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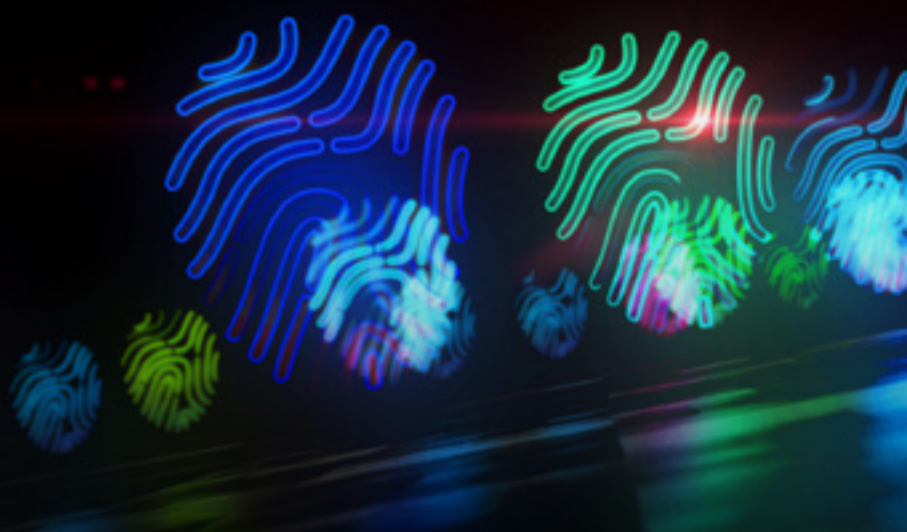
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THE CAPCO INSTITUTE
JOURNAL
OF FINANCIAL TRANSFORMATION

RISKS

Economic policy in a world where inflation, production, and productivity are mismeasured and misleading, and where macro-models cannot work effectively

STEVEN W. KOHLHAGEN | D. SYKES WILFORD



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DEAR READER,

Welcome to edition 54 of the Capco Institute Journal of Financial Transformation.

In this edition we explore recent transformative developments in the insurance industry, through Capco's Global Insurance Survey of consumers in 13 key markets, which highlights that the future of insurance will be personalized, digitalized, and connected. Other important papers cover topics high on global corporate and political agendas, from ESG and climate change to artificial intelligence and regulation.

The insurance industry has been undergoing transformation in recent years, with insurers responding to the needs and expectation of tomorrow's customers, for products that were tailored, flexible, and available anytime, anyplace, and at a competitive price.

COVID-19 has accelerated such change, forcing insurers to immediately implement programs to ensure they can continue selling their products and services in digital environments without face-to-face interaction. New entrants have also spurred innovation, and are reshaping the competitive landscape, through digital transformation.

The contributions in this edition come from a range of world-class experts across industry and academia in our continued effort to curate the very best expertise, independent thinking and strategic insight for a future-focused financial services sector.

As ever, I hope you find the latest edition of the Capco Journal to be engaging and informative.

Thank you to all our contributors and thank you for reading.

A handwritten signature in black ink, appearing to read 'Lance Levy', with a stylized, flowing script.

Lance Levy, Capco CEO

ECONOMIC POLICY IN A WORLD WHERE INFLATION, PRODUCTION, AND PRODUCTIVITY ARE Mismeasured AND MISLEADING, AND WHERE MACRO-MODELS CANNOT WORK EFFECTIVELY

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ABSTRACT

Mismeasured GDP is now the norm. In a period when policy implications for inflation, new structures in monetary and fiscal policies, and the efficacy of historical models of policy are being argued, with hyperbole, it is time to move away from the narrow, typical GDP-centered economic analysis to look holistically at the measurement problem. The COVID-19 shock has led to multiple mini-shocks and numerous policy actions while at the same time the Third (and maybe Fourth via AI) Industrial Revolution is taking place. Responses to shocks are often driven by historical measures of GDP and the ancillary issues of inflation, productivity, and economic wellbeing. Unfortunately, they are likely based upon incorrect, badly measured data. This paper discusses these measures, the problems associated with them, and the implications arising from mismeasurement. It points out that while macroeconomic models are calculus-based and can, thus, be used effectively to analyze and predict what will happen to, say, GDP if there is a small change in an independent variable, they are absolutely ineffective in predicting what will happen if there is a massive pandemic or a series of massive exogenous government actions. It further suggests that the actual real economic output being experienced in the United States and the advanced economies is terribly underestimated and concludes with policy and forecasting dilemmas created by the lack of reliable measures for output, inflation, productivity, the actual state of the economy and the ineffective forecasting ability of macroeconomic models in a period of massive shocks.

1. INTRODUCTION

We believe that current economic data – such as inflation, the size of the economy, and productivity growth – are materially mismeasured. Additionally, while current calculus-based macroeconomic models were developed to forecast the effects of small changes in independent variables on the economy, the exogenous shocks we have witnessed since February 2020 have been massive, and, accordingly, do not lend themselves to forecasting with current economic

models. Not surprisingly, we believe that the implications for current policy debates are very significant. We are not alone in this belief. There are other economists and government statisticians who are also concerned about the public policy ramifications of these miscalculations, but sadly it is not as yet part of the public discussion or knowledge base.

What are the implications for government monetary and fiscal policy if actual inflation is materially lower than is being reported? If the actual values of production and consumption

and productivity growth are greater than is being measured? If the actual debt to properly measured and adjusted GDP is not at its highest level ever, but actually at levels that were considered normal a generation ago? If macroeconomic models are not effective for economic forecasting?

Before we try to answer these questions, let us return to the beginning:

In the 15th Century, the rulers, kings, emperors, etc. had created systems where governments took whatever they wanted from their people in exchange for protecting them from their fellow citizens and “the other” rulers, kings, and emperors. There was no official economic data. The rulers did not need to know what GDP or inflation was in order to determine public policy. They just took what they wanted until they no longer could – taxes in the form of money were just one example of what they took.

Fast forward 500 years through countless economic and technological innovations, wars, massacres, plunders, pandemics, plagues, different forms of financial and economic systems, governments, and rulers to, say, 1945. The U.S. had been created and evolved into the largest, most powerful country in history. Founded on principles of democracy, regulated capitalism, and no taxation without representation, it had weathered a horrendous civil war, continuous episodes of other wars, a great depression, and several financial panics. It created and financed the most powerful army in the world. It financed this and other government activities through income and consumption taxes, and, inevitably, borrowing, following the British model of the Napoleonic Wars, all with at least the tacit approval of its citizens.

And economists had now developed ways of measuring the economic benefits from the relatively free market, regulated capitalist system that had evolved. The staggering results of two industrial revolutions created the goods we consumed and used to make other goods, and in this world, economists set up a system for counting and measuring output, GDP. With these measures, economic policies designed to meet the needs of “the people” could be managed by “the rulers”, now the government.

Adam Smith (1776) would have been proud that the world had adopted a measurement of a wealth generation system that fit nicely with his view of the world, recognizing what the actual “wealth of nations” was and was not. And, of course, due to the Enlightenment and the subsequent Industrial Revolution, economists could measure how much new production of goods and services was being created in a fairly efficient

manner. Yes, there would be the inability to measure the output of some activities, for example “stay-at-home moms” or the “underground economy”, however, it was felt that these could be considered constants or only analyzed periodically. As long as there were markets to observe transactions then Price times Quantity (PQ) could be observed and counted, documented, and measured. Governments, thanks to professional economists, now had the tools they needed to determine effective policies, including taxation and many others.

“
*Something is happening here, and
you don't know what it is, do you
Mr. Jones?* – BOB DYLAN

”

Largely ignored in all this was what the creators of the measure of GDP had originally cautioned about, that the “welfare of a nation can scarcely be inferred from a measurement of national income as defined (by the GDP)” [Kuznets (1934)]. Like all tools, economic data, to be effective, had to be defined, measured, and used responsibly and with care.

Governments today provide a vast array of social services to their citizens, including national defense, infrastructure development and maintenance, healthcare, social welfare, the aforementioned economic data, education, housing support, etc. A similarly vast array of taxes and, of course, borrowing is used to finance these activities. In the fifty years after 1945, the world economies grew at what had come to be considered, with the usual variances of ups and downs, a “normal” pace. This was accompanied with what came to be accepted as normal productivity growth, normal tax rates, normal budget deficits, etc. For the measurement of economic output, PQ, GDP seemed certainly adequate, if not perfect. And with our ability to observe price movements, one could observe the growth of Q, recognizing that having Q (quantity of goods and services) grow was a major, if not a main consideration. And as Q grew, it was clear that, on average, we were becoming wealthier, which could be observed by looking at measured real GDP growth rates (where real denotes adjusted for measured inflation). Between 1945 and 1995, U.S. real GDP grew four and a half times, a 3.1% annual rate of growth. And on a per capita basis, it grew a little more than two and a half times, nearly 1.8% a year.

But in the 1970s, we entered the Third Industrial Revolution, the computer age, with a vengeance. Change began to happen much faster (if not always adequately measured). The world now enjoys staggering increases in productivity that we will argue are not being correctly measured (as “the other” Marx, Groucho, famously asked, unintentionally playing the role of government economist: “Are you going to believe me or your lying eyes?”). Consumer benefits in the form of improvements in product quality, innovation, and new products expanded rapidly, increasing the wellbeing of citizens that is simply not being fully measured and reported.

We are now well into that Third Industrial Revolution and perhaps just entering the Fourth if that is where AI takes us. One of the public goods that governments should and do provide is economic data. Presumably accurate data. But, as Robert Solow noted as early as 1987, “You can see the computer age everywhere but in the productivity statistics.” Increasingly, it is clear that some of the data the government is providing, and that policy-makers and forecasters are relying on, is quite clearly wrong. And much other data is very misleading. This is not because of any malfeasance or lack of professional good intentions, but because it is hard to accurately measure what is happening. And happening so fast.

The fault for a lack of public understanding does not lie completely with government statisticians and bureaucrats. Only a small part of the economics profession is aware of this problem, and, with a few unheralded exceptions, they are not calling it out. Most private citizens and some public policymakers are operating under the delusion that the data they are seeing continue to give an accurate description of our economy. But they don’t.

Thus, current “rulers” are making policy decisions partially blind. They are being forced to try to manage production, inflation, and social and economic progress without even knowing what the current levels are, let alone how their policies will affect actual future levels. Needless to say, forecasters are also in the dark, making guesses about data that are incorrect when reported. So, what is one actually forecasting when arguing that real GDP will rise by X? The number reported will be inaccurate.

2. MEASURED INFLATION IS BEING OVERSTATED

The easiest place to begin analyzing these issues is to look at the difference between actual inflation and the inflation that is measured (and reported). Actual inflation, to be properly measured and useful, needs to be adjusted to reflect quality changes and the introduction of new products. This is very hard to do, and, as a result, actual inflation is lower than what is being measured and reported.

As early as 1996, the Boskin Commission reported that actual inflation had historically been lower than what had been reported by 1.3% per annum, and that it was, to highlight it, still 1.1% in 1996 [Boskin et. al (1996)]. Subsequent literature mostly agrees that it is high by close to 1.0% per annum Moulton (2018) made several suggestions to the Bureau of Labor Statistics (BLS) and Bureau of Economic Analysis (BEA) on how to best deal with the continuing problems going forward. He cited in particular a need for better accounting for globalization and, still, a way to deal more effectively with measuring new and outdated products. We believe that the greater and faster innovation and new product development are, the more reported inflation will overstate actual inflation, as statisticians and economists struggle to keep up.

Measured U.S. inflation has been stubbornly and surprisingly low since the early 1980s, certainly relative to the expectations of many, if not most, economists, market forecasters, and central banks. The long-term downward trend in interest rates reflects this despite the fact that many experts and policymakers were forecasting the opposite for much of the forty-year period. Among the explanations for this continuous forecasting error are the mismeasurements of inflation and production due to the pace of product innovation, the growing mismeasurement of economic wellbeing (including consumer surplus), and the openness of the economy.

It should be stated that it is easy to measure a manufactured good’s sale price, the price of a typical food basket, the number of cars, the number of phones sold, the accounts of electrical or phone connections, or the money spent on utilities. It is very easy to measure items if the only change is price. Significant measurement difficulty is introduced with quality improvements and new products. We know cars are better; we know medicine/healthcare is better; we do not know if education is better; we know that clothes are more plentiful, but better?

As a simple comparison, one product the author purchased 10 years ago for approximately \$1,000 is now available for about half the cost – replacement product is the same – and should show up as a negative in calculations for inflation. However, the newer updated version, which is much more efficient and does a better job, costs, yes, about \$1,000. So, for that service in general no change in the price is likely registered. The quality improvement is large.

It is simply very difficult to measure the benefit of a better product. Over the past 20 to 30 years, greater proportions of what we use comes from technology. In 1975, the price of long-distance calls was not zero. Today, thanks to technology, per capita long-distance calls, at a price of zero, are multiple times as frequent as before. We do not measure that increase in Q (quantity of goods and services) or in the Consumer Price Index (CPI) for the simple reason that its price became zero. And, of course, this challenge is increasing at a faster and faster pace with the advent of the digital economy, smart phones, and the internet. As is, therefore, the over-measurement of inflation.

One of the interesting results of this overstatement is that consumers, investors, and public policymakers, expecting interest rates to keep pace with measured inflation, remain puzzled about why interest rates stay so stubbornly low. Many remain convinced they will go much higher. But most likely, the market has this right – interest rates are not too low. They are where they should be with properly measured, actual inflation being lower than what is being reported. The level of interest rates reflects real rates of return that seem sensible when one realizes that reported data overstate actual inflation.

3. PRODUCTION, PRODUCTIVITY GROWTH, AND CONSUMPTION ARE GREATER THAN REPORTED

In all industrial revolutions, production, innovation, and both new consumption products and new production input products grow much more than long-term historical averages. The ability of economists to keep up with how to measure the value of these newly created, produced, and consumed new products, and, especially, the value of the associated quality changes, has been understandably inadequate. This has been especially difficult in this Third Industrial Revolution, the newly developing digital economy, where so many products are free to the consumer. This inability is not because economists are not capable and/or not trying, but because it is very hard,

possibly impossible, to fully measure these phenomena. Moulton (2018) urged more work in these very areas at the Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis (BEA) to get a more accurate measure of actual inflation. But the problem exists in measuring the size of the economy as well.

As a result, we believe that reported, measured production and consumption levels and real growth rates are lower than actual values. And even lower still than the value to individuals and society. That is, our current measures understate both the growth and health of the economy as a whole. This is especially apparent when examining the growth in value to consumers, both individually and collectively. In fact, as we will discuss, we believe that the underestimation, non-recognition, and non-reporting of consumer welfare is by far the most mismeasured of economic data. It is, arguably, not measured at all.

The best place to start may be that we know, as a profession, that productivity is being mis-measured; it is much higher than reported. And, whereas there is an increasing amount of academic work on this, its existence is not yet fully visible in the public sector [see work by Erik Brynjolfsson and Oh (2012), Groshen et al. (2017)].

The simplest way to see this (but it is only one of a number of contributing factors) is to start from the fact that productivity is defined to be GDP/hours worked. As mentioned earlier, GDP, as it was designed to do, measures only total purchased output in an economy. It is increasingly not an appropriate measure of the total benefits of production or the wellbeingness of an economy, especially in the digital age with many valuable products available for free. Accordingly, going forward we will call GDP* the appropriate, currently unmeasured, more complete size/benefits of the economy (with apologies to Brynjolfsson et. al. at the Stanford Digital Economy Lab who are making great progress analyzing and measuring individual examples of the concept, calling it “GDP-B”).

Thus, using GDP rather than GDP* in the numerator of measured productivity significantly understates actual productivity in the economy. No thoughtful observer believes that U.S. productivity is on the order of the 0.7% that is being measured.

It is close to preposterous to claim, for example, that Google workers, because much of their product sells for nothing,

have zero, or close to zero, in the numerator of their measure of productivity, and are, thus, essentially measured as unproductive workers in our economic data. This reduces the overall measured and reported productivity in the economy relative to actual productivity. And thus, with just this one illustrative example, we know that productivity is materially much higher than is being measured. And increasingly so. (NOTE: the careful reader may ask at this point, but what of the real value to consumers and the economy/society of goods sold for close to or actually zero? Precisely. Now we begin to see the dimensions of the issue.)

Search costs have collapsed. How does one easily count the value of reduced search costs? Time searching for information has typically not been estimated and except for the creation of the printing press and the massive roll out of libraries little has changed for long periods of time. In this new era, however, a radical change has occurred and needs to somehow be measured. To be fair, government statisticians, while understandably always chasing technological change from behind, are working to catch up. They do recognize the issue. In the case of Google, for example, they are striving to use advertising revenue and profits as proxies for correctly measured GDP*. It seems to us that, while credible and important, these efforts are likely to continue to understate actual GDP*.

Additionally, to this mismeasured value discussion, note that Google has become a word. It connotes little search time and cheap access to information. Search time in an economy is a real cost, but often measured in theory more than reality. With respect to information, search time has collapsed, not just fallen. How do we measure this value to the consumer? We do not. How do we count this value in GDP? We do not.

If you Google a problem and repair it yourself, there is no measure of the benefit. If you hire a plumber or electrician to repair the problem then there is a measure of output measured in GDP. These inconsistencies and information cost collapses are increasingly important, and at faster and faster rates. Search cost collapses can be seen in more practical ways. As a current example, due to the internet and the digital universe, many skilled workers have been able to weather the COVID-19 shutdowns simply by working from home.

Zoom is a perfect example of how something basically free, or not fully measured, is changing the economy. Is the use of Zoom a productivity enhancement? Again, if P (price) is zero,

then so is PQ. Our standard measurements simply do not work for the digital economy proportion of our total economy. We should add here that it is obviously difficult to measure Q if there is no P to observe (as noted previously, economists wrestled with this for decades with the existence of stay-at-home, unpaid moms. Zero production? Zero productivity? Really?).

What would the search cost for a new job have been if the pandemic shutdown and new products did not allow for many individuals to continue to work remotely? What would the level of unemployment have been without these digital aids? The answers are obvious in direction, but, importantly, not in magnitude. And not measured adequately by economists or policymakers. Interestingly, it seems that the recession in the U.S. in 2020 lasted only two months; adjustments due to better technology and lower costs of information allowed what could have been catastrophic effects on the economy to be short-lived. Even with all the negatively impacted segments of the economy reeling, the overall economy adjusted and began to recover quickly.

Consumers may not need to pay the plumber as often, and also do not have to work through the files or the paper manuals at a library to find the key to fixing the problem. Time has economic value that should be measured. Due to such unmeasured reduced search costs, actual productivity has risen by more than measured productivity. Lower search costs generate better resource allocation and investment efficiency, benefits not fully capturable in GDP data. The recent COVID-19-driven recession is just one example of the speed of adjustment possible with low search costs due to technological advances.

Additionally, these mismeasurements of real GDP growth and productivity gains leave us with a measure of the deflator that is too high. Thus, reinforcing the belief that measured inflation is higher than actual inflation. Asked how long before we can expect to get a usefully more correct measure of productivity given ongoing work by both academic and government economists, Goshen alarmingly replied “twenty years.”

4. CONSUMER SURPLUS

The incomplete picture painted by overstated inflation and understated production and productivity growth is only the start. The economic concept of consumer surplus also informs our knowledge of the wellbeingness of the economy compared to measured GDP. Yet, economists do not use it in

analyzing our economy. Consumer surplus is the benefit to a consumer of buying something whose price is less than the consumer would have been willing to pay. Without going into it technically, as a group, consumers in a society clearly derive very large unmeasured benefits from buying products at less than some of them would have been willing to pay. Consumer surplus may not be precisely measurable, but we know a great deal about it directionally.

The ongoing work on valuing society's benefits from free consumer goods is very helpful here [again, see the work of Brynjolfsson (2018) and his Stanford Digital Economy Lab among others], since almost all consumers pay much less for goods than what they actually are willing to pay. What would they be willing to pay for free goods? But most importantly, we know that the extremely wealthy, the merely wealthy, and the merely well off all get more satisfaction than do subsistence level consumers from being able to buy goods at prices considerably below what they would be willing to pay. We do not need to know how much Bill Gates, Warren Buffett, or even we would pay for an iPhone or an iPad or even a cheeseburger to know our derived benefits are much greater than those for the purchaser paying their just barely affordable amount.

In a society where everybody had identical income and wealth, consumer surplus would largely measure differences in consumer preferences. Chocoholics, for example, because

the market price would be less than they were willing to pay for a chocolate bar, would get more satisfaction from it than those who were only willing to pay the market price. In a more inegalitarian society, however, consumer surplus is considerably higher. The very wealthy or merely wealthy can derive multiples more consumer satisfaction from their consumption than the poorer members of their society. The previous examples of iPads and iPhones are very illustrative. Many citizens cannot afford them at all, while many would be willing to pay multiples of the market value.

How do we get our arms around the magnitude of consumer surplus of new technological products as it relates to information and consumption? Since there is currently such a massive change in relative costs of both delivered products and information, the answer is: not easily. And isn't one of the reasons to get inflation and GDP calculations correct to be able to better consider consumer surplus?

5. FIRST ATTEMPT AT ESTIMATING MAGNITUDE: THE VELOCITY CONUNDRUM

There are many ways that the public dialogue among policymakers, many journalists, economists, and the public is being misled by the understandably reasonable assumption that inflation and production are being measured correctly. Analyses of the reported dramatic decline in the velocity



of money is a great case in point and leads directly to our attempted approximation of the magnitude of GDP* mismeasurements. As put to one of the authors recently, “when will the velocity of money once again be normal?”

The velocity of money is the rate at which money is exchanged in an economy. It is the size of the total economy divided by the amount of money in the system, the number of times that money moves from one entity to another, or how much a unit of currency is used in a given period of time. Simply put, it is the rate at which consumers and businesses in an economy collectively spend money.

Shooting in the dark to try to understand why the velocity of money seems to be declining so rapidly while assuming that both inflation and GDP* are being measured correctly, has led to long discussions about how money is used, what substitutes there are, etc. While those discussions may be interesting, in our opinion they do not lead to the real, revealing answer.

If we are mismeasuring the size of the economy because we mismeasure both price changes and quantity changes, could this explain the decline in velocity? Could the observation of declining velocity thus be spurious? Perhaps velocity is not declining so rapidly. Perhaps it is not declining at all. Perhaps the measurement is merely the result of calculating velocity with mismeasured P and Q. Perhaps declining velocity is, at least partly, “fake news”.

First, consider M1¹ velocity, which reportedly has fallen off a cliff during the recent past. From a high of 10.6 in 2008 it fell to 1.22 in Q4-2020. A cleaner comparison for our purposes would be to eliminate the unknown temporary effect of COVID-19, and only include the period to Q1-2020 when it had only fallen in half, to 5.25. We should note, however, that what drove it so low by the end of 2020 is at

least partly the phenomenon that we believe is contributing to the mismeasurement of GDP. Buying habits are changing dramatically and the digital economy roared during a period when much of the rest was so negatively impacted.

Anderson et al. (2017) provide a discussion and a picture of the debates on changes in velocity. Using their M2² measure of money, velocity of money was relatively stable, bouncing up and down between 1.8 and 1.9 till 1990 when it began to rise, hitting a high of 2.1+ in the mid-1990s. From that point it has been on a downward trajectory, falling to 1.4 before the recent collapse to just above 1.

But, what are the implications if we assume that, with correctly measured inflation and GDP*, actual velocity, rather than declining as calculated, was constant from 1995 to now? If that was the case, what is the resulting implied mismeasurement of GDP*? Examining the data closely, assuming a constant velocity of money and a, say, 1% per annum overmeasurement of inflation, we believe that the magnitude of error for estimating GDP* growth to be somewhere between 50 and 100% since 1995 (between 1.6% and 2.8% per annum).

The implications of this view of velocity generate an interesting starting point for determining the possible mismeasurement of GDP*. And note, if we chose M1 velocity the results would be even larger. In short, we believe it is partly mismeasured inflation and largely mismeasured GDP* that is leading us to wrongly conclude that the velocity of money is falling dramatically.

6. REINFORCING OBSERVATIONS

What has happened to calculated velocity in other countries reinforces our view that we are not measuring actual output or inflation correctly. M3³ velocity for the U.K. fell from well over

¹ “Before May 2020, M1 consists of (1) currency outside the U.S. Treasury, Federal Reserve Banks, and the vaults of depository institutions; (2) demand deposits at commercial banks (excluding those amounts held by depository institutions, the U.S. government, and foreign banks and official institutions) less cash items in the process of collection and Federal Reserve float; and (3) other checkable deposits (OCDs), consisting of negotiable order of withdrawal, or NOW, and automatic transfer service, or ATS, accounts at depository institutions, share draft accounts at credit unions, and demand deposits at thrift institutions. Beginning May 2020, M1 consists of (1) currency outside the U.S. Treasury, Federal Reserve Banks, and the vaults of depository institutions; (2) demand deposits at commercial banks (excluding those amounts held by depository institutions, the U.S. government, and foreign banks and official institutions) less cash items in the process of collection and Federal Reserve float; and (3) other liquid deposits, consisting of OCDs and savings deposits (including money market deposit accounts). Seasonally adjusted M1 is constructed by summing currency, demand deposits, and OCDs (before May 2020) or other liquid deposits (beginning May 2020), each seasonally adjusted separately.” The Board of Governors of the Federal Reserve System, <https://bit.ly/37oQU8Y>

² “Before May 2020, M2 consists of M1 plus (1) savings deposits (including money market deposit accounts); (2) small-denomination time deposits (time deposits in amounts of less than \$100,000) less individual retirement account (IRA) and Keogh balances at depository institutions; and (3) balances in retail money market funds (MMFs) less IRA and Keogh balances at MMFs. Beginning May 2020, M2 consists of M1 plus (1) small-denomination time deposits (time deposits in amounts of less than \$100,000) less IRA and Keogh balances at depository institutions; and (2) balances in retail MMFs less IRA and Keogh balances at MMFs.” The Board of Governors of the Federal Reserve System, <https://bit.ly/37oQU8Y>

³ “M3, called the “broad money” is the sum of M1 (currency in circulation and overnight deposits), M2 (M1 plus deposits with maturity of maximum two years and deposits redeemable at notice of maximum three months) and marketable instruments issued by Monetary Financial Institutions such as repurchase instruments or money market fund units.” Statista, <https://bit.ly/3rRI3aJ>

2 in the 90s to 0.7 in 2018. In the eurozone, M3 velocity has fallen since 2000 by 50%, the Australian decline in velocity has been material but less, and we know that M2 velocity for Japan has collapsed. We believe these phenomena in the advanced economies are largely explained by underestimates of GDP*. In the case of Japan, a declining workforce has been held up as an answer to the deflationary factors impacting the economy and it also does fit and support our narrative here.

To close the velocity conundrum, we can use the average of these calculated velocity declines in the advanced economies (40-50% since 1995). We can then use this average to estimate our undermeasurement of actual output and overmeasurement of inflation. Similar to the U.S. estimate, this implies that the real economies could be 100% or more larger since 1995 than is being measured (2.8% p.a. or more). Though perhaps a radical statement of the size of real economic output, it highlights the fundamental problem of underestimation of GDP*.

One additional note on the mismeasurement of inflation. Our sense from the earlier discussion is that it is overestimated in the U.S. by on the order of 1% p.a. Anything greater would, of course, be suggestive that U.S. actual inflation has been approaching zero or negative. Initial, comparable, estimates for Japan and the eurozone (even more so in the more advanced eurozone countries) definitely suggest negative actual inflation rates.

Current markets, which seem to perplex many observers, seem to be holding a non-perplexing view to us. First, consider interest rates. The 10-year Treasury interest rate has fallen from 8% in 1990 to an average of 2% over the past decade. In Germany, a similar story with rates falling from just under 8% in 1990 to zero in 2015 and now below zero. The story in Japan is even more illustrative. The bond markets seem to be agreeing with us that near zero interest rates are consistent with lower than measured inflation and a real rate of return on the order of 3%. Basically, interest rates are telling us that our measures of inflation are wrong. Indeed, the interest rate story is even more likely to be correct if, as we are asserting, we are underestimating actual real GDP growth by some 2 to 3 percent. A long-term real rate of return of some 3 to 4%, as would be implied by today's Treasuries, is, on average, consistent with other periods of rapid growth.

In this context, it is noteworthy that during the age of English industrial dominance and expansion, consoles yielding 3 to 4% were the norm, while average inflation was bouncing up and down around zero. Taking this as a gauge of real returns

during periods of strong industrial growth, the possibility of a 4% actual rate of return today is consistent with our contention of a 2 to 3% p.a. GDP undermeasurement – the story of an industrial revolution, properly measured.

Finally, also consistent with our velocity view, equity markets appear to be reflecting the reality of undermeasured growth. The stock market has been behaving as if it is seeing the total wellbeingness of the economy as 2-3% p.a. higher than is being measured and reported. This is even true through all the ups and downs of the tech bust, the Asian contagion, Russian default, 9/11, the 2008-09 financial crisis, the PIIGS crisis, and more recently COVID-19. That is, the market is not inconsistent with what we think are actual growth and inflation. It is our government's reported measures of real output, inflation, productivity, and consumption that are mismeasured!

7. ONE EXAMPLE OF A PUBLIC POLICY CHALLENGE WITH GDP Mismeasurement

The measurement problem is not new. Economists are aware of at least some of this, but until recently they have not even begun to develop a substitute definition or measure of national output to measure GDP*. And the profession has not communicated the issue very well to the public and maybe not to all policymakers. The effect is that policymakers and the general public have no idea what the general wellbeing of the economy is, or how it is changing over time. Measured GDP is all they have and know.

A perfect example of this problem is the currently important public debate about the sudden rise in the measured debt/GDP ratio. The measured public debt to GDP ratio of the U.S. has grown from 30% in the mid-1960s to 65% in 1995 and as high as 130% during the pandemic. Many politicians, journalists, and economists have sounded the alarm about impending inflation or, even, doom as a result of this “unsustainable” development. How sustainable is the current level comparable to, say, 1945? 1995? Clearly, using only measured GDP data in the denominator materially misstates the problem. What if the debt to correctly measured GDP* ratio is at historically reasonable levels?

When we use our approximation from the velocity analysis above to estimate the debt/GDP* ratio, as opposed to the measured debt/GDP ratio, we get an interesting result. If we take the midpoint of our 50%-100% potential range for GDP mismeasurement since 1995, we find that the debt/GDP* ratio has risen from 65%, not to 130%, but to a much more reasonable 74%. Essentially, to the mismeasured level

of 2009 debt/GDP ratio. It is important to note that we do not present this as an empirically accurate data point. It is an approximation. In fact, had we started estimating GDP* in, say, 1960 (or 1945), our estimated ratio would be lower. But, whereas we believe this approximation adds value to the debate, like all economists, journalists, politicians, and policymakers, we, too, are handicapped by the blindness resulting from our mismeasured inflation and production data. But, we believe this to be a constructive start.

8. NEXT STEPS, PAYING FOR PUBLIC POLICY

Let us begin with the proposition that policy in our “enlightened age” (unlike, say, in the 1400s) should be designed to increase the wellbeing of the society and its members, including their consumer surplus. For many policymakers and economists, GDP has become the de facto approximation for that concept of wellbeing. However, as we have discussed, this is emphatically inappropriate because it is increasingly mismeasured and, even when measured correctly, it does not include significant amounts of society’s total welfare (e.g., consumer surplus).

Thus, importantly, in contrast to the perception from GDP’s general usage, it has become, silently, a rapidly decreasingly useful tool for evaluating public policy choices. If GDP is mismeasured, as we contend, then examining how to measure GDP correctly is a useful first step in the direction of better public policy decision-making. Then, secondly, once we have a correctly measured GDP, how do we use that as a basis for developing a better measure, say GDP*, that will respond responsibly to the challenge of creating a measure that does come close to measuring the wellbeingness of an economy. Which, again, GDP was never intended to do and emphatically does not.

It is important for many reasons that the economics profession work with policymakers to achieve this goal. Most public policy debates are impacted by the mismeasurement of GDP*, as well as the expected impact of changing policy on potentially mismeasured GDP* growth. To name a few: should we raise taxes to deal with rapidly rising expenditures by the Federal authorities; are zero interest rates too high; is the stock market “obviously” overvalued (irrational exuberance); and, of course, there is the Fed or Old Lady, the BOJ, or the ECB trying to figure out what the best combination of interest rate and monetary policies in general are needed to promote real growth (presumably of GDP*).

Many of these policy issues are thorny. Perhaps the thorniest of all is appropriate tax policy. We began this discussion by stating that in 1500 it was simple. I am powerful and I will take what I want. It is not so simple in a “free” society, a Keynesian world, an open economy world envisioned by Mundell, a supply side economics world, a rational expectations world, or even in a classical economics world of say, Patinkin, where optimal tax policy is not easily defined.

Nobody wants to be taxed. Everybody would prefer that their neighbors pay for the public goods they enjoy: defense, economic data, infrastructure, the justice system, the resulting thriving economy, etc. For each individual from time immemorial the ideal tax system has been clear: I pay zero and everybody else pays for all the valuable public services we share. Economists even have an appropriate term for this, the free rider problem.

What are some accepted elements of the appropriate tax system for a society? Should we tax publicly non-preferred activities like smoking or drinking or gambling? Tax by how much? Who knows? Economists do agree that corporations and citizens should be taxed by the difference between the private costs of their activities and the public costs of those activities (e.g., pollution) and subsidized for the difference between the private benefits and social benefits of their activities (e.g., charitable contributions).

The problem is that tax revenues from these two sources, setting aside the difficulty of calculating the second source, are a very small proportion of government spending. They simply are not sufficient to fund the activities of modern governments.

How about taxing your work? For each individual? Taxing your savings? Certain classes of investments? There is no economic rationale for such taxes, except to force individuals to contribute to the general welfare they are receiving from government services and the resulting economy. However, it is impossible to measure the individual’s benefits, so there is no way of knowing whether individuals are paying more or less than their share. There is little, if any, alignment between benefits from government activity and tax contributions. Almost nothing in public debate is more counterintuitive than for a country to be taxing their citizen’s work. Governments appropriately generate program after program to guide and enhance work. But taxing work? There is no possible rationale for it, except for the fact that it is relatively easy to measure and implement.

The same can be said, with nuances, about taxing savings, certain classes of investments, and certain classes of assets. There is simply no alignment between benefits received and taxes required for each individual.

An argument has evolved that it is fair to tax those with the highest income, the most assets, etc. But would fair not involve a better attempt to align benefits received and benefits paid for? And it might be true that those with the highest income and the most assets do benefit the most from government activity, but we have never seen such a case developed. It might be true. We just do not know.

Nevertheless, it is worth another step backward. Whether justifiable or not, would the average citizen, wealthy or poor, feel that our current taxation system and rationale is an improvement over those that existed in the 16th Century? Whereas we feel the answer in modern capitalistic democracies is probably yes, it does not mean that the current systems or rationales cannot be improved upon.

Since the origination of the corporate structure, it is a given that corporations pay taxes in return for the benefits they get from a society that grants them protection under the rule of law and protection from enemies, both foreign and domestic. It is now popularly accepted that corporations should be there for their workers and their owners, and should also pay for the benefits they receive from society, rather than retaining 100% of the benefits for their owners. Absent an acceptable way to calculate each corporation's individual benefits, and given the difficult choice of whether to tax each corporation the same lump sum amount, or according to their number of employees, their total revenues, their total net revenues, or their market value, societies have generally evolved into taxing them on their net revenues. Again, with no notion at all of aligning benefits and contributions either among corporations or between individuals and corporations. This also is probably an improvement over how kings and emperors taxed organizations five hundred years ago. Probably.

In all cases, however, one begins with some measure of real GDP and inflation and argue from there. If our measures of inflation and real output are different than actual inflation and output, then what are the correct tax policies, assuming one wants to pay for government services at all? Indeed, if actual economic output and/or consumer surpluses are much higher than we think, then is there a need to raise taxes (one group of economists will clearly like this outcome, but which one?). If the actual debt to GDP ratio is low, should we not issue more

debt, assuming it is put to productive uses (and again one can debate these uses), just as a private firm may use debt to grow? If we do not really know what actual Q is how are we to be confident about any particular tax policy?

As we discussed earlier with our velocity-based approximate GDP* estimate, the economy may be some 20 to 50 percent larger than is currently being measured, with a corresponding lower ratio of debt to GDP*. This would have important implications for all macroeconomic policy discussions. Does recent fiscal authority profligacy require immediate tax hikes? Do planned spending bills threaten to push the debt to GDP* ratio over the tipping point? Is a Fed targeted inflation of 2% or 0% or 3% relevant in a world where we do not know actual growth of inflation rates and when an increasing number of our consumer products are free (or at least only approximated in real output)? Why are we seeing creation of government debt held at the monetary authority without a serious rise in average inflation – could it merely be that we are relying on mismeasured inflation and economic growth rates?

Since we really do not know what the actual level of GDP* is and how it is growing in this period of rapid transition, these public policy debates, where GDP is a centerpiece, may, and almost certainly will, lead us to many misleading and inappropriate policy solutions.

9. CONSUMER SURPLUS AND PERSONAL INCOME TAX

This brings us back to the rapid changes of the last decades. We admittedly have no way of measuring each citizen's and each corporation's benefits from government actions. Consequently, we have no way of allocating the tax burden in proportion to those unmeasurable benefits. However, if we bring consumer surplus and digital products into a discussion of how to better align benefits received and benefits paid for, we can grossly define 1) which segments do we know that benefit far above what they pay for their bundle of consumption goods and 2) which segments do we know benefit closer to what they actually pay for their bundle of consumption goods.

Whereas we have not seen this question asked by economists, policymakers, or laymen, the answer seems fairly obvious. Perhaps trivially so. Theoretically, empirically, and intuitively, those consuming at a subsistence level are benefiting close to what they pay for their bundle of goods. And without putting too fine a point on it, consumer surplus informs us that the wealthiest, say 5% of consumers, are benefitting far above

what they need to pay for their bundle of goods. And, of course, so are the wealthiest 10%, 20%, etc. The nature of consumer surplus leads us to conclude that the wealthier you are, the more likely, in general, you are benefitting from your consumption more than those who are also wealthy but less wealthy than you.

This leads to the all but obvious conclusion that a thoughtfully crafted graduated income tax, with all its flaws, will tax increasingly those who are getting the most unpaid for value from their consumption. A graduated income tax has generally, anecdotally, and popularly been considered as the fair way to design and implement an income tax. But, consideration of consumer surplus shows rigorously that, whether “fair” or not, it is one, if not perfect by any means, way to achieve a goal of taxing those benefitting the most from their consumption.

10. ECONOMIC FORECASTING IN A WORLD OF MASSIVE EXOGENOUS SHOCKS

In a world where innovation is so high and growth and product changes so rapid that measured data materially misrepresents what is actually happening, it is very difficult to make a living forecasting the future economy. If you do not know actual inflation, productivity, the size of the economy, or actual economic growth today, how can you reasonably forecast what is actually coming as opposed to what is going to be measured?

To compound this problem for forecasters and policymakers, macroeconomic models are calculus-based. They are designed to analyze and predict what will happen, say, to GDP if there is a small change in, say, government spending. They are absolutely not designed to predict what will happen to GDP or inflation if there is a massive exogenous shock to the economy from, say, a pandemic and the human responses to it. Not to mention if there are a series of massive exogenous government interventions in response.

Accurate economic forecasts are simply not possible in an environment where both reported data are wrong and there are such large exogenous shocks.

But, what of relative price movements in the face of these exogenous shocks? It is reasonable to expect unusually large movements in relative prices as different sectors are hit by different, and possibly opposite, shocks and associated distortions. One is reminded of the consumer price index of the U.K. from the 18th and 19th centuries. Prices rose during war periods then fell back to a long run norm of zero inflation. War,

like other exogenous shocks, will cause overall prices to rise as trade is interrupted, regulations imposed, and general demand for labor increased. Some of the changes are temporary, some lasting, as stressed markets seek new equilibria. Examples abound of stress in various markets: shipping rates, timber, wood pulp and paper, copper, steel, groceries, etc.

Many of these relative price changes will be interpreted by some as inflation or deflation, while, in fact they are often to-be-expected market adjustments. Much of the reporting of changing individual prices will be noise, much like the politicians’ statements of blame, rather than inflation data. As new data rolls out, economists and policymakers are forced (if they so choose) to expound on possible average outcomes, variance and unevenness in different sectors, the possible length and duration of shortages and eye-popping sudden price changes, the many possibilities in changing asset prices, and the effects of these on inflationary expectations and Fed policy, etc. Not possible.

As we are increasingly seeing, many, if not all, markets are in disequilibrium and adjusting as fast as they can (including, it must be pointed out, many, if not all, labor markets). Generalizing and/or forecasting from such out of equilibrium data points is, rather than may be, hazardous to one’s health.

Rutledge (2021) makes the case with characteristic inability to get his tongue out of his cheek: “Sadly, I learned today that 231 economists have been hospitalized with neck and spine injuries sustained when they suddenly and without warning flipped from worrying about deflation to worrying about inflation when the Labor Department reported the CPI was up 4.2% in April (’21). When questioned, the head of orthopedic surgery at Boston General explained, ‘The damage appears to be concentrated between cervical vertebrae C1 and C2, used when a person suddenly changes their mind... In this case, the movement was just too quick, damaging the connective tissue, made worse by the fact that many of the sufferers had never actually changed their minds before.’ The good news is that the patients are all economists, not plumbers or carpenters, so there should be no negative impact on GDP.”

Unable to put it any better ourselves, we make no forecasts in this paper. And we recommend that others’ forecasts be taken with more than the usual number of grains of salt until sufficient time has passed for measured data and economic models to catch up to the rapid changes of the past 25 years and the shocks of 2020-1.

11. CONCLUDING COMMENTS AND POLICY IMPLICATIONS

Unbeknownst to the general public, many economic analysts, and, possibly many policymakers, much of our reported U.S. macroeconomic data is materially mismeasured. Most importantly, measured GDP, the universally used policy target, is increasingly understating the size of the economy. This is especially true with respect to the wellbeing of the economy. And this is only partly because of mismeasurements.

The dramatic increase in innovation and product change associated with the current Third Industrial Revolution has led reported inflation numbers to be overstated by the order of 1% per annum or more. Utilizing a constant velocity of money assertion, we develop an approximation that shows productivity, GDP, and consumption have been understated since 1995 by as much as 3% per annum (even if half as much, this is huge). This would suggest that appropriate measures of our economy have grown by as much as two times what our measured data are showing. We discuss the fact that these observations are the same or greater in other developed countries. As an example of the implications for public policy debates, we show that this implies that the U.S. debt/GDP ratio is much lower than is currently being debated. This is a very important, but not very surprising, conclusion in a very important policy debate.

We note the implications for fiscal and monetary policy of ignorance about actual inflation and GDP numbers, that is, of conducting economic policy without known data points. In that

vein, we note that if a better measure of the total wellbeingness of the economy is used, rather than mismeasured GDP, there is a strong argument to be made, on purely economic grounds, for a progressive income tax in a world where policy perfection is not possible.

Lastly, we observe that calculus-based macroeconomic models are not designed to work in periods of very large exogenous shocks. In point of fact, they simply will not effectively forecast future economic changes in a world where the shocks are of a magnitude experienced after February 2020.

To put it bluntly, economic policymaking is being made in the dark with mismeasured data and ineffective models. And this is not being acknowledged by either the bulk of the economics profession or our policymakers. It is possible that a large number of policymakers are unaware of this. It is also possible that many economists are equally unaware. But certainly not all.

It is time for the economics profession and policymakers to invest in correctly measuring GDP, inflation, productivity, and a newly created measure of economic production and national wellbeing that is more useful for public policy than even a correctly measured GDP. Perhaps the American Economic Association (AEA) or the Royal Economic Society (RES) can push for and achieve a national government-associated task force on these issues.

Public economic policy made in the dark, with known misleading underpinning data, can only be in the interest of our economy and society by accident. By luck.

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