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STRATEGIC ECONOMIC DECISIONS

Leaders in the Economics of Uncertainty



PROFILE

February 2016

Number 141

INFLATION AND DEFLATION

What Truly Causes Each? What Lies Ahead? And Why?



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Explaining a Change in Inflation

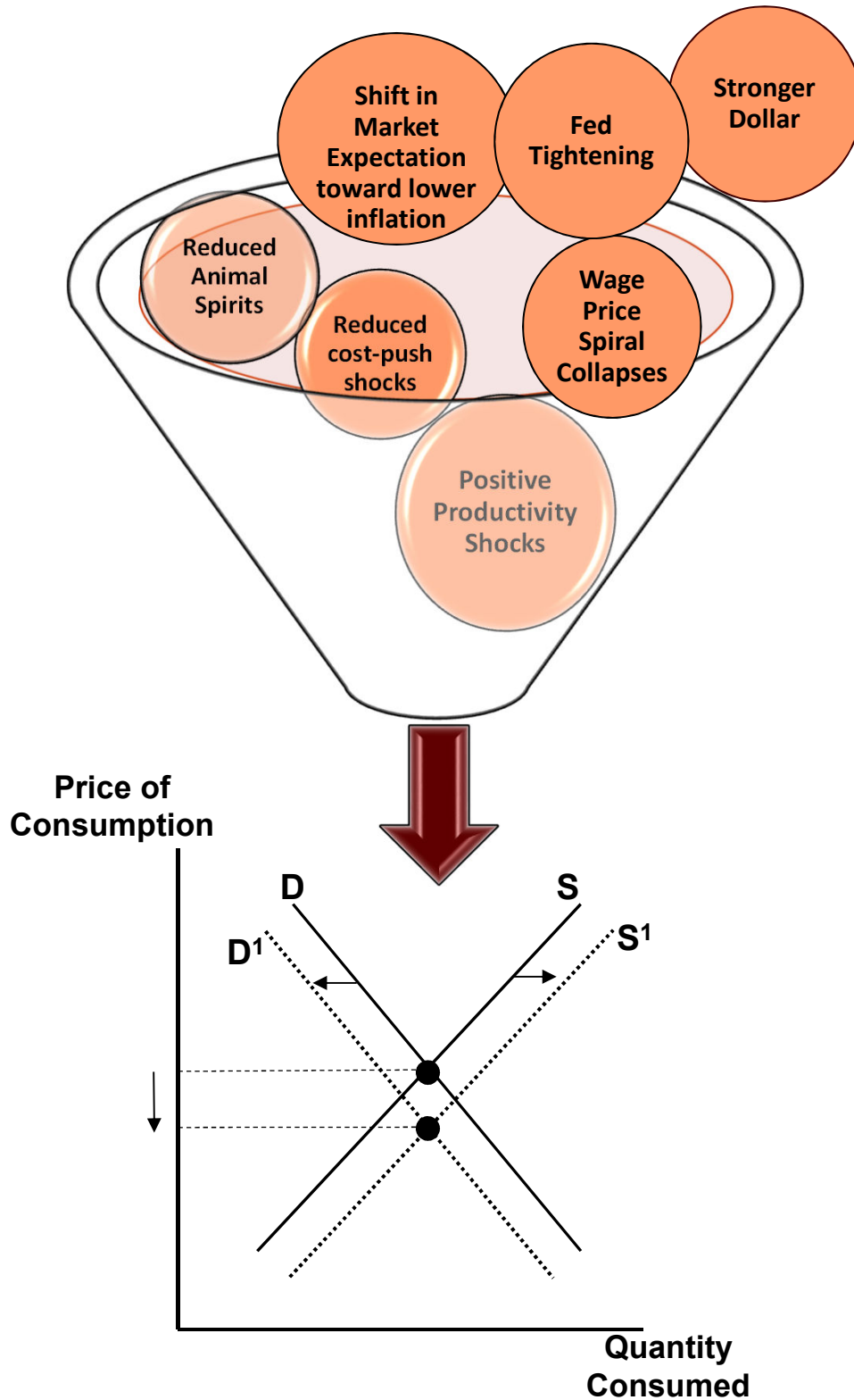


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INFLATION AND DEFLATION

What Truly Causes Each? What Lies Ahead? And Why?

– A Signal Failure of Market Research –

While most any investor would agree that inflation is one of the three most important variables driving asset market returns, recent market research into the prospects for inflation has been superficial and misleading. Consider where we are today. During the past fifty years, the US has witnessed the greatest inflation (1966–1981) and subsequently the greatest deflation (1982–2015) in over a century. Neither of these was forecast. These developments played a key role in generating the worst stock and bond market performance in eighty years (1966–1981), followed by the best (1982–2015). Take the case of the S&P 500 Index. During the earlier regime, inflation averaged 7.1% while the Index (price only) rose at an average annual rate of 2.7%. In the latter regime, inflation averaged 2.8% while the Index rose at an average rate of 9.0%. In short, inflation matters to markets, although we must never confuse correlation with causation.

What exactly caused these two inflation episodes? Did inflation soar in the first regime solely because of guns-and-butter excess demand from the Vietnam War, easy monetary policy, and skyrocketing oil prices? If so — and these developments are only half of the story — exactly *how* did each of these developments impact inflation? And what of the great disinflation that followed starting in the early 1980s? Was it really all about the explosion of cheap Chinese imports, and tighter monetary policy? No, it was not.

Greater confusion would follow as the twenty-first century unfolded. Over the past five years, many nations have seen “lowflation” morph into deflation despite **(i)** a six-year recovery from the Global Financial Crisis, and **(ii)** implementation of a vast array of QE strategies involving the supposed “printing” of trillions of dollars, euros, and yen of new money. To add to investors’ consternation, all major central banks have failed to raise inflation rates from their current below-target levels. For example, European Central Bank President Mario Draghi recently announced that the fight against deflation would be his central goal moving forward. He

proposes to prevent deflation by “more QE” despite the fact that QE has failed to rekindle inflation anywhere during the past five years. Investors are increasingly skeptical about the comments of central bankers regarding inflation, and with good reason.

Given these realities, the failure of financial market research to focus on the inflation/deflation story better than it has is hard to understand, especially since the issue of inflation is a demanding one that deserves more than bogus assertions about “money printing.” We are not aware of a single proper analysis of this all-important issue written during the past ten years, although this may simply be an oversight on our part. And what about prospects for the future? No prediction of future inflation can be made without first understanding *why* inflation has behaved as it has in the past. But such an understanding presupposes a proper understanding of what inflation is all about, and why most assumptions about its behavior have been proven to have been wrong time and time again.

Purpose of This *PROFILE*

This essay is an attempt to remedy this situation, and as always, to do so from first principles. We attempt to dispel confusion about the exact meaning of inflation, its true causes, and how it will behave in the next five or ten years. The good news is that, unlike complex issues such as endogenous risk or productivity growth that we have tackled in the past, the issue of inflation is not particularly difficult to understand — provided that the following Fundamental Principle is always kept in mind:

Inflation/deflation (e.g., of consumption goods) is always and everywhere a story about shifts in the supply and/or demand curves for goods and services. Inflationary “events” of any kind (whether oil shocks or monetary easing) only generate inflation to the extent that they shift one or both of these curves. Please refer to the figure titled, “Explaining a Change in Inflation” in the very front of this essay that graphically summarizes this principle.

This statement is in marked contrast to more familiar clichés such as “inflation is always and everywhere a monetary phenomenon,” as Milton Friedman famously decreed. As will be seen, Friedman’s view is correct at a certain level, but it is a tautology that provides little help in

forecasting how inflation will behave in the future, and why. Then there are the utterly nonsensical assertions about how changes in velocity can impact inflation.¹

Part A: We introduce some preliminaries needed for our analysis, and highlight some of the most pervasive myths about inflation. Our Fundamental Principle cited just above is introduced and justified here. In doing so, an all-important distinction is made between the *ultimate* and the *proximate* causes of inflation. The ultimate driver of inflation lies in shifts in either or both the demand and supply curves for goods and services. The proximate drivers are those “events” that are most frequently discussed in the context of inflation, e.g., excess money printing, a productivity shock, excess demand growth, a change in animal spirits, an oil price shock, a wage/price spiral, a change in the Fed funds rate, and so forth.

These drivers are proximate in that they themselves do not cause inflation. Rather they determine the nature and magnitude of the shifts in the supply/demand curves for goods and services, shifts that *in turn* determine whether and by how much the price level rises. Moreover, these drivers are often off-setting in nature, e.g., one shock might shift the supply curve outwards, while another may push it backwards. What matters to price changes in consumption goods (the CPI inflation rate) is the *net shift in each curve*. This point is rarely made, and is critical to understanding and forecasting inflation.

We also highlight the differences in what drives *goods prices* on Main Street versus *asset prices* on Wall Street. The two are uncorrelated, and completely different macroeconomic policies are needed to govern each. Yet in popular accounts, they are regularly confused.

Part B: Here we discuss several proximate causes of inflation in some detail. We review how each can impact inflation by shifting the relevant supply/demand curves for goods and services. For motivation, we apply this mode of analysis to the arresting inflation/disinflation story of the past fifty years. As part of this analysis, we point out how the supposed great divide between monetarist and Keynesian views on the true causes of inflation does not in fact exist at all. In particular, we clarify the confusion centering on Milton Friedman’s celebrated comment that “Inflation is always and everywhere a monetary phenomenon.” It is not.

¹ The money supply/velocity/GDP/inflation equation is an *identity* that is useless for forecasting. Suppose, for example, that nothing changes in an economy except that people suddenly pay all their bills via electronic transfers of funds, rather than by writing checks on their bank accounts. Then the velocity of money will shoot towards infinity assuming the components of “money” have not changed. For very little money is now needed to generate national income. This change in velocity has no impact on the economy or on inflation.

Part C: Our third section sets forth our prediction that inflation should remain low for a number of years, and why this is likely. We agree with certain consensus views on why inflation will be moderate, including growing risk aversion driven partly by demography, excess supply in products manufactured overseas, low commodity prices, and collapsing growth in China and many other emerging economies. *But valid as many of these arguments are, they do not suffice to explain the disinflation that the US economy has experienced for the past twenty-five years.*

To explain this development, we argue that a significant outward shift in the supply curve of goods and services due to Digital Revolution productivity shocks has played the central role. We expect them to continue to do so during the next decade. As we argued in our recent essay on productivity growth, the official statistics fail to capture both the disinflationary and the productivity-enhancing impact of this astonishing revolution that is changing our lives.

Part D: Finally, we discuss the true interrelationships between inflation, productivity growth, and GDP growth. Our analysis here refutes in a novel manner the thesis of declining productivity growth set forth by Robert Gordon in his new book, *The Rise and Fall of American Growth*. We urge the reader to study this section.

A. Preliminaries

Definition: By the rate of inflation, we simply mean the percentage change in *nominal* terms of the price of some fixed “basket” of consumer goods and services. All prices mentioned below are nominal. The rate of inflation can be measured in two equivalent ways. It can refer to the annual percentage change in the price of the basket. This is the convention we utilize. Or, for longer periods of time, the rate of inflation can refer to the percentage change over x years of an index value of the price level. Typically, the price level of the first year in the sample period is given a score of 100, and the scores in subsequent years refer to the compounding impact of inflation over time. Thus, we could posit a score of 100 for the year 2000 and then compute a score of 116 for 2015. We shall not make use of such indices herein.

Our Fundamental Supply/Demand Principle: As stated above, the fundamental principle we are working with posits that an understanding of the behavior of inflation ultimately factors into the supply curve/demand curve implications of events that are thought to drive inflation, e.g., the proximate events cited above. Quite literally, the price of a good or of a consumption basket can *only* change if its supply and/or demand curve shifts to a new position. This follows directly from the Law of Supply and Demand. Recall that a demand *curve* for a good refers to

the aggregate demand of consumers for that good at each and every price. And likewise for the good's supply curve, which indicates how much producers are willing to supply at each and every price. When market conditions change, it is these *curves* that shift their position. This in turn causes their intersection point (the resulting prices and quantities) to rise or fall.

Goods Price Inflation: The classical law of supply and demand is all that is required to understand price changes in the market for individual goods and services. If there is a seasonal drought, and the production of wheat falls accordingly, then *ceteris paribus* the price of wheat rises due to the backward shift in the supply curve. When this logic is extended to a "basket" of goods and services rather than a single good, matters are more complicated — but not too much so. The principal problem here lies in the issue of "substitution effects."

To see this, suppose oil is included in the consumption basket, and suppose the price of oil rises by 50%. What happens to the inflation rate governing the price of the overall basket? Given the price inelasticity of demand for oil ("I'll pay anything to drive to work and to heat my home"), consumers will have less money with which to purchase the other goods in their consumption basket — assuming they have strict budget constraints. As a result, the demand curves for all items *other* than oil will shift backwards, and all non-oil prices might thus fall by a small amount. When all the dust has settled, it will be the nexus of substitution effects that determines whether the price of the overall basket rises or falls due to the oil shock, and by how much. In general, an oil shock *will* cause higher overall inflation.²

Asset Price Inflation: The normal law of supply and demand does not govern asset prices, which is one reason why there has been so much confusion about, for example, the impact of QE bond purchases on yields. The reason lies in the so-called "stock-flow" complication that arises in the case of asset prices, but not in goods prices. Briefly, consider the strike in gold production at Western Deep Mining in South Africa in the early 1980s. With a significant reduction in "supply" from the strike, one would have thought that — as with our wheat example — the price of gold should have risen. But it fell. That is because the stock of "old gold" held by private investors and central banks is *far larger* than the annual production of "new gold."

² To determine the exact inflationary impact of an oil shock, one needs to solve a general equilibrium model for its Slutsky coefficients, and then to compute the basket-weighted individual goods price changes to arrive at the desired inflation rate of the overall consumption bundle.

What happened to the gold price was that, at the very time the strike cut the production of newly-mined gold, investors' sentiment shifted from worries about sky-high inflation (which had driven the gold price way up) to worries about global recession. The result was a shift in asset preferences out of gold and into other assets, and the price of gold fell significantly despite the situation at Western Deep.

The same story holds true with QE. If the Fed steps up purchases of bonds, then bond prices will rise and yields will fall (helping Main Street) *unless* those investors who hold the largest block of government debt suddenly worry about higher inflation due to fears of Fed "money printing." [The public now holds some 75% of outstanding federal debt.] If this is so, their asset preferences will shift against bonds, and the net effect would be higher not lower yields. Note the irony here. The Fed in acting to lower yields would in fact *cause* yields to rise. The moral of the stock-versus-flow story is that it is always David versus Goliath, where public asset preferences play the role of David and predominate over the Goliath-like eminence of the Fed.

Caveat: As indicated, we shall not discuss asset prices in this analysis. For asset prices do not and should not enter into the subject of "inflation." The job of the Fed since its inception has been to stabilize employment and *goods* prices on Main Street (its "dual mandate"), not asset prices on Wall Street. Furthermore, statistical analysis reveals that these two different types of prices are not correlated. So, Heaven forbid that the Fed should attempt to control *both* types of prices (e.g., "trying to please the financial markets") when changing the Fed funds rate — its primary policy lever.

In the event that asset prices are sharply inflating/deflating, while goods prices are steady, the *Treasury* can target asset prices through *non*-central bank measures such as raising/lowering leverage requirements in the asset markets. [The Fed could also do so.] The need for new such measures is reflected in the growing debate about the use of "macroprudential" policies.

B. Proximate Versus Real Causes of Inflation

Examples of More Obvious Causes: As listed in the introduction, the proximate drivers of inflation include such well-known phenomena as "cost push" shocks like the OPEC oil shocks of the 1970s, "demand pull" shocks such as "guns-and-butter" spending in the Vietnam era, and "wage/price spirals" as in the 1970s. The link between such shocks and shifts in the supply and demand curves for goods and services is pretty clear. But a few points of clarification will help

investors understand the relation between these basic proximate causes of inflation on the one hand, and the actual amount of inflation they generate on the other.

Let us start off with an analysis of the oil shock inflation of the 1970s. Exactly how did this impact the overall inflation rate? What were its “channels of transmission to inflation” as economists would say? It is usually assumed that inflation exploded in the 1970s because oil prices rose from \$3 in 1972 to over \$30/barrel by 1980. But is this the whole story? No it is not. To begin with, consumption basket inflation (e.g., the CPI) need not rise just because a single important price rises a lot. Whether and by how much the basket price will rise (given an oil shock) will depend upon the elasticity of substitution story discussed above.

To understand the true magnitude of the inflation caused by the oil price shock, we need to incorporate what was going on in the US labor market at a time when industrial labor unions were still powerful. Union leaders used the excuse of oil price shocks to demand sharply higher Cost-of-Living Adjustments (COLAs) from management. Given their bargaining power, they won these for their workers. Over time, the ongoing expectations of higher inflation due to oil prices led to still higher wages — which in turn led to still higher inflation which led to demands for even greater COLAs, etc. [Wages are far more important to inflation than oil prices.] It was primarily this “wage/price spiral” that pushed the US inflation rate to 14% by 1981. Soaring oil prices themselves did not do so, as Fed Chairman Paul Volcker took pains to point out.

Thereafter, due to President Reagan’s crushing of the PATCO air traffic controllers’ strike, due to the rise of Chinese competition in the manufacturing sector, and due to the implosion of industrial union power that resulted, there would be no more COLA-driven inflation. Thus, when oil prices exploded eight years ago from \$65 to \$140, there were no COLAs, and inflation rose only briefly before following oil prices back downwards.

There were two other developments that drove US inflation all the way up to 14% in 1981, shocking everyone. *First*, producers were forced to raise their prices quite dramatically given their soaring labor and material costs. *Second*, many argue that the Arthur Burns Fed erred on the side of excess monetary easing in his response to the economic shocks of the first half of the 1970s. Such easing is believed to have accelerated the rise in inflationary expectations already underway. We join with Fed Chairman Paul Volcker (who succeeded Burns) in viewing this account with some skepticism. Hindsight has played an important role in converting many economists to this view. Had it not been for the OPEC shock of 1979 when the Iranian revolution sent oil from \$10 to over \$30 — and inflation soaring — Burns would not have been blamed as much as he subsequently was.

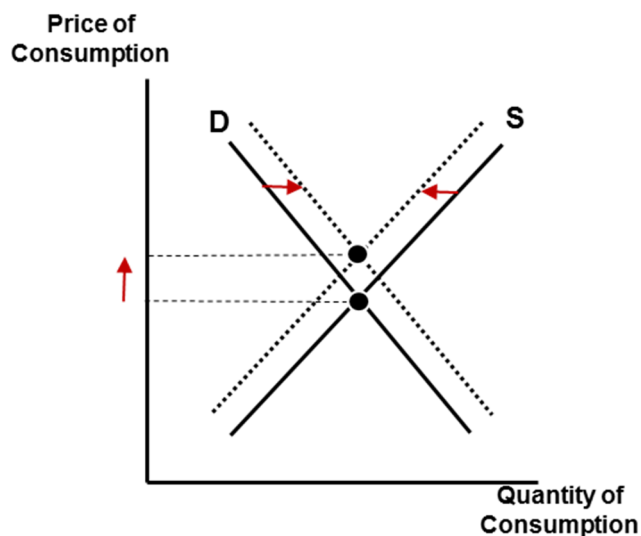
Let us now restate this analysis of inflation more formally in a manner that demonstrates how our Fundamental Principle underlies everything just stated. This principle reminds us that the price of either a particular good or a basket of goods will not change unless there is a shift in the underlying supply and/or demand functions involved. So consider both sides of the market for goods and services:

The Consumption Basket Demand Curve: During the 1970s, consumers had more money in their pockets due to COLA wage adjustments and due to what many believe was excessively easy monetary policy. So did retirees who enjoyed large annual benefit increases. Assuming a fixed savings rate, consumers would thus have more money available with which to demand a greater quantity of goods and services at any given price of such goods than before the advent of COLAs. *This of course is the very definition of an outward shift in the market demand curve for consumption goods.*

The Consumption Basket Supply Curve: On the supply side, OPEC in the 1970s shifted the oil supply curve backwards by monopolistically clamping down on output — the way in which the cartel “raised prices.” That is, at any given level of oil prices, less oil was being supplied than before — *the very definition of a backward shift in the supply curve.* But this was true for not only the oil market, but for many other markets in which petroleum-based products were inputs, e.g., petrochemical products and airlines. The supply curves for their products also shifted backward. As a result, the overall supply curve for consumption shifted backwards.

The Resulting Equilibrium Inflation Rate: As shown in Figure 1, the inflation rate of the consumption basket rose to an unprecedented high because of **(i)** a significant backward shift in numerous supply curves, and **(ii)** a large outward shift in the demand curve for all goods and services. Conversely, during the post-COLA environment starting in the mid-1980s, consumers stopped gaining extra COLA-based income that would have shifted the demand curve outward causing greater inflation. We witnessed this when oil prices rose (briefly) from \$65 to nearly \$140 some eight years ago, and then collapsed. While the inflation rate rose briefly, it followed oil prices right back down. Higher inflationary expectations never became “embedded.”

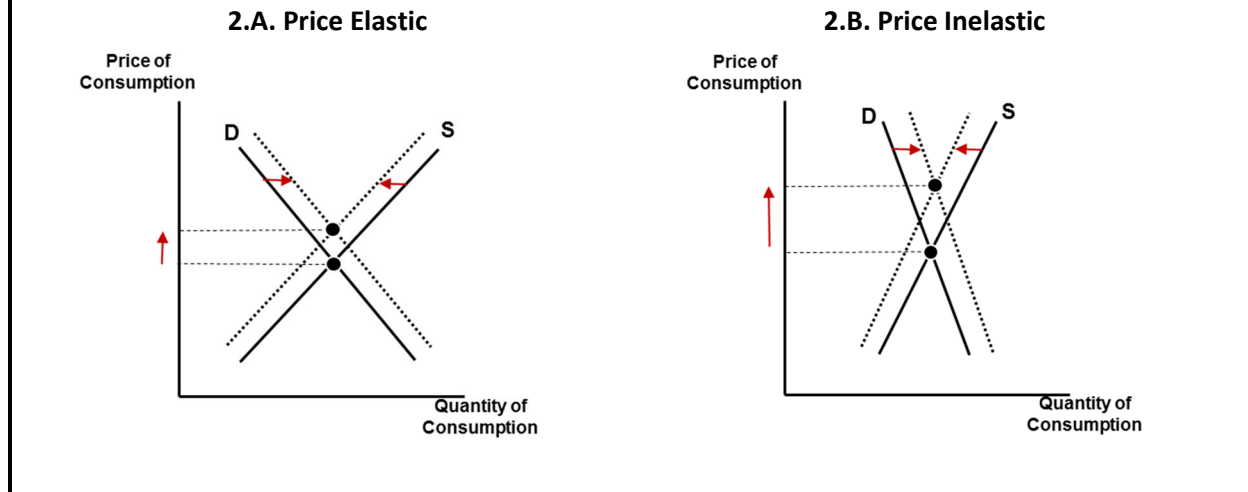
FIGURE 1: The 1965–1980 Era of Rising Inflation



Inflationary pressures were further constrained after 1984 by the lack of further oil price increases that had pushed the supply curve backwards due to ever-higher energy input prices. Additionally, such oil price changes as did occur ceased to impact both economic growth and inflation less than before because the *amount* of energy utilized per unit of GDP dropped some 45% in the thirty years since the height of the OPEC era in the 1970s. Finally, the Volcker Fed pursued a tighter monetary policy than the Burns Fed did in the 1970s. This shifted the demand curve for consumption backwards.

Lessons Drawn from This Analysis: The purpose of the foregoing analysis has been to make crystal clear how inflationary “events” such as oil shocks end up impacting inflation, often in counter-intuitive ways. In particular, the inflation transmission channel of such shocks is through shifts in relevant supply and demand curves — shifts that are not particularly obvious. But the analysis achieves even more. It demonstrates graphically the all-important impact of the *steepness* (elasticity) of both the supply curve and the demand curve on the resulting rate of inflation.

FIGURE 2: ROLE OF SLOPES



To see this, consider Figure 2.B. Here, that the *magnitude* of the outward/backward shifts of the **S** and **D** curves is the same as in Figure 2.A.. However, note that both curves are more vertical (price inelastic). See how the resulting increase in inflation will be *much greater* than that shown in Figure 2.A. In this regard, there is new evidence that both the consumption supply and demand functions are flatter (more price-elastic) than they used to be as the economy shifts evermore to services, and as more and more goods possess substitutes — even oil. This trend should help stabilize the inflation rate in the future.

The moral here is that investors will arrive at very misleading forecasts of future inflation if they fail to carry out a supply/demand curve analysis of the kind sketched above, even if the exercise is quite simplistic.³

³ An economist might object to the need for the proposed “structural” model by turning instead to a reduced form forecasting model wherein inflation is the dependent variable, and inflationary “events” are the independent variables — each weighted by its historical regression coefficient. However, there are serious risks in dispensing with a structural model. For example, only a structural model can incorporate the impact on equilibrium prices and volatility of *slope changes* as seen in Figure 2. These and related issues are discussed in detail in the author’s paper, “Arrow-Bayes Prices: A New Theory of Price Forecasting,” appearing in *Arrow and the Ascent of Modern Economic Theory*, Ed. George Feiwel, MacMillan Press, London, 1987. This paper introduces the most general price-forecasting model yet formulated, namely a model in “stochastic structural form.” It generalizes and extends all classical and Bayesian forecasting models.

Less Obvious Proximate Causes – Productivity Shocks and Monetary Shocks: In the first case, there is an inadequate appreciation of the importance of productivity shocks to inflation. In the case of monetary shocks, much of what is written is either misleading or simply wrong.

Productivity Shocks – and the Phillips Curve Paradox: When productivity increases, producers are able and willing to supply more product than before at any given price for the product. This is, of course, nothing but an outward shift in the supply curve. It is disinflationary. There are other ways of interpreting this. For example, workers can produce more than before at a given wage level, and thus *unit labor costs* drop. But this is the same story with different words. Such shocks are rarely discussed in popular accounts of inflation, partly because productivity growth for the economy as a whole has been quite stable. In Part C below, we shall identify new productivity shocks as a principal reason for the falling inflation rate that we are witnessing throughout the world today.

There is one very good case study of how a productivity shock can reduce inflation, and we witnessed this at work during the 1995–2001 period. Do you recall the Phillips curve, one of the most basic “relationships” in all of macroeconomics? This postulates that, as the rate of unemployment falls, inflation will heat up. Well during the period cited, the second term of the Clinton administration, the US economy boomed due to the largest rise in corporate capital spending since World War II. The unemployment rate fell to 3.8%. Phillips curve logic suggested that inflation would rise significantly. But in fact it fell. This happened because a remarkable internet-driven productivity shock drove productivity growth way up from around 1% to over 4% in the period of 1995–2002. The Phillips curve was thus *inverted* for a few years, to the shock of many economists.

Monetary Shocks – and the Monetarist versus Keynesian “Debate”: It is here that confusion about inflation is greatest. First, recall Milton Friedman’s celebrated claim that “inflation is always and everywhere a monetary phenomenon.” This statement is a tautology that, while true, is utterly useless in providing an understanding of what drives inflation when and where. It is also wrong in that it tells only half the story about inflation. Consider the following two examples to understand this. First, suppose that more money is created, or printed in some meaningful sense of the word “money.” Then as we saw above, the demand curve for consumption will shift outward causing prices to rise, i.e., causing CPI inflation to increase. This is indeed a “monetary” explanation for higher inflation. Second, consider what happens when there is a positive productivity shock: the supply curve for goods and services

shifts outward, the price falls, and thus inflation falls. This is in no way a “monetary” story about inflation.⁴

The reality is that, when Milton Friedman and Anna Schwartz wrote their 1963 classic *A Monetary History of the US* that analyzed inflation during the period 1867–1960, they did not attempt to offer any theoretical explanation of inflation. Their work was strictly empirical, and their principal finding was that inflation and money supply were strongly correlated. Subsequent monetarist economists, mistaking correlation with causation, asserted that one would know the behavior of inflation by knowing in advance the behavior of money supply. This is not the case. Indeed, no sooner was the ink dry in the Friedman-Schwartz book than there was a reversal in the stable “velocity” trend that had held fairly constant in the sample period of their work. Thus the data of the subsequent thirty years told a story very different to theirs.⁵

For those who are not convinced by these comments, please refer to Figure 3 to behold the weak and confusing relationships that exists between money and inflation. Note in particular the *negative* 0.38 correlation between M2 and the CPI during the past twenty-five years in Figure 3.B.

Neo-Keynesians for their part answered Friedman and Schwartz by demonstrating how many variables other than the growth of the money supply could explain inflation. It is widely and incorrectly believed that Friedman opposed the views of neo-Keynesians. He did not. When it came to *explaining* inflation (via a proper supply/demand framework), he agreed that variables other than the growth of the money supply needed to be taken into account. *Thus there never really was the monetarist/Keynesian inflation debate that people assumed to exist.* Monetary considerations do indeed matter, and all that can be said about the Friedman-Schwartz work is that it concentrated on the behavior of the money supply during a period when monetary growth and inflation *were* highly correlated empirically.⁶

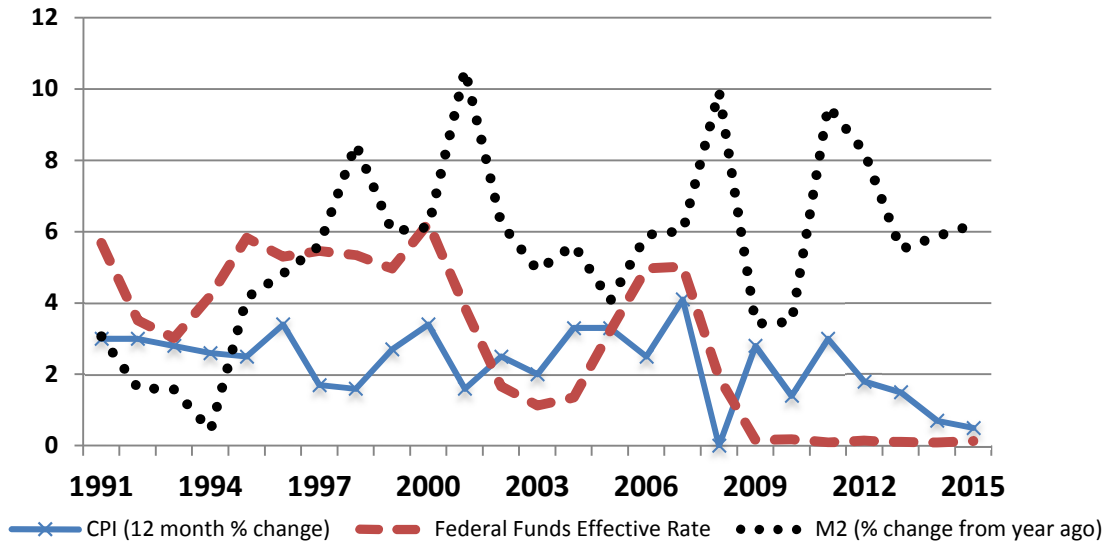
⁴ Milton Friedman would have rejoined, “Yes this is true. However, *should* the Fed tighten sufficiently in response, *then* the demand curve for consumption would shift back in a manner offsetting the outward shift in the supply curve, and inflation would not change.” He is right, of course, but his point is trivial.

⁵ Many complex issues arise here, including the constant reinvention of what types of money should be included in which categories of “money supply.” The important point is that little of this materially impacts how we should think about and forecast inflation proper.

⁶ I am grateful to Professor Benjamin Friedman of Harvard University for emphasizing this point to me. There was, however, a debate between rational expectations versus neo-Keynesian economists as to the causes of inflation during the 1980s. The latter are supposed to have won this debate, one we find quite uninteresting.

FIGURE 3: Data 1990–2015

3.A. Money Supply, CPI, and Federal Funds Rate



3.B. The Resulting Correlations

Correlations 1991 to 2015			
	CPI	Fed Funds	M2
CPI	1.00	0.45	-0.38
Fed Funds		1.00	-0.14
M2			1.00

Sources: BLS, Federal Reserve, Federal Reserve Bank of St. Louis

“Money Printing” and “Helicopter Drop” Confusions: Recall how inflation and gold prices were expected to rise sharply when the US Fed announced its large QE program at the end of 2010. We stressed at that time why this would *not* occur, and how the impact of QE on inflation was being misunderstood. As readers all know by now, the Fed paid for the entire \$3 trillion of securities it brought onto its balance sheet via QE by increasing its reserve account liabilities — dollar for dollar. Its overall balance sheet went up from about \$1 trillion to over \$4 trillion today, as both its assets (bonds) and its liabilities (free bank reserves) increased by over \$3 trillion. Banks for their part were now flush with huge amounts of “free reserves.” As these are

included in the so-called monetary base, the base exploded, stoking understandable fears of future inflation. But as these reserves were never lent out in the form of new loans that increased citizens' bank balances, the money supply (as opposed to the monetary base) did not increase. Americans were not in a borrowing mood after the crash, and credit growth was thus stagnant.

In light of all this, our fundamental supply/demand framework predicted that the CPI would not rise due to QE since the demand curve of citizens for consumption never shifted outward as it would have had citizens chosen to borrow. This would have given them more money to spend. The same was true for two decades in Japan. What we have witnessed is that neither large-scale QE nor rock-bottom short-term interest rates engineered by the Fed succeeded in generating inflation.

Is there any fool-proof way for the central bank to generate inflation? Yes, there is.

A Workable Strategy for Creating Inflation: Recall that there are two liabilities on the balance sheet of the Fed: bank reserves and “cash” (serially numbered Federal Reserve Notes). Suppose the Fed had financed the securities it bought via QE by issuing bank notes rather than bank reserves? Would this have worked? The problem here centers on exactly what this type of “helicopter drop” of money might amount to in practice.

To begin with, the US Fed is not legally allowed to print dollar bills under current law. But that does not mean the government as a whole cannot do so. Indeed, the *Treasury* could undertake several different strategies whereby money would in effect be printed, and inflation would rise. For example, suppose that the Treasury declared that all income tax payers would receive a tax refund of, say, \$3,500 per taxpayer for five consecutive years regardless of their income. This would of course significantly increase the Federal budget deficit, which would mean that the government would have to issue more bonds to finance the larger deficit. The Fed in turn could perfectly well buy in these bonds on the secondary market (monetize the debt). And the Treasury could service the new debt at virtually no cost since, by assumption, inflation and interest rates are near zero.

The result: citizens would have hundreds of billions of new dollars in their bank accounts. Assuming a fixed propensity to consume, they would then have considerably more funds with which to acquire their consumption goods. *That is, there would be a lot more dollars chasing a fixed number of goods. This represents once again an outward shift in the demand curve for consumption, with no adverse supply curve effects.* The result would be an increase in the price

of consumption, and the CPI inflation rate would rise as desired.⁷ Much more extreme forms of money printing can be imagined, but in a nation like the US the strategy we have proposed seems both reasonable and legal. As would be an equivalent strategy of large tax cuts.

C. Today's Disinflation and Prospects for the Future – Implications for GDP Growth and Living Standards –

Why have conventional predictions of inflation failed as much as they have during the past five years? Despite record low interest rates, large fiscal deficits, a five-year economic recovery, and the adoption of QE strategies, the rate of inflation has fallen — and fallen to levels unimaginable only six years ago. More broadly, the disinflation we witness today is in some ways a continuance of a longer-term downward trend in inflation that variables such as lower oil prices, Chinese distress, and a weak recovery do not explain. What is really going on here?

Key Role of Productivity Shocks: We believe that the fundamental driver of falling inflation is the complex set of productivity shocks stemming from the Digital Revolution. From the standpoint of our supply/demand principle, this outward shift in the supply curve of goods and services *complements* the standard story about weak demand (“secular stagnation”); the latter can be thought of as a *slowing* in the outward shift of the demand curve. All that lower inflation requires is that the supply curve shifts outward *faster* than the demand curve does. The demand curve itself need not shift backward.⁸

Role of Adverse Incentive Shocks: The outward shift in the supply curve is not only due to positive productivity shocks, but also to adverse incentive structures and government policies in Europe, China and Japan. These policies have brought about an *overproduction* of everything from autos, to widgets, to minerals. Many European governments and especially the Chinese government pay producers who ought to close down to stay open and keep producing goods

⁷ We ignore here the possibility of higher *bond* yields due to increased inflation premia caused by heightened fears of “monetization and inflation” on the part of bondholders. Higher yields could of course constrain the growth of consumer spending.

⁸ In the author’s 2010 book *American Gridlock*, the crisis in the US healthcare system was analyzed along similar lines: the supply curve of health services is shifting outward much slower than the demand curve is. The result will be soaring national expenditures on healthcare in the long run. A solution to the entire crisis lies in adopting measures that would reverse this situation. Should S shift outward faster than D, not only is rationing eliminated, *but total national expenditure on healthcare as a share of GDP peaks and then drops way back down*. Indeed, the total expenditure function becomes a downward-sloping parabola over time, as was proven formally in Appendix B of the book. Incomprehensibly, Obamacare was altogether silent on the supply side of the market, as was documented in Appendix A.

that make no economic sense. The resulting glut represents an additional outward shift in the global supply curve of goods and services, one that further represses inflation.

Looking Forward: In the US, the slide in the unemployment rate is slowly causing US inflation to rise a bit, or at least to stop falling. The US may thus escape outright deflation and negative interest rates. Yet rising wages will continue to be offset in the inflation calculus by higher productivity growth (properly measured), and by today's global production glut. Nations suffering from ongoing unemployment will continue to face disinflation, or worse. There is little that central banks alone can do about this.

D. The True Interrelationships Between Inflation, Productivity Growth, and GDP Growth

In our recent 2015 *PROFILE, Resolving the US Productivity Paradox*, we defended our view that neither real GDP growth nor productivity growth has slowed during the past half century, contrary to the trend revealed in the official data. Since this essay is about inflation, and since the rate of inflation is central to these arguments, we now briefly revisit them. In doing so, review three altogether different “proofs” that inflation and productivity growth have been significantly mismeasured. Our analysis here directly refutes the argument of declining growth and productivity set forth by Robert Gordon in his new book, “The Rise and Fall of American Growth.”

We first showed that, when appropriate downward adjustments are made to official data covering the past two decades, neither productivity nor economic growth has slowed. This becomes clear when the official data are adjusted in two different ways. *First*, there is the need to lower the measured inflation rate by at least 1.0% to reflect the huge improvements in the quality of goods and services (think color televisions) that the Bureau of Labor Statistics admits it has not been able to incorporate into the official inflation and real growth statistics.

The resulting lower inflation rate over the past two decades will of course raise both the annual productivity and GDP growth numbers by 1.0% each, *by definition*. It is very important here to remember the definition of productivity growth as the change in *real* GDP growth minus the

increase in the workforce. Holding the latter constant, if inflation is *exaggerated* by *x%*, then productivity growth and real GDP will both be *understated* by exactly *x%* on the downside.⁹

Second, there is the new problem of “free goods” such as smartphone apps like UBER and GPS, and the related issue of ever-cheaper goods. The failure of official statistics to include these goods has depressed measured GDP and productivity growth by up to 0.75% annually (an MIT estimate). This is on top of the failure to account for myriad improvements in product quality cited above.

All of this suggests that both real growth and productivity growth have been mismeasured by $1.0\% + 0.75\% = 1.75\%$ on the downside during the past two decades, and probably at an accelerating rate. Were the official data amended in this manner, we obtain a very interesting result: the alleged 50% slowdown in real GDP growth and in productivity growth during the past half century was illusory. For example, the alleged decline of the 3.6% average annual US growth rate of the 1950–1980 era to 1.8% growth during the 2001–2015 era never occurred. It has been an illusory artifact of poor data. The same is true of productivity growth.

We also presented a second and wholly new justification for our view that productivity growth did not slow down. The logic here is obverse to that just above. We noted that, if living standards have in fact kept rising at the same rate as they used to — and we claim they have been — then productivity growth *could not* have slowed down. For only productivity growth can explain increases in living standards: the two numbers must be the same. *Working backwards from the truth about living standard increases, and recalling the precise definition of productivity growth, inflation therefore has to have been mismeasured and exaggerated.*

In this case, it is the proper measurement of living standards that leads us to our conclusion that productivity growth did not slow contrary to what the official data say. This differs from the logic of our first analysis where we claimed that an exaggeration of inflation in the official data arithmetically implied that productivity growth was higher than captured in the official data. The difference in logic in these two analyses is subtle. A footnote below summarizes this

⁹ The National Bureau of Economic Research in Cambridge has finally addressed these issues, along with those in the next paragraph. See the excellent new paper “Measuring the Economy of the 21st Century” by Charles Hulten, NBER report 2015 No. 4.

somewhat complex argument in more depth for the interested reader. We also review how changes in living standards *should* be measured.¹⁰

Finally, in our recent Memo on Global Turbulence, we presented a *third* justification for our view that the official data must be wrong. We noted that, if real growth really had fallen in half during the past fifty years, then the equilibrium unemployment rate in the US would have to have risen from 5% to say 7%. This happened in Europe where policies generating “Eurosclerosis” did retard the growth rate, driving the equilibrium unemployment rate at least 2.5% higher. But this did not happen in the US.

In a lead article on this issue in the *New York Times* on Monday January 18, Torsten Slok (chief international economist of Deutsche Bank Securities) put it well: “It is a real mystery how you can have nearly 300,000 new jobs created in December with the economy only growing by 1% or less.” The explanations offered by experts interviewed for this article center around the belief that recent changes in the economy — many not captured in the data — have caused GDP growth to be understated. These changes stem from the rapid growth of the service sector, and the mismeasurement of its output.

A Thought Experiment Prefiguring a Disinflationary Future: Since we believe these anti-inflationary developments will not cease soon, let us explain via a *Gedankenexperiment* what could really be going on, even if we are unaware of it.

¹⁰ Consider average workers whose officially measured real wages have remained “stagnant” for the past two decades, as the official data suggest they have. Now suppose that we correctly measure the change in their living standards—not their wages. This is done by assessing the contrast between the pleasure (utility) they receive from their *current* consumption bundle versus their *former* bundle two decades ago. And suppose they prefer their current bundle by 35%, i.e., their living standards have increased by 35% as revealed by their own answers to proper questions. The only way this can have happened is that new and/or better goods could be purchased with their same wages, or else that goods that have not improved (wheat) now cost less than before. That is to say, the only explanation is a cumulative 35% growth in productivity in two decades. This follows from the reality that *only* an increase in productivity growth could make possible this measured growth in living standards, given our assumption of constant wages. If the official data on productivity growth do *not* show this cumulative 35% increase, as they do not, then they have *necessarily* been mismeasured. The key insight here is that the correct measure of changes in living standards is totally *independent* of any official data on GDP and productivity growth, and whatever living standards have done must mirror what productivity has done. All this was discussed in detail in our 2015 **PROFILE** “Resolving the Productivity Paradox,” and to lesser extent in the Hulten NBER study cited just above.

Suppose a series of extreme technological shocks occur over the next ten years, and that these cut in half the cost of making all goods. Let all other things remain equal. Then what happens to inflation, to growth, and to living standards? For simplicity, assume that the only “product” consumed is a fixed consumption basket. Also assume that no new goods or goods of superior quality are introduced. What would result?

To begin with, note that nominal GDP will fall in half. This is because nominal GDP is nothing more than the dollar value of output. If the quantity of baskets produced does not change, but the price of each basket falls 50%, then measured $P \times Q = \text{GDP}$ falls in half. Note we are not talking about the growth rate of GDP, but about the size of GDP itself. But wait: if we assume that labor’s share of National Income remains constant at, say, 65%, then workers’ incomes will also fall in half along with GDP. [Recall here that GDP equals National Income by accounting identity.]

When wages and prices fall in tandem, we have what is called “homogeneous deflation.” Note that living standards do not change at all since workers consume the same amount as before. Additionally, if there is ongoing productivity growth, living standards will continue to rise.

Could we be heading towards an economic environment resembling this example? After all, measured GDP growth is slow, wages are stagnant, and we read daily of ever-cheaper goods and services. If so, what damage could be done looking forward? On the surface, homogeneous inflation or deflation will not matter to citizens to the extent that living standards do not fall. Yet there is a much deeper problem: assuming that consumers carry large amounts of fixed nominal debt as they now do, the collapse of nominal income would make it impossible for them to service their debt. Total economic collapse could result. This is why we may all soon be reading about *workable monetary strategies* for stimulating inflation, and why we have written about it for three years.

To sum up, were national statistics to be corrected in many nations as they need to be, then much of the world will have witnessed a fall in inflation even greater than people believe — and for reasons far transcending lower oil prices and sluggish global growth. This lower inflation has been gathering steam for three decades. To be sure, there are sectors whose supply curves are not shifting outward. Education and medicine come to mind, although recent research suggests that, when adjusted for the increasing quality of service and the rising number of cures, health expenditures have not risen nearly as fast in real terms as the official data suggest. In the dismal

case of education, a rediscovery of the effectiveness of learning-by-doing apprenticeships may betoken future progress.

Finally, the Digital Revolution is not alone in fostering significant productivity growth. There are comparable revolutions occurring in material science, in 3D-printing, and in medicine. Does the best perhaps lie ahead — assuming that the central banks act to forestall deflation?

E. Conclusion

We have attempted to define the term inflation (using the CPI as our case study), to relate its behavior to the fundamental law of supply and demand, and to expose any number of myths and half-truths concerning what has happened and what will happen to inflation in the future. We have also highlighted reasons why actual *deflation* might take hold, and what central banks could do to prevent this above and beyond today's strategies of QE and zero-bound interest rates. We hope this has been helpful to investors who should give much more thought to the prospects of inflation than they probably have.