern farmers) and benefited eastern industrialists and bankers (the Robber Barons). The agrarian revolt and the rise of populist and progressive movements – that led to the regulation of monopolies, the passing of an income tax, the creation of a central bank, and a series of other reforms – turned the tide and generated inflationary pressures. The importance of these events is that for the first occasion in modern times it became clear that inflation could result from disputes over the proverbial pie. Distributive conflict would become central for several explanations of inflation in the twentieth century.

Distributive conflict may very well have had a role on the inflationary surge in the US, but it was ultimately an American phenomena. Hackett Fisher (1996, p. 186) argues that the twentieth century price revolution has structural causes related to rising living standards, a public health revolution that led to rising population, and institutional changes that led to what Heilbronner referred to as "floors without ceilings." The rise of corporations, and the development of a more regulated economy, with increasing participation of governments, led to an upward bias in prices. Thus, Robinson (1971) famously argued that "the general price level has become a political problem."

Distributive conflict and political disruption were particularly important in the discussion of inflation in the 1960s. Conventional wisdom presumes that the inflationary pressures were brought about by the expansionary fiscal policies in the US, and the propagation of these inflationary pressures through the international system (Laidler and Parkin, 1975). The increasingly expansionary fiscal policies of the 1960s – resulting both from the Vietnam War and the Great Society experiment of the Kennedy-Johnson administrations – led to growing balance of payments deficits. The US deficits were initially considered instrumental for the

working of the international monetary system that was desperately in need of dollars to obtain the essential imports of capital goods needed for reconstruction. However, by the late 1960s the accumulation of idle dollar balances started to put pressure on the money supply of the rest of world, leading to inflation. That is, according to the monetarist logic, inflation was caused by the US fiscal and monetary policies, and transmitted to the world as a result of the system of fixed parities.

An alternative explanation for the inflationary pressures of the 1960s is possible though. The Golden Age accumulation regime implied a commitment to full employment and the creation of a safety net for unemployed workers. Additionally, the imposition of capital controls and the cheap money policies – which led to low real rates of interest – implied a favorable environment for workers. Parties with strong ties with the labor movement were in power in several Western countries, and this was tolerated, to a great extent, since it was considered a form of reducing the dangers of the Soviet menace. Further, full employment tended to increase the bargaining power of the working class.

In this environment, workers pressures for higher nominal wages were usually accommodated. For a given real rate of interest, and a fixed nominal exchange rate, the only effect of rising wages would be higher prices. In sum, inflation was the result of wage pressures – cost-push – rather than the expansionary fiscal and monetary policies – demand-pull – (Coutts, Tarling and Wilkinson, 1976). Note, however, that for a good part of the Golden Age, wages increased at the same pace that productivity, and hence, had a negligible inflationary impact. Hence, the inflationary process of the 1960s and 1970s seems to be related to the increases in taxes (passed to prices), competitive depreciations (more prominently after 1973), and supply side shocks, notably the two oil shocks of the 1970s. Stabilization and the end of this last price revolution would not be related then to fiscal consolidation, but to the fall in the prices of commodities, and the weakening of the labor movement (Kaldor, 1976; Eisner, 1989).

It is worth noticing that the Quantity Theory tradition faces an important conundrum. If exogenous increases in money supply are the ultimate cause of inflation, then a *diabolous ex machina* is the culprit for increasing the money supply (Hackett Fisher, 1996 p. 83). Corrupt and incompetent politicians are the main suspects. This explanation of the ulterior causes of inflation is one that emphasizes the role of individuals at the expense of the structural constraints faced by them. Alternative theories are less dependent on methodological individualist premises, and on the moral and intellectual qualities of politicians to explain inflationary processes.

Our brief description of the historical record of money and inflation cannot leave hyperinflationary processes out. The most famous episode of hyperinflation is the post-World War I German case. Historians, says Ferguson (1995, p 19), have essentially followed two interpretations of the German hyperinflation. The first was offered in the 1930s by the Italian economist Bresciani-Turroni (1931), who blamed poor monetary and fiscal policy and argued that the inflation had predominantly negative consequences (Câmara and Vernengo, 2001). Recent scholarship among historians, however, Ferguson admits has emphasized alternative views of inflation (e.g. Kindleberger, 1985).

The view according to which deficit spending was the main cause of German inflation was named the English or allied view by Bresciani-Turroni (1931, p. 46). The allied view corresponds to what today would be called monetarist, and was later formalized by Cagan. In this view, the burden imposed by the internal war debt, the payment of pensions to war veterans, widows and orphans, the reconstruction of the few devastated regions, and the process of war demobilization were too heavy for the young Weimar Republic and the leftist Social Democrat government to carry. In addition, the incapacity to raise fiscal revenues implied that the increasing fiscal spending had to be financed by the Reichsbank.

One of the crucial characteristics of the monetarist interpretation of inflation is that the rise in money supply precedes the rise in the price level. Also, given the dominance of purchasing power parity as the explanation of exchange rate determination in that period, the rise in the domestic price level precedes and causes the depreciation of the deutsche mark. There is a chain of causality that runs from the exogenous money supply to the price level and then to the exchange rate.

For Bresciani-Turroni, the solution to the inflationary problem was simply to cut the fiscal deficit. Once the principles of sound finance were re-established, the price level would be stabilized. The German government was then to blame. Still, as noted by Merkin (1982, p. 25), among the defenders of the quantity theory of money there was a certain degree of acceptance that in reality the rise in the price level preceded the increase in the quantity of money, and, hence, expectations of future money supply increases played a role.

The German officials that had to deal with the day-to-day problems of running an economy under hyperinflationary conditions saw the problem, not surprisingly, from a different perspective. The most notorious defender of the so-called balance of payments theory was Helfferich. This view was named the German view by Bresciani-Turroni (1931, p. 47).

The disruption of the war led the German government to regulate the foreign exchange "by way of a direct control of all foreign payments and credits" (Helfferich, 1927, p. 259).

However, "as the collapse of the German nation shows, the force of circumstances proved more powerful than any policy of exchange control" (ibid., p. 262). That is, trade deficits led to depreciation despite the control of the German authorities. As correctly noted by Ellis (1934, p. 224), "the balance theory takes as its point of departure the decline of German exports." Helfferich argued that the permanent unfavorable trade balance, caused by the war and the impositions of Versailles, led to depreciation. This was the root of German problems. For him contrary to the widely held conception, not inflation but the depreciation of the mark was the beginning of this chain of cause and effect. Inflation is not the cause of the increase of prices and of the depreciation of the mark, but the depreciation of the mark is the cause of the increase of prices and of the paper mark issues (Bresciani-Turroni, 1931, p. 45).

In other words, causality runs from the exchange rate to the price level. That means that the rise in the price level cannot be related to the increase in the money supply. Graham (1930) defended Helfferich's position in what was to become, up to the publication of Bresciani's book in English, the most influential view of the German hyperinflation. Graham (1930, p. 172) argues that "the proximate … chain of causation, up to August 1920 at least, and perhaps at other times, ran from exchange rates to prices to volume of circulating medium rather than in the reverse direction". According to the balance of payments view it is not possible to stabilize the economy without stabilizing the exchange rate. This was only possible if foreign reserves were available. The renegotiation of reparations in 1922 and the loans obtained through the Dawes Plan in 1924 allowed the stable foreign value of the rentemark to be maintained.

It is clear that some notion of passive or endogenous money is present in the work of the defenders of the balance of payments theory. Yet, as Robinson (1938, p. 74) noted, there was no explanation of the role of wages in the inflationary process. In her words, "neither exchange depreciation nor a budget deficit can account for inflation by itself. But if the rise in money wages is brought into the story, the part which each plays can be clearly seen." As correctly pointed out by Robinson, there is an inverse relation between the real wage and the exchange rate, so that depreciation leads to a decline in the real wage. If workers resist the fall in the real wage, because tradables are an important component of the wage basket for example, then domestic costs will increase, and so will prices. That is, distributive conflict is an essential part of the hyperinflation story. Robinson's reformulation of the German view provided a sound basis for alternative explanations of hyperinflation.

Quantity Theorists and the Balance of Payments school are the two main groups with opposing views on the German hyperinflation. Cagan (1956) developed the typical

monetarist view on the basis of the quantitativist or monetarist analysis. On the other hand, the Balance of Payments school argues that reparations and depreciation are the cause of hyperinflation. Robinson introduces the notion of wage/foreign-exchange spirals and distributive conflict. Variations of these two views remain the canonical interpretation of hyperinflationary processes.

The Quantity Theory and All That

In the old Quantity Theory tradition (e.g. Friedman, 1956) inflation results from a simple exogenous increase in money supply – in which the money was thrown from an *ad hoc* but memorable helicopter. In modern versions (e.g. Friedman, 1968) an output-inflation tradeoff and the policymakers intention to maintain full employment are the essential force behind inflation. The older version proclaims that inflation is always a monetary phenomenon, while the modern affirms that monetary policy determines inflation in the long run, but in the short run it has effects on the level of unemployment. The existence of a tradeoff between inflation and unemployment, and the willingness of governments to exploit it, is seen as the main explanation for the existence of persistent inflation in developed countries.

Wicksell's classic *Interest and Prices* still provides the best starting point for the understanding of conventional wisdom on inflation.[3] Wicksell distinguished between the natural rate of interest (R^*) and the monetary or bank rate of interest (R). The former was determined by the marginal productivity of capital (I) and the intertemporal decisions of consumption (leading to savings S), along the lines of what became known as the loanable funds theory. The monetary rate was determined by bank decisions. That is, banks supplied credit (M) at the chosen rate of interest (R), according to money demand (L). Monetary equilibrium occurred when the two rates coincided (see figure 1). The natural rate is the gravitational center around which the bank rate fluctuates. Real and monetary shocks could cause deviations of the bank rate from equilibrium.

In a pure credit economy, in which all payments are made through bookkeeping entries as in gyro system, there is no money in circulation. Wicksell presumes that in such a system the banking sector would provide credit on demand. Hence, money is endogenous. Following Wicksell, one can assume that a positive productivity shock raises the natural rate of interest (see figure 1), and that banks maintain the initial monetary rate. Thus, with a low bank rate, investment exceeds savings and once the system reaches full employment prices would go up. In a gyro system the process can go on forever, and the resulting process is termed the cumulative process of inflation. In a normal economy, however, continuous lending would reduce bank reserves, and as a result banks would be forced to increase the monetary bank

until a new equilibrium was reached. Inflation resulted from a bank rate that was too low, as much as deflation (and temporary unemployment) from a bank rate that was too high.[4]

Figure 1 Monetary Equilibrium
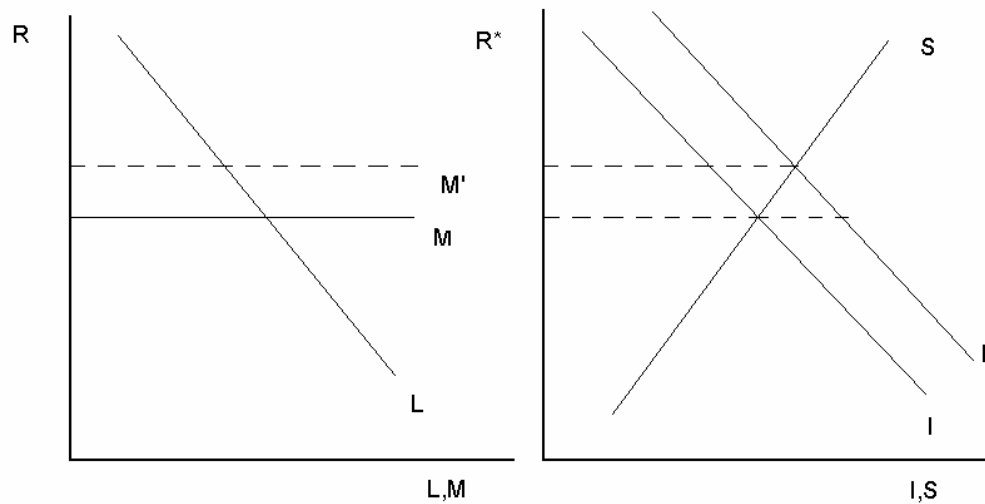
The low bank rate implies overinvestment, and the need for additional savings. The inflationary process by reducing the ability of consumers to spend provides the additional forced savings. In this view, then inflation acts as a tax that provides the additional resources needed to finance investment. Keynes (1923) provided an inflation-tax model of inflation. His long struggle to escape from the Quantity Theory tradition did not lead to an abandonment of neither the notion of demand-pull inflation or exogenous money supply. In Keynes (1940) he turned once again to discuss inflation. At full employment output, if aggregate demand rises, output cannot follow because of supply constraints. Note that excess demand would mean that the level of output that would be determined by the multiplier process would be higher than the full employment level, and, thus, the market-clearing level of output is not achievable. The difference between the market clearing and full employment output is the inflationary gap. As nominal wages lag behind good prices in adjustment, the rise in prices will therefore lead to a reduction in the real wage and a redistribution of income away from wage-earners. Further, as workers have greater propensities to consume than capitalists, the redistribution of income induced by the inflationary gap would lead to lower aggregate demand and close the gap. The process is similar to the Wicksellian forced savings effect, emphasizing the role of income distribution instead.

The predominance of the full employment objective as the main target of macroeconomic policy and the widespread use of Keynesian policies in post-World War II period implied that eventual tradeoffs between full employment and inflation became more visible. The Phillips curve implies that there is an empirical relationship between inflation and the level of unemployment, and that there is a level of unemployment at which prices are stable. Friedman (1968, p. 7) named that rate of unemployment the natural rate, as an explicit analogous to the Wicksellian natural rate of interest, since both imply that whenever the interest rate or the unemployment rate are at their natural level, prices would be stable.

The Keynesian rationalization for the Phillips curve suggests that the rate of change in money wages is a function of excess demand in the labor market. Further, the unemployment rate has a negative correlation with the rate of change in money wages since the later represents excess supply in the labor market. Also, the rate of change in prices is given by the difference in the rate of change in money wages minus the rate of change of productivity. Formally

$$(1) \qquad \frac{\dot{w}}{w} = f \frac{(N_d - N_s)}{N_s}$$

$$(2) \qquad \frac{\dot{p}}{p} = \frac{\dot{w}}{w} - \frac{\dot{\lambda}}{\lambda}$$

where dots on top represent changes in levels, w is the money wage, N_d and N_s are labor demand and supply respectively, p is the price level, and λ is labor productivity.

Yet the experience of the 1960s in which macroeconomic policies were used to stabilize the business cycle brought serious doubts on the stability of the Phillips relation. Friedman (1968) and Phelps (1967) anticipated the breakdown of the Phillips curve, suggesting that the relation had only short term validity, and that in the long run there is no tradeoff between inflation and unemployment. Friedman argued that inflationary expectations were relevant for wage bargaining. Hence the original Phillips equation had to be augmented to incorporate expectations. The monetarist of expectations augmented Phillips curve can be written as

$$(3) \qquad \pi = \pi_{-1} - \beta(u - u_n)$$

where π is inflation, π_{-1} is the previous period inflation, u is the rate of unemployment and u_n is the natural rate, also know as the non-accelerating inflation rate of unemployment (NAIRU). Equation (3) assumes that economic agents are backward looking and that they form expectations about the future using information about the past.

A positive monetary shock has short term effects on the level of activity because of backwards looking expectations formation. In figure 2 that situation is represented by a movement from point 1 to 2 along the original Phillips curve. In Friedman's story money illusion would lead to an increase of labor supply, and higher output, but as information about disseminates the economy returns to the natural rate, shifting the Phillips curve up, and returning to equilibrium in point 3. The only way government could maintain a level of unemployment below its natural level is by accelerating inflation.

Figure 2 Phillips Curve
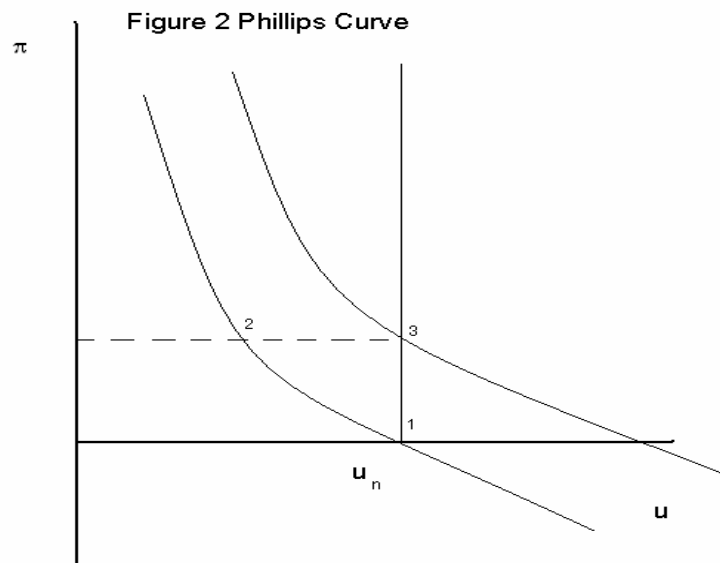
The rational expectations revolution of the 1970s took some of Friedman's conclusions to the extreme. Lucas (1972), using the view that information is costly, argued that producers faced with a monetary shock would have a signal extraction problem, and would not adjust prices fully. Hence, lack of information or other source of price rigidities would allow the existence of a short run tradeoff and the possibility that governments could exploit, for political gain, the advantages of lower levels of unemployment. One must note that in Lucas' model agents form expectations rationally and the Phillips curve is rewritten as

(4) $\pi = E\pi_{t+1} - \beta(u - u_n)$

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where backward looking inflation is replaced by forward looking expectations, i.e. the expectations of inflation in the next period. In the absence of imperfect information, and when the economy is at the natural level, inflation is a random walk. This proposition generated important results, within the mainstream, related to the effects of expectations on inflation and stabilization processes in particular the question of dynamic inconsistency.

Dynamic inconsistency implies severe difficulties in bringing down inflation. The public knows that the government has an incentive to renege its promises after the public sets its expectations, and therefore does not believe in the disinflation announcement. Hence, a strong and credible commitment to low inflation is seen as a precondition to avoid long and deep recessions during stabilization. Goodfriend and King (2004) suggest that the Volcker disinflation was costly in terms of output because it was highly incredible.

A simple solution to which many countries have resorted to solve the dynamic inconsistency problem is to peg their currencies to that of a low inflation level country. By pegging the exchange rate, the government intends to reduce inflation by importing credibility from abroad (Giavazzi and Pagano, 1988). This has been behind the process of dollarization or fixed exchange rate stabilization programs in several developing countries (Vernengo, 2005). Once again, given that the government has an incentive to break its promises and devalue the currency to stimulate exports and the domestic output it follows that stabilization will only succeed if it is credible. Price stability requires that central banks build a reputation for stalwart defenders of low inflation (Ball, 1994).

Further, a fully credible disinflation, according to Ball (1994) may very well lead to an economic boom. The cause for the boom is related to the forward looking behavior of firms. If firms believe in the central bank's announcement of a stabilization program, then they should reduce prices well before the actual money supply is reduced. The consequent increase in real balance would have positive wealth effects leading to increased consumption, higher output and lower unemployment. As noted by Mankiw (2000, p. 14) the main problem is that "credible disinflations cause booms … but actual disinflations cause recessions." The main response to this problem has been to admit that there are no perfectly credible stabilizations. Another solution is to assume that economic agents are more myopic than has been presumed since the rational expectations revolution. Roberts (1997) questions the rational expectations and uses backward looking adaptive expectations instead. Finally, and more interesting Gordon (1996) and Staiger et al. (1997) argue for hysteresis and the notion that the natural rate moves sluggishly towards the actual unemployment rate. In this case, if contractionary monetary policy leads to a short run reduction of unemployment below

its natural level, the natural level will permanently increase. A variable natural rate also implies that governments have real incentives to maintain the economy close to full employment, even at the expense of a bit of inflation.

It is usually assumed that in developed countries the incentives associated to the maintenance of full employment, and the existence of an inflation unemployment tradeoff should be seen as the main causes of inflation. However, in developing countries the lack of organized fiscal institutions and the need for collecting inflationary tax through the power of seigniorage are seen as the main cause of inflation within the mainstream of the profession. The canonical model is based on Cagan's explanation of the German hyperinflation. The model assumes that the government borrows from the central bank which monetizes government debt. Causality runs from fiscal deficits to money emissions.

Seigniorage is defined as the real value of the increase in the money base, and in steady state is assumed to be equal to the government deficit. We have

$$(5) \qquad S = \frac{D}{p} = \frac{\dot{M}}{p}$$

where S is seigniorage, D is the public sector's nominal deficit, p the price level and M is money supply. Hence, seigniorage is equal to the real deficit (d), which can be re-written as

$$(6) \qquad d = \frac{\dot{M}}{M}\frac{M}{p} = g_m - m$$

where g_m is the rate of growth of money supply and m represents the real money balances. By definition the rate of growth of real money balances is given by the rate of change in nominal balances minus the rate of change in prices, i.e. inflation. Therefore, we have

$$(7) \qquad \frac{\dot{m}}{m} = g_m - \pi$$

Substituting (8) into (7) we obtain the following

$$(8) \qquad d = g_m m = \dot{m} + m\pi$$

that is, seigniorage is divided into two components, namely: the variation of the real stock of money, and the loss of value of the current money stock resulting from inflation, also known as the inflation tax. Furthermore, in the case of a steady state, when m-dot equals zero, seigniorage would be equivalent to the inflation tax.

Figure 3 Inflation Tax Laffer Curve
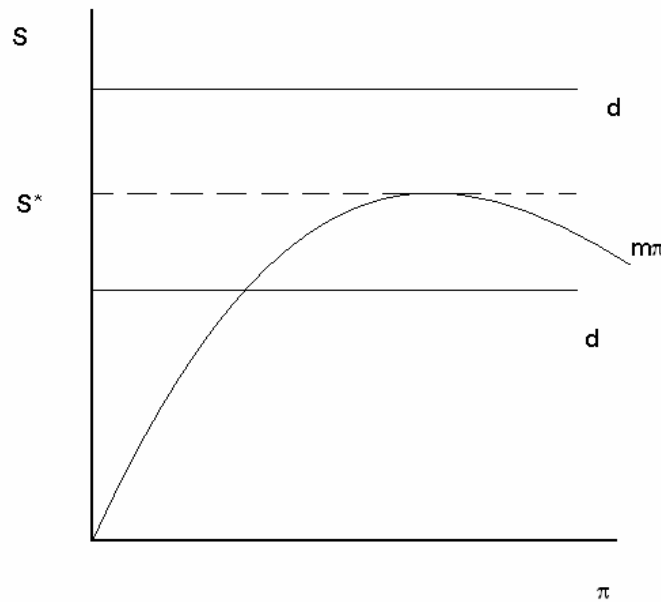
At low levels of inflation, seigniorage and the inflation tax are low. Initially as inflation goes up the tax revenue also increases, because the increase in inflation acts as an increase of the marginal tax rate. However, as the rate of inflation increases economic agents reduce their cash holdings, and the tax base is reduced. Eventually, at very high levels of inflation, an additional increase in inflation would lead to a reduction of inflation tax revenues. This is illustrated by the inverse-U shaped inflation tax Laffer curve in figure 3.

If we abstract from the Olivera-Tanzi effect – according to which an increase in inflation leads to a reduction in tax revenues because of lags between the tax generating act and collection – the real deficit can be represented as an horizontal line (see figure 3).[5] Equilibrium is given at the intercept of the real deficit and the inflation tax Laffer curve.[6] Hyperinflation occurs when the public sector's financial needs as represented by the real deficit exceed the maximum feasible amount of seigniorage S*. In that case, d>S* and real money balances increase without limit.

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A more complete model would allow for government debt, reducing the role of deficits in financing government spending. However, most models impose an upper limit on governments' abilities to borrow, in which case borrowing only delays the day of reckoning (Sargent and Wallace, 1981). Once it is noted that the government is overborrowing the central bank will be forced to buy unwanted government bonds and deficits will become the norm again. Further, in this case borrowing would lead to increases in debt servicing requirements, and inflation tax revenues would be needed to pay current expenses and the additional interest rate burden. Ultimately stabilization requires that governments reduce their need for inflation tax revenues. The task is easier when economic agents find the government's promise to reduce inflation tax credible (Sargent, 1982).

A Structural View of Inflation

This section describes briefly the main alternatives to the dominant monetarist theories of inflation, according to which inflation is always a monetary phenomenon. There are three main alternative schools of thought that provided relevant contributions to inflation theory, namely: the Marxists, the post-Keynesians, and the structuralists, which include a latter day's subdivision, usually referred to as inertialists or neo-structuralists.[7] According to all heterodox traditions inflation is essentially the result of a conflict over the distribution of income. Conflict over income shares arises in several social environments, between capital and labor, between landowners and peasants, between different groups of workers, between producers in different sectors or the economy, such as those that produce tradables and those that produce for the domestic market.

The Marxist model developed by Rowthorn (1977) assumes that conflict is a direct function of effective demand, which in turn depends on the exogenous money supply.[8] In this view inflation increases profits by reducing the real purchasing power of workers, since the latter are not able to protect themselves against it. The main difference between Rowthorn's model and the conventional monetarist story is that excess demand affects balance of power between workers and capitalists and only indirectly the price level. In the monetarist approach demand affects prices directly.[9]

Post-Keynesian authors have constructed conflict models of inflation in which excess demand is not a relevant component of the explanation. Further, in these models the money supply is endogenous. In other words, inflation reflects only the inconsistency of the desired mark up of firms and the target real wage that workers consider fair. However, most post-Keynesian models have neglected open economy considerations. Open economy matters have been central to structuralists.

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Latin American structuralists also emphasize the role of distributive conflict within a cost-push approach. But, given the recurring balance of payments problems of the region, structuralist authors have paid more attention to balance of payments constraints.[10] Noyola (1956) and Sunkel (1958) are generally regarded as the seminal contributions to the structuralist theory of inflation. According to the structuralist view, inflation has its origins in the supply side. In that sense, excess demand caused by fiscal deficits is irrelevant. In particular, the inelasticity of food supply that results from the concentrated structure of land ownership is seen as the major cause of inflation (Cardoso, 1981).[11]

Also, the structural dependency of capital imports, and the lack of foreign reserves means that developing countries have recurrent balance of payments problems. Currency depreciation is endemic, with or without foreign exchange control or other types of capital control. Hence, depreciation is also seen as an essential part of the inflationary problem.

In that sense, the structure of land ownership and the dependence on foreign exchange are seen as the central problems that spark social conflict ultimately resolved by inflation. Shocks to the terms of trade provide the spark that ignites the inflationary process. Structuralists emphasize both the shocks that initiate inflation and the propagation mechanism that maintains it alive. It must be noted that some structuralists, in particular Noyola (1956) and Furtado (1959), argue that the propagation of inflation is the result of incompatible income claims. If after an inflationary shock a group is dissatisfied with its income share it will try to pass its losses to another group. Further, for structuralists inflation is not a monetary phenomenon, and results from real disequilibria. Hence, monetary police is a passive element in the inflationary process. The notion that monetary policy is passive is close to the post-Keynesian view on the endogeneity of the money supply as developed by Kaldor (1982) and Moore (1988).

Finally, neo-structuralists also provided an alternative view to monetarism. In particular, the experience with wage-indexation, and the failure of austerity measures to bring down inflation during the 1970s led many authors to argue that inflation was mainly inertial.[12] The precursors of the idea of inertial inflation were Simonsen (1970) and Pazos (1972). Bresser Pereira and Nakano (1983), Arida and Lara-Resende (1985) and Lopes (1986) were the key contributions to the notion of inertial inflation. These authors called for a "heterodox shock," by which they meant extreme price controls, that is prices should be frozen completely to avoid inertia. Given their distrust in orthodox policies, the inertialist authors became known as neo-structuralists.

A simple model that catches up some elements of all the above mentioned contributions can be sketched out.[13]   The Kaleckian notion of differential prices for agricultural and manufacturing goods is central to the model. Inflation is defined as the weighted average of inflation in both sectors.

(9) $\pi_t = \rho\ \pi_{At} + (1 - \rho)\ \pi_{Mt}$

where π_{At} and π_{Mt} refer to agricultural and manufacturing inflation respectively. Further, it is assumed that firms form prices as a markup on variable costs in Kaleckian fashion, and as a result inflation in the manufacturing sector is a linear combination of changes in input prices such as wages, and the prices of imported inputs and the firm's degree of monopoly, reflected in its ability to increase the markup. This is represented as

(10) $\pi_{Mt} = \phi\ \omega_t + \ \sigma\varepsilon_t + \tau*$

where ω_t is wage inflation, ε_t is the exchange rate depreciation, and $\tau*$ represents a change in the markup. Finally, wage indexation introduces an element of inertia in the system. Formally

(11) $\omega_t = \pi_{t-1} + \omega$

ω represents a wage push factor that reflects the workers' willingness to increase wages above past inflation. Solving for inflation we obtain

(12) $\pi_t = (1 - \rho)\phi\ \pi_{t-1} + [\rho\ \pi_{At} + \sigma\ (1 - \rho)\ \varepsilon_t] + (1 - \rho)\phi(\omega* + \tau*/\phi)$

Inflation is the result of three factors, namely: inertia, a series of changes in relative prices (agricultural goods, imported inputs), and changes in wages above indexation and changes in markups in the fix-price sector that reflect distributive conflict.

The first term shows that inertia depends on the share of manufacturing goods in the consumption basket, and the share of wages in producing those goods. For simplicity it was assumed that wages were fully indexed to past inflation. Alternatively one could argue that inertia may result from staggered forward looking wage contracts, or that indexation is less than perfect and wages recover only a share of past inflation. Inertia is essential in the explanation of persistently high inflation that never leads to full fledged hyperinflation. This

was typical of the Latin American experience. An important effect of indexation is that a shortening of the period of indexation leads to acceleration of inflation.

Although under certain circumstances inflation may very well be fundamentally inertial, it is clear that other forces are relevant. For structuralist authors inflation is an inevitable companion of the process of development. Industrialization implies profound changes in the structure of production, reducing the size of the agricultural sector, increasing the demand for imported intermediary and capital goods. The process of development, thus, increases the possible sources of supply side constraints on the economy. The increase in manufacturing production may come at the expense of the agricultural sector's ability to produce foodstuff for domestic consumption. In that case, the relative scarcity of agricultural goods would lead to higher prices. More importantly, by increasing the price of foodstuffs industrialization may lead to a reduction of the real wage. Real wage resistance would then lead to wage-price spirals that propagate through indexation mechanism. In sum, a supply side shock generates a process of chronic inflation.

Structuralists and post-Keynesians see balance of payments constraints as the main limitation to growth and development. External shocks affect the cost structure and may change the income distribution equilibrium of the economy. Relatively appreciated exchange rates allow developing countries to import the essential intermediary and capital goods necessary for the development process. As a windfall gain appreciated exchange rates tend to reduce inflationary pressures. However, inability to obtain enough foreign exchange to close the balance of payments – to maintain a current account balance sufficient for the requirements of servicing foreign debt, and hence avoiding default – tend to force developing countries to devalue their currencies.

In the same vein that the increase in agricultural prices, devaluation affects directly prices, and to the extent that imported goods are part of the wage basket, or affect the prices of goods in the wage basket, the real wage would tend to fall. Once again wage resistance would lead to further hikes in prices, and foreign exchange-wage spirals would ensue. Propagation mechanisms would lead to a process of chronic inflation.

Finally, according to the model above inflation depends on the distributive conflict expression. Prices may increase because workers and capitalists are not satisfied with their respective shares of the pie. These inconsistent claims are represented by increases in wages above the indexation norm, or increases of prices by firms above what would be required by increases in the prices of inputs. In other words, the economy is divided between workers and capitalists, who try to increase their share of total income at the expense of each other.

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The profit share is positively related to the degree of monopoly as represented by the markup. Hence, whenever the actual share of profits falls below the target share firms will increase domestic prices.

For heterodox economists monetary policy and fiscal policy have limited effects on inflation, even though both can be very strong instruments to affect the level of activity. Controlling inflation is ultimately associated with the elimination of inertia, by promoting the eradication of indexation of wage contracts, the reduction of the effects of supply side shocks which may be achieved, to some extent, with price controls and foreign exchange controls, and, last but not least, by some sort of social pact that placates the distributive conflict.

Heterodox authors have challenged conventional wisdom, and put forward a view of inflation based on distributive conflict, supply side shocks, and propagation mechanisms. Endogenous money more often than not complements the accepted view among heterodox authors. Stabilization relies on incomes policies rather than macroeconomic austerity. Traditionally the institutional arrangements such as a national level collective wage bargaining system were essential for wage-setting practices that reduced inflationary tendencies. The increase in labor market flexibility and the dismantling of labor market institutions makes this type of incomes policy less likely. Also, international financial deregulation, and the ensuing exchange rate volatility, makes the possibilities of inflationary shocks greater. This is a paradoxical result, since according to the mainstream views one of the main reasons for both policies, labor flexibility and financial deregulation, was to control inflation.

Concluding Remarks

It was suggested that two organizing principles were essential to clarify diverse views about inflation. Table 1 below organizes theories according to the adoption of a demand-pull or cost-push view of inflation, on the one hand, and the adoption of exogenous or endogenous view of money supply, on the other.

The principal diagonal contains the traditional views regarding inflation. It is clear that the defenders of the old Quantity Theory tradition from the Salamanca School onwards until recent monetarists, including those using the Phillips curve would fall into the upper-left quadrant. Keynes inflation gap model would also fall into that quadrant, but that should be qualified by the fact that his arguments were applied to a war period context. The exact reverse positions taken by most heterodox schools grouped in the lower-right quadrant.

The secondary diagonal contains the, at least until now, out of the ordinary views on inflation. In the lower-left quadrant we find the real views of inflation that emphasize excess demand and endogenous money. This is a strong view among economic historians,[14] and

increasingly so among macroeconomists that embrace some variation of the post-Wicksellian view of the economy. For Wicksell, the Real Business Cycle authors, and the so-called New Neoclassical Synthesis[15] – that incorporates New Keynesian rigidities into a Real Business Cycle model – real shocks explain economic fluctuations, including price fluctuations, and hence money becomes endogenous.

Table 1 Classification of Theories of Inflation

	Demand-Pull	Cost-Push
Exogenous Money	Salamanca School Quantity Theory of Money Keynes' Inflation Gap Phillips Curve Models	Marxists Neo-Chartalists
Endogenous Money	Neo-Malthusian Model Wicksell's Cumulative Process Real Business Cycle New Neoclassical Synthesis	Balance of Payments School Structuralists Scandinavian Model Post-Keynesians Inertialists

The upper-right quadrant is perhaps the oddest of all. Marxists authors may be seen as arguing that excess demand by pushing the economy beyond the NAIRU leads to increasing bargaining power for workers, and eventually the tighter labor market would generate higher wages and inflation. However, the NAIRU does not represent a natural or full employment barrier; it is a social construct that depends on the nature of labor institutions and reflects class conflict. In that respect, inflation can also be seen as arising from cost-push pressures in the labor market. Hence, even though Marxist could be bumped into the upper-left quadrant they fit better the one chosen above.

Finally, neo-chartalists who believe that money is a creature of the State– fall into the upper-right quadrant. Chartalists, it should be noted, position regarding money is controversial, but it seems that their views imply that the monetary authority controls exogenously the money supply, and that the means of payment are multiplied by the banking sector.

The most significant feature to emerge from the table above is that all orthodox schools of thought are in the left side, while all the heterodox are in the left side of the table. This suggests that the most important dichotomy is the one associated with the demand-pull versus cost-push divide. This result seems to emphasize the fact that the main distinction between conventional wisdom and all unorthodox views of inflation depends on whether some

extraneous element forces inflation into a system that would otherwise work perfectly, generally in the form of government's excessive money printing, or if social conflicts and structural limitations are ultimately resolved by inflation, typically by allowing costs to increase.

Not surprisingly orthodox research has concentrated on explanations for government's inflationary behavior. Government behavior, in turn, is usually justified in terms of short term electoral gains. In this respect, by introducing political variables into the discussion of economic outcomes inflation theory became a branch of the so-called New Political Economy. It is the external political process that contaminates the well functioning market economy. In contrast, alternative theories have emphasized the old classical political economy tradition according to which distribution is determined by social variables, and historically developed institutions. In that context the creative impulse of history is the conflict of antagonistic forces in the productive arena. Inflation is then seen as the vector solution by which some conflicts generated in the process of economic development are accommodated. In the end, heterodox economists argue that the internal contradictions of the functioning of a market economy are essential to understand inflationary processes.

Endnotes

[1] Similar, if somewhat different, efforts have been done by Moore (1978) and Wray (2001).

[2] On the Salamanca School see Grice-Hutchinson (1952), and Popescu (1997).

[3] See Leijonhufvud (1997) and Woodford (2003) for Wicksell's influence.

[4] Wicksell's analysis prefigures modern discussions on monetary policy. The interest rate rather than money supply is the instrument of policy, and in order to maintain price stability the central authority must equalize the bank rate to its long term equilibrium level, i.e. the natural rate. For a comparison with modern conventional views on monetary policy see Clarida, Gali and Gertler (1999).

[5] The Olivera-Tanzi effect was first noted by Olivera (1967) and independently described later by Tanzi (1977).

[6] Two equilibria are possible, one with low inflation and one with high inflation. Stability depends upon economic agents' expectation formation (Heymann and Leijonhufvud, 1995, p. 21). In particular perfect foresight implies multiple equilibria.

[7] The discussion is by no means conclusive. Some views are left out inevitably. References to other schools, such as the Scandinavian, the neo-chartalist and the German Balance of

Payments Schools can be found on the footnotes. Taylor (2004) presents a discussion of structuralist views of inflation that can be seen as broadly encompassing the views of heterodox economists.

[8] Bowles (1985) similarly argues for a heterodox version of the natural rate of unemployment. The non-accelerating inflation rate of unemployment (NAIRU) reflects the effects of excess labor demand on the bargaining power of workers. The neoclassical natural rate is a full employment one, while for Marxists the NAIRU is not (Pollin, 1999). Post-Keynesian authors have been more critical of the NAIRU, in particular the fact that both the natural rate and the NAIRU presume that the level of employment is a supply side phenomenon, rather than the result of demand decisions. Sawyer (2001), while emphasizing the role of capacity constraints as possible inflation barriers, argues against the NAIRU and the notion of employment determination as a labor market phenomenon.

[9] Desai (1973) and more recently Screpanti (1997) are also important contributions to the Marxist theory of inflation.

[10] On Latin American structuralists, and also the German Balance of Payments School, inflation theories, see Câmara and Vernengo (2004).

[11] Canavese (1982) shows that there is a similarity between Latin American structuralists' views and the Scandinavian model of inflation. Both models can be seen as a formalization of the notion that different sectors have different rates of productivity growth. On the Scandinavian model see Frisch (1977).

[12] Some post-Keynesians authors emphasized also the role of expectations in producing price inertia, rather than the role of contracts (e.g. Frenkel, 1979; Tavares and Belluzzo, 1986; Carvalho, 1993).

[13] Heymann and Leijonhufvud (1995, pp. 29-34) provide a clever version of what may be termed the canonical heterodox model of inflation. A modified version is presented here.

[14] The Neo-Malthusian view that is dominant among historians emphasizes demand led inflation. Note, however, that if instead of stressing the role of population dynamics on demand, one accentuates the impact of demographics on the relative strength of the labor class and consequently on wage dynamics, one would have a position that is closer to heterodox interpretations of inflation.

[15] On the New Neoclassical Synthesis see Goodfriend and King (1997).

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