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**WHY US REAL ECONOMIC AND PRODUCTIVITY GROWTH
HAVE *NOT* DECLINED AT ALL**

– Martin Feldstein’s Important New Discovery –



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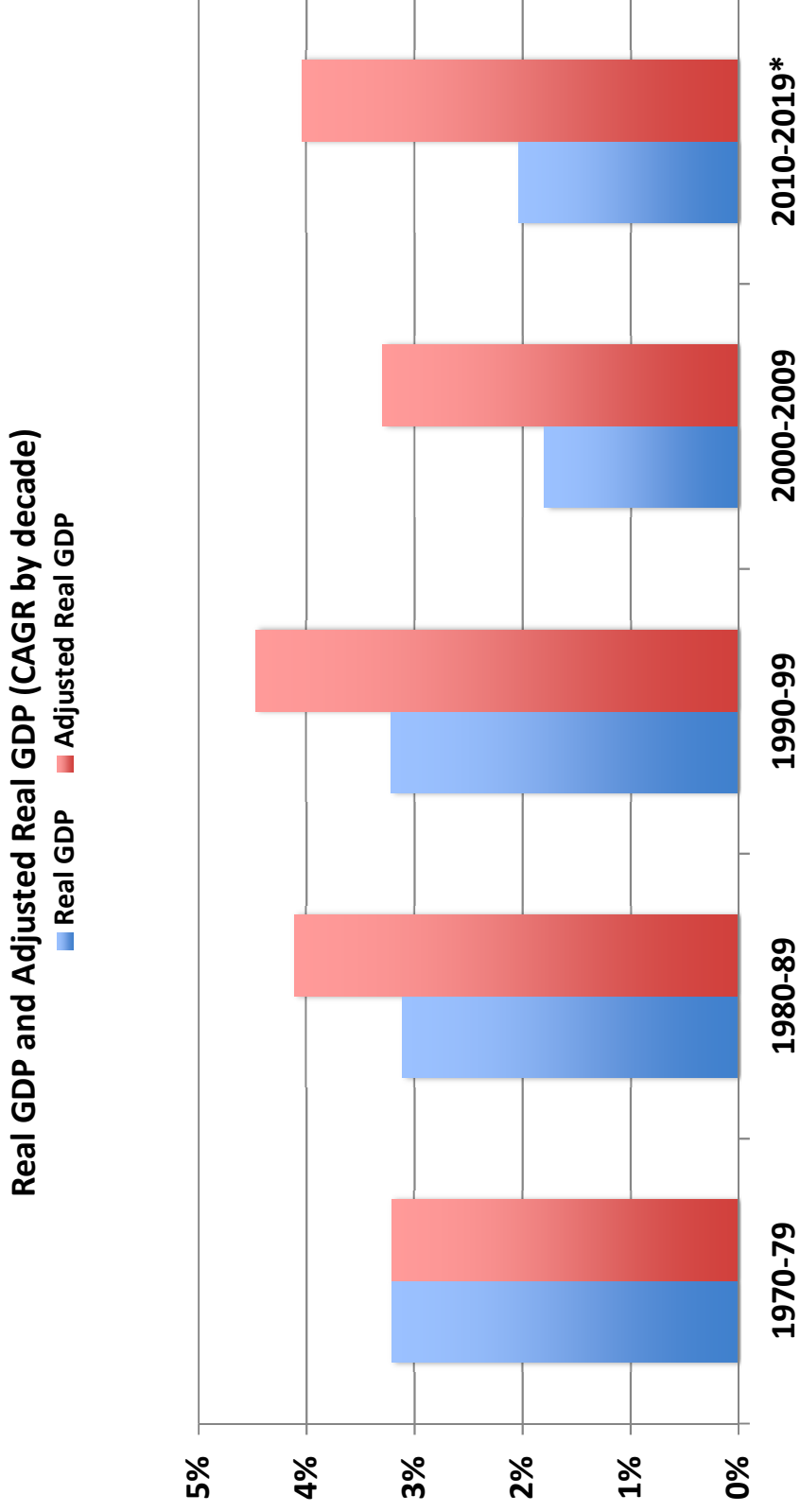
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The Myth of Decreasing Real Growth and Productivity



Note: Adjusted Real GDP assumes a lower inflation rate.
* estimated growth rate of 1.8% from 2017 to 2019

Sources: BEA; SED





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1. The Two Great Questions

There are two sets of historical data that investors must understand when projecting future inflation, interest rates, and economic growth. Both phenomena date back over three decades and have attracted considerable attention in policy circles.

1. Declining Nominal GDP and Inflation: First, there is the 50% decline of nominal economic growth, wage growth, and of inflation since 1980. In our August 2016 *PROFILE*, we attempted to explain all three of these developments as manifestations of a *single* underlying cause: The US economy’s supply curve **S** shifted outwards faster than its demand curve **D** did. We proved formally that, as long as **S**>**D** in this sense, then all three of these phenomena will result. Had **D** shifted out more than **S**, then the values of these three growth rates would have increased, not decreased. But they did not.¹

There are two reasons why **S**>**D**. *First*, the growth of demand has slowed for demographic and economic reasons. Economists call this “sluggish demand growth” and have been quite concerned about it. *Second*, the Digital Revolution has resulted in a veritable cornucopia of ever-greater efficiencies and cost reductions, not to mention completely new products and services. Just consider the acts of making a phone call, buying computing capacity, buying computer memory capacity, and mailing a letter. In all cases, the costs have fallen by over 99% over the last forty years. This has never happened before in human history. What matters is that, every time it becomes cheaper to produce goods and services, the corresponding industry supply curve shifts outward, other things being equal. This is a theorem, if not widely understood.²

¹ In arriving at our results, we held the money supply constant so as to isolate the impact on growth and inflation of shifts in the supply and demand functions *alone*.

² More formally, for any given market price for widgets, if the cost of making a widget falls, then producers will maximize profits by producing *more* at that price than before. But since this statement is true for *all* prices, the entire supply curve shifts outward.

2. Declining Real GDP and Productivity: The second set of data to be explained is the roughly 50% decline in both *real* economic growth and in productivity growth. We stressed in our summer report that our supply/demand model did *not* explain this. Moreover we stressed that these twin declines were incompatible with the supply/demand curve logic set forth above. With the supply curve shifting out rapidly, it struck us as very strange that productivity growth and real economic growth *could* have fallen by more than half. This paradox has been dubbed the Productivity Paradox in the literature. As MIT's Robert Solow famously quipped some twenty years ago, "evidence of increasing productivity growth can be found everywhere except in the official data."

*But this paradox may finally have been resolved. Due to important new research by Professor Martin Feldstein at Harvard, it is now possible to square the circle and demonstrate that neither real growth nor productivity growth have fallen at all, regardless of what the official data suggest. The purpose of this **PROFILE** is to explain and interpret Feldstein's results. His contribution is exceptionally important, and we strongly recommend that the reader follow the argument here.*

This finding is not merely of academic interest. Claims about declining real growth and productivity growth played a significant role in the recent US presidential election. Additionally, Feldstein's analysis strengthens our belief that the market's current views about future inflation and interest rates are mistaken. During the past decade, most investors were wrong about the inflationary implications both of QE and of zero percent interest rates. This was true all over the world. They were hence caught off guard by the lowest inflation and the greatest bond market rally in modern times. Analogously, they may well be surprised by the behavior of inflation in the next five years, unless a strategy of *true* money printing is adopted. Inflation should rise as the US gets ever closer to full employment, but only modestly and less than expected. This will be true regardless of Trumpian stimulus.

2. Problematic Official Data on Real Growth and Productivity

In making sense of the official data that reveal declining real growth and productivity, let's start from scratch. Where do the government's productivity data come from? These result from the following four-step operation.

First, collect data on nominal GDP over the past four decades. There is little dispute over the validity of this nominal GDP growth data series. After all, the growth rate of nominal GDP growth

is simply the growth in **Price x Quantity = Revenue** (summed over all companies) year over year. Happily both **P** and **Q** are known and verifiable³.

Second, collect data on the price increases for all goods and services, and conflate these into an appropriate “inflation index” measuring the rate of inflation.

Third, for each of the forty years, subtract this official inflation rate from the nominal GDP growth of that year. This yields the growth rate of so-called “real” GDP.

Fourth, for every year, subtract the percentage growth in the workforce from the growth of real GDP. The result is defined as the productivity growth of the economy, that is, the increase in real GDP growth per hour worked. Thus, if workforce growth is unchanged, if nominal GDP is 5%, and if inflation is 3%, then both real growth and productivity growth are $5\% - 3\% = 2\%$. If the workforce grew by 1%, then productivity growth would have been that much lower, namely $2\% - 1\% = 1\%$.

By applying these four steps, government officials in the BLS and in the BEA have shown that both real growth and productivity growth have fallen by about 50% in the past three or four decades. This is, of course, alarming. For it is widely but incorrectly believed that living standards rise in sync with productivity growth as defined above. People are thus being told that their living standards have stagnated, an argument used by both Democrats and Republicans in the recent election.

3. Two Well-Known Problems with Measuring Productivity and Real Economic Growth

Many of us have long been uncomfortable with the story of decline told by the official data. There are two justifications for skepticism here.

First: Many believe that the official data on inflation are overstated because of insufficient “hedonic” adjustments to the data. These are the adjustments made to reflect improving product

³ Two additional points. *First*, there are two components to nominal GDP: total revenue and total government spending **G**. For our purposes, we can and have ignored **G**. It does not affect our analysis. *Second*, there is in fact one problem with measuring nominal GDP growth, simple as it seems to do so: Nominal growth does not reflect the value of *free* goods and services like smartphone apps. Suppose one billion people hit on 10 free apps every week. Then with a price per hit of \$0, the arithmetic product **PxQ** will always be zero. There is no impact on nominal GDP.

quality. The *greater* the quality improvement of a given good — that is the greater the hedonic adjustment — then the *lower* the price increase.

The point here is simple. If a color TV in 2005 cost \$1000, and its price rises to \$1050 in 2006, then the unadjusted inflation rate has been 5% over this period. But if consumers believe that their newer TV is 25% better than the previous year, then on a quality adjusted basis, the price of the TV has *dropped* appreciably. The government *does* try to make adjustments of this kind, and they have done so for years.

But critics argue that they have only scratched the surface in doing so. As a result, by underestimating quality improvements, the official inflation rate is *overstated*. As a result, the official real growth and productivity growth data are *understated*. For these two variables are the result of subtracting too high an inflation rate from nominal growth.

Believe it or not, politics play a role here. Liberals do not welcome downward revisions to the inflation rate. For these will lower the cost-of-living adjustments to social security payouts and to many other indexed benefits.

Second: While much less appreciated than the hedonic issue, a particular structural change has taken place within the economy for over three decades. This change renders the traditional concept of productivity growth problematic, and makes it very difficult for statisticians to measure true productivity growth given the data available. The economic change we have in mind is the shift from making *more* goods and services per worker due to productivity growth, to making *better quality* goods and services.

Quality versus Quantity Increases: Traditionally, productivity growth has been defined as the annual increase in real output per hour. *Repeat, real output per hour.* When the Nobel laureate Simon Kuznets invented national income accounting in the late 1920s, he was very clear on the need for productivity growth *only* to measure increases in output, e.g. the increase in steel production per worker hour due to the discovery of the Bessemer process. Quality improvements were explicitly ruled out as were the introduction of new products. Indeed, as Robert Gordon points out in his important 2016 book *The Rise and Decline of American Growth*, production of Model T Fords was not included in the US GDP data for thirty-five years.

Such omissions may not have mattered very much back when economic growth was indeed about *more* wheat per farmer, *more* steel per worker, etc. But with the advent of the Digital Revolution, production has shifted to an ever greater number of new or highly improved goods

and services. Accordingly, the problem of measuring productivity growth has become far more serious over the past few decades. Yet no one has been able to measure how serious this problem is. Since remedying this deficiency would be extremely challenging, and would require “subjective” judgements — God forbid — highly risk-averse government statisticians have had no incentive to raise a red flag here.

4. Feldstein’s Contribution

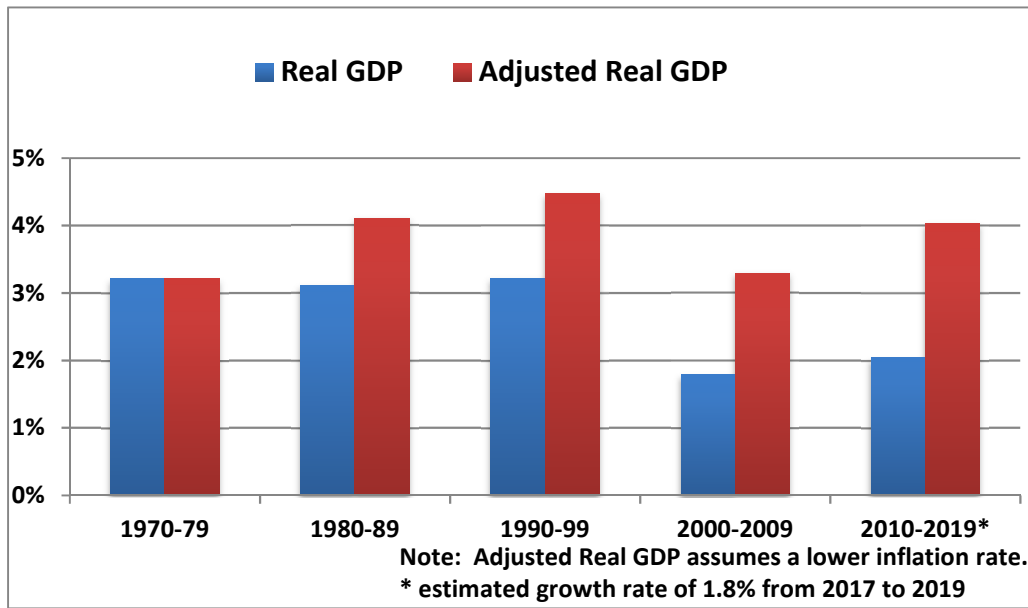
Harvard’s Martin Feldstein is arguably the most eminent macroeconomist in the world. He identifies issues ahead of his colleagues, and he researches them with renowned analytic prowess. Most important, he is skeptical of much of the macroeconomic narrative that is currently fashionable and of the official data that sustain it. In short, he is a truth-seeker.

In new research, while Feldstein has not solved the problem of measuring by how much official data overstate inflation (and thus understate productivity growth), he has discovered exactly *why* this mismeasurement must have been *much larger* than previously assumed. What he has discovered is quite astonishing. We can only wonder why it has taken so long for economists to discover this.

On the basis of his analysis, Feldstein believes that inflation has been overstated for many decades by at least 2%, and at an accelerating rate. Before we explain his reasoning, consider the consequences of his finding, assuming it is true.

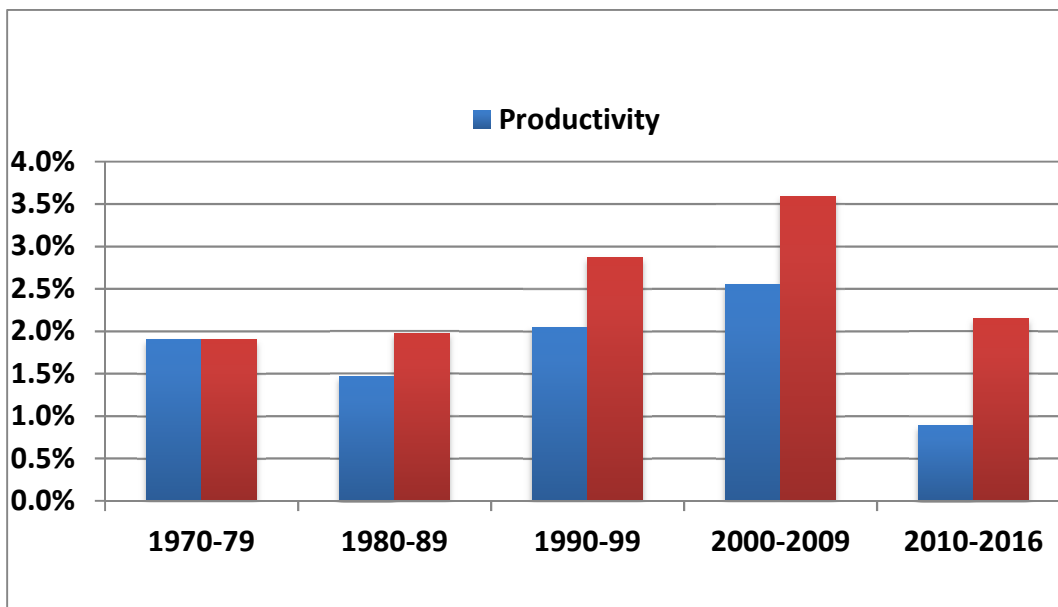
In these Figures, we plot for each decade the official BEA data on real growth and productivity growth. We then introduce an inflation-reduction *adjustment factor* that reduces the official inflation rate by 0% in the 1970s, thereafter rising continuously to 1.25% in the current decade. The resulting recalculation of both real growth and productivity growth reveals that neither declined at all. *Note that we are being very conservative here: Feldstein recommends a 2% adjustment rate, but we utilized a 1.25% adjustment rate. Had we used 2%, the data would show a significant rise in both real growth and productivity growth.*

FIGURE 1.A.: Real GDP and Adjusted GDP (CAGR by decade)



Sources: BEA; SED

FIGURE 1.B. Nonfarm Business Productivity and Adjusted Productivity (CAGR by decade)



Note: Adjusted productivity assumes lower inflation and therefore higher real output

Source: BLS; SED

Feldstein’s Logic: In what follows, we shall quote Feldstein extensively, drawing upon his paper “Remarks at the Brookings Institution Conference on Productivity,” September 8, 2016. He is known for his ability to explain complex matters very simply, and we cannot improve on his exposition.

“The official changes in real output and real income, and therefore the changes in prices, just don’t capture what has been happening, don’t capture adequately what has been happening to changes in quality and changes in the introduction of new products. The official methods tell us more about the increase in inputs, in other words about the cost of production, and not much about the increased value to consumers when there are (quality) changes in products or the introduction of new products. And this is true for goods as well as for services, although (measuring improvements) in services is more difficult than it is for products.”

Existing Goods and Services: “Let me explain by looking at how the government statisticians deal with quality changes for goods. Goods (as opposed to services) account for about 25% of GDP. Now for a small fraction of these goods in GDP the government uses ‘hedonic regression’ for assessing quality changes. I would emphasize that for GDP as a whole, this covers only a very small fraction of total goods and services.”

“In doing so, the BLS follows a very large number of product categories, and for each it asks the manufacturer or producer the following question: ‘Has the product changed in the last year?’ And if there’s been no change, then there’s no issue about having to deal with quality change. In such cases, any change in product price is correctly regarded as inflation and there is no quality change to be accounted for. But — and here’s the key part — if the manufacturer says this year’s model *is* different from last year’s, the BLS then asks the following question: What is the marginal cost of the new input requirements that are directly tied to changes in product quality? Let me say this again: What is the marginal cost of the new input requirements that are directly tied to changes in product quality?”

“So if the manufacturer says, ‘Well, no, there wasn’t any increased cost,’ then the BLS concludes there’s been no quality change. *If and only if there is an increase in the cost of making the product does the BLS conclude that there has been an increase in quality.* That’s a very narrow, and in my view incorrect way to measure quality change. ‘If it doesn’t cost more to make the new product there’s no quality improvement.’ In reality, of course, producers improve products in ways that don’t cost more to produce, or may cost even less. That is what we economists think of as true technological progress.”

We would supplement Feldstein's main point here. A hallmark of the digital revolution has been the ability of producers to cut costs radically, even when product or service quality is improving. Thus, with the accelerating penetration of digital logic, greater product and service quality has gone hand in hand with reduced costs, at an accelerating rate, for over thirty years. Yet *none* of this quality improvement *can* be reflected in government data because of the reasons Feldstein has explained.

"The government doesn't really measure output changes in connection with quality improvements or the value to consumers, but just the increased volume of inputs. The official data thus misses the increase in real GDP and thus the increase in productivity due to changes in product quality. Moreover, the measurement of output changes for *services*, which are three times as large or about 75% of GDP, is also based upon the cost of inputs....so there is no attempt to measure the value of the new or improved service to consumers."

"Let me be clear, measuring the value to consumers of quality changes is a very hard problem. So I'm not being critical of the efforts of the BLS and the BEA. My point is that their estimates are in a sense *mislabeled and misinterpreted*."

TRANSLATION: *Government bureaucrats are risk averse in the extreme, and to justify their analyses, they utilize verifiable data on cost increases when deciding whether there has been an improvement in quality. What matters to them is that they can back up their inflation claims, if challenged, with allegedly "objective" data. What apparently does not matter are the grossly distorted data on productivity growth that are generated by ignoring those product innovation and quality improvements that reduce rather than increase input costs, and that are thus ignored.*

To be fair, there was a time when the assumption that greater quality required greater input costs made sense. Consider the introduction of automatic transmissions in cars back in the early 1950s. A car with an automatic shift did qualify as a product improvement, and it did cost more to make an automatic rather than a standard stick shift. But those days are long gone. We are now in a world where, for example, the revolution in materials science makes it possible to build a bridge that will last 1000 years rather than 100 years despite a 50% reduction in material (input) costs.

New Goods and Services: Feldstein continues, "The other source of underestimation of real growth and productivity change is the failure to capture the benefit of *new* goods and services.

So here's how the current procedure works. A new product is developed and sold to the public. Its market value enters into nominal GDP and into the nominal value of industrial production. These nominal values of GDP are converted to real values using price indices that don't reflect the new product at all.

Why? Because the new product is too small in the beginning to be worth changing the weights in the GDP price index. But over time, if the new product represents a large enough amount of spending, the BLS then includes the changes in its price explicitly in the price index. After that, the BLS tracks increases and decreases in the price of the product like any other existing product. *But the process that I've described never can take into account the value created by the new product per se.* This is true for smart phones, for tablets, for new pharmaceutical products, and it's true for many other products."

Case Study of Statin Drugs: "Think about statins. The remarkable drug that lowers cholesterol and reduces deaths from heart attacks. By 2003, statins were the best-selling pharmaceutical product in history. By then it was included in the price index. And when patents expired and generic forms of the statins became available, the prices fell and the BLS recorded that, implying a rise in real incomes. But it never estimated anything for the improvement in health that came about as a result of the introduction of statins in the first place."

"Well, how big a deal was that? Here's a quick history to give you a sense of the importance of this single ignored health effect. In 1994, researchers published a five-year study of 4000-plus patients. They found that taking a statin caused a 35% reduction in cholesterol and a 42% reduction in the probability of dying of a heart attack... Between 2000 and 2007 the percentage of men 65 and older taking a statin doubled to about 50% of men over age 65. High cholesterol levels declined more than half among men and women over age 75, and the death rate from heart disease among those over 65 fell by one third. Pretty impressive!"

"This was a remarkable contribution to the public's well-being over a relatively short number of years, and yet this part of the contribution of the new product is not reflected either in real output or real growth of GDP. And this of course is just one example of a myriad of new goods and services that get introduced year after year."

Feldstein concludes with an assessment that the official data on real growth has been and is being understated "by 2% or more annually." To be conservative, when we created the data in Figure 1 above, we utilized an adjustment factor that increased from 0% to 1.25% over the forty-year period analyzed — not to the 2% Feldstein

recommends. Had we used his factor, then we would conclude not merely that there has been no decline in real growth or productivity, but that both have increased.

All this turns the conventional narrative of US economic “decline” on its head.

5. Nonsense about Stagnant Living Standards

By conventional macroeconomic logic, if there has in fact been no decline in productivity growth over the past three decades or more (recall Figure 1), then widespread claims about stagnating living standards must be false. Can this conclusion be validated *independently* of problematic official data on productivity growth? That is, is there another way of determining whether living standards have stagnated over this period — a way independent of the official data? Happily, there is, as we have explained in a past report.

The Calculus of Indifference: Consider a person on a fixed real income over the past thirty years. Show that person forty photos of his/her consumption bundle thirty-five years ago. Then show him forty photos of last year’s consumption bundle. *Only if he is indifferent between the two bundles can we say that living standards have not changed.* Virtually no one who has been asked whether he is indifferent has said “Yes.” Of course, most consumers far prefer their consumption bundles today over those of three decades ago when life was four years shorter, when there were no airbags, no Thai food, no Viagra, no smart phones, no email and free phone calls, and poor quality color TVs. In other words, living standards have risen significantly since then, just as the revised productivity growth data in Figure 1 say that they should have risen according to the traditional logic of equating productivity growth with living standard growth.

Quantitatively, to assess *by how much* this person’s living standards have risen, we ask him/her the following question: “What percent of your current income would you give up that would leave you indifferent between the reduced consumption you would enjoy next year, and your consumption bundle of thirty-five years ago?” If the person replies “40%,” this means that, despite a 40% reduction in pay next year, he would be indifferent between the much reduced consumption bundle he could then afford and the bundle he enjoyed thirty-five years ago. *In other words, the person is stating that he/she lives 40% better than three decades ago despite non-increasing real wages.*

Over the past five years, we have asked about 200 people this question, and the mean reply is about 40%, although the distribution is wide. This increase of 40% is consistent with the rapid productivity growth over the past few decades shown in Figure 1, as in principle it should be.

While we have not proven anything here, we have shown that there are several different ways to assess the all-important living standards issue. And they should be fairly compatible.

6. A Postscript on our August 2016 Profile

Our August report attempted to explain the slowdown in *nominal* GDP and in inflation and in wage growth. One reader asked: “Since your model simultaneously computes the change in prices and also the change in nominal GDP, haven’t you implicitly computed the change in real GDP growth?” The answer is yes. For as the supply curve shifts out more than the demand curve, then it is visually apparent from our supply/demand graphs that we are solving for changes in both nominal GDP (the sum of all **PxQ** revenue areas) and in prices (inflation). We could then simply subtract the inflation rate at each period from **PxQ** nominal GDP growth to arrive at a measure of real GDP growth.

But this would be invalid given the arguments introduced in this new report. For by doing this, we would implicitly be assuming that there is no change in the quality of goods sold. For we are analyzing changes in the supply and demand for a given good of constant quality. Thus we would end up overstating inflation and understating real growth by using the inflation rate we solve for.