THE MEASUREMENT OF WEALTH:
RECESSIONS, SUSTAINABILITY AND INEQUALITY

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ABSTRACT

This paper considers two central problems in our statistical frameworks which impair the ability to use wealth to assess economic sustainability or the impacts of economic downturns. Some increases in wealth may reflect increased economic rents—in particular, land and exploitation rents—and their capitalized value, unrelated to an increase in the productive capacity of the economy.   Another major problem in our wealth accounts is the "missing capital" required to explain   the marked decrease in economic output, at the time of the recession and in the years following, that cannot be fully accounted for by a decrease in measured inputs. When account is taken of this missing capital, the adverse effects of austerity appear much greater than suggested by the standard national income accounts.

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Introduction

This paper considers two central problems in the measurement of wealth within the existing statistical frameworks, which impair both the ability to assess economic sustainability and the impacts of an economic downturn. These measurement problems have, in turn, led to confusion concerning the interpretation to be given to the dramatic increase in the wealth-output ratio in recent decades.

The Commission on the Measurement of Economic Performance and Social Progress emphasized the central role of wealth in the assessment of **sustainability.** The proposition was simple: if wealth (with a growing population, wealth per capita), appropriately measured, was non-decreasing, then the given path of consumption could be sustained in the future.[1] The Commission noted, however, that there might be significant problems in the valuation of assets—exemplified by real estate bubbles (which might give the impression that wealth was larger than it was and that, therefore, the economy was on a sustainable path when in fact it was not, as occurred in the 2008 financial crisis). It also noted the difficulties of assessing natural/environmental assets, particularly because there were no markets for such assets.

But standard measures of "wealth" may not adequately reflect sustainability for other reasons, or more broadly an *increase* in measured wealth may not reflect the ability of the economy to sustain higher rates of consumption. Here, we focus on three key instances, in two of which an increase in wealth does not measure an increase in future productive capacities and in one of which our wealth metrics do not capture a diminution in the economy's productive potential.

Two anomalies[2]

The possibility that there might not be a close correspondence between measured wealth and a variable ("K" for capital) that assesses the future productive potential of the economy helps explain a disquieting aspect of Piketty's recent book[3]: He showed that the wealth output ratio increased enormously in recent decades. In spite of this, average wages did not increase, and interest rates did not fall. It is hard to obtain such results in any standard production function *if we interpret wealth as capital*.

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[1] Arrow et al. (2012).
[2] The ideas in this section are elaborated upon in Stiglitz (2015a,b).
[3] Piketty (2014).

There is a second puzzle. It has been observed that the labor's share of income is decreasing. There is a wealth of evidence arguing that the elasticity of substitution is less than unity.[4] If wealth is increasing, relative to the labor supply, then the share of labor should be increasing.

But these puzzles are immediately resolved if the measured wealth is not what is meant by productive capital. Wealth and capital are both aggregates, but they represent different aggregates. It is possible that wealth has gone up, but productive capital has not gone up commensurately, or may even have gone down. That appears to have been what has happened in several countries.[5]

A quick look at some of the key sources of increases of wealth shows that some may not lead to an increase in the economy's productive potential—and some may even lead to a decrease in its potential.

I. Land

The most important source of the disparity between the growth of wealth and the growth of productive capital is land: much of the increase in wealth is an increase in the value of land— not associated with any increase in the *amount* of land (and, therefore, of the productivity of the economy). An increase in the value of land in the Riviera or in Southampton does not increase the productive capacities of the land. Even if measured wealth has increased, if the value of "K" has decreased, the economy's future productive potential has decreased: the amount of land is no greater now than it was fifty years ago.

Why the value of land might increase (and in particular, why it might have increased so dramatically in recent decades) is a question I discuss more extensively elsewhere. (See Stiglitz, 2015a,b,c.) Note, for instance, that if the rents associated with land are fixed and last in perpetuity, then a slight decrease in the (long term real) interest rate can lead to a large increase in the value of land.[6] As we noted earlier, the Commission, deliberating as a housing bubble was forming in the United States, Spain, and many other countries, could not help observe that market prices of land and other assets may not represent "equilibrium prices," i.e.

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[4] See: Arrow et al (1961), Young (2013). It should be noted that some authors have recently argued otherwise. See Mallick (2007). But the assumption of an elasticity of substitution greater than unity has one very disturbing consequence: in models where the factor bias (i.e. whether technological change is capital or labor augmenting) is endogenous, the steady state equilibrium is a saddle point. The economy is unstable. Stiglitz (2014).

[5] There is a third important puzzle: one can only explain a fraction of the increase in wealth (in the case of the US, between one half and three quarters) on the basis of savings, from national income data. In some cases, they suggest a decline in the wealth income ratio (assuming wealth were capital), when there appears to be an increase. Stiglitz (2015a, 2015b) refers to this as the *wealth residual*—the unexplained increase in wealth. But this is at least less of a puzzle once it is recognized that wealth and capital are different concepts. The discussion in sections I and II below explain why wealth can go up even when capital is declining.

[6] If R is the rent from the land, and r is the real interest rate, then the value of land $V_T = R/r$, so that there is an equiproportionate increase in the value of land from a permanent decrease in the real interest rate.

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may not even provide an accurate assessment of the present discounted value of future rents to be derived from the asset. (That is why the Commission took the eclectic approach of suggesting a dashboard that would include along with value measures physical metrics, e.g. of the atmospheric concentration of greenhouse gases and changes in those numbers.)

Bubbles are a pervasive and recurrent aspect of market economies. While recessions may represent "corrections", the economy may not fully correct the prices of real estate, so the economy simply moves from one bubble path to another.[7]

The central point of this section is simple: an increase in wealth reflecting an increase in the value of real estate does not, in any way, measure an increase in the productive capacity of the economy.

II. Increased rents capitalized in financial assets[8]

Some increases in wealth (as conventionally measured) may reflect increased economic rents, unrelated to an increase in the productive capacity of the economy. Rather, they reflect an increase in the ability of those in the financial sector, or more broadly, "capitalists", to exploit others—workers, consumers, and ordinary citizens. The result is that overall, changes in measured wealth in recent decades probably overstate true "capital" accumulation. (In the third part of this paper, we will argue that, in the context of the Great Recession, our metrics understated the adverse effects of the downturn, by understating the adverse impacts on wealth and wealth accumulation.)

Such would be the case if the average degree of monopoly in the economy increases—if, for instance, network economies became more important, so that the fraction of the economy in which monopolies or oligopolies dominate is increased. While hard to quantify, and varying from country to country, in almost all countries these exploitive rents are significant, and in many countries they seem to have gone up significantly.

The effective degree of monopoly could increase as well if firms get better at exploiting whatever market power they have—if, for instance, firms get better in discriminating among different categories of customers.

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[7] The recurrence of bubbles has been noted by Kindleberger (1978) and may reflect the fundamental instability of economies with heterogeneous capital goods in the absence of a full set of futures markets extending *infinitely* far into the future (or without perfect foresight extending infinitely far into the future), analyzed by Hahn (1966) and Shell and Stiglitz (1967). Stiglitz (2014) shows the same dynamic instability arises in models with productive capital (K) and land: unless the price of land is set initially correctly, the dynamics do not lead the economy to the steady state equilibrium.

[8] Some of the ideas in this section are elaborated on in greater length in Stiglitz 2015a.

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Typically, the value of these rents gets capitalized into the value of financial assets—in the value of those who can lay claim to the monopoly rents. Such exploitation represents a redistribution from workers to capitalists, not an increase in the productive capacity of the economy. Indeed, because there are distortions associated with the exercise of monopoly power, the true productive potential of the economy has, in this sense, been reduced. If we included in our accounting framework the present discounted value of real wages (human capital), we would note that the increase in financial capital as a result of an increase in monopoly power is less than the diminution in human capital. But, of course, wealth, or capital, as conventionally measured does not include human capital.

But there are more subtle forms of "exploitation." Government allows too-big-to-fail banks. The value of those banks is higher than they otherwise would be, *because of government risk-absorption.* But the contingent-liability of the government is not capitalized; it doesn't show up in the national balance sheet, and so it appears as if the wealth of the economy has increased. But with appropriate metrics (where the decreased after tax wealth of wage-earning citizens, as a result of the increase in the expected present discounted value of the higher taxes that they will have to pay to bail out the banks), just the opposite would have happened: we would have recognized that because of the distortions associated with too-big-to-fail banks, the productive capacity of the economy has been diminished, with the decreased "wealth" of taxpayers being larger than the increased value of banks; these metrics would have told us that the bail-outs are Pareto-inefficient, and that the wealth of the economy has been diminished.[9]

Although the capitalization of *exploitive* rents may perhaps represent the largest part of the increase in financial wealth associated with an increase in rents, changes in taxes and regulatory regimes can have similar effects.

What's missing?

In each of these situations, a change in the flow of resources that accrues to "capital" gets capitalized in wealth, and the present discounted value of the decreased flow to the rest of the economy is not reflected in our wealth metrics. *We don't, for instance, value the stream of tax revenues to the government or the reduced wages accruing to workers as a result of increased market exploitation.*

There is a further potential problem, which we can only hint at here: *Market intertemporal pricing is in general not correct.* Wealth (in the conventional accounts) uses the private sectors' after tax returns. Whether a shift in taxation from capital to labor increases or decreases societal welfare depends on labor and savings elasticities, and societal evaluations of the

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[9] This discussion raises similar issues as those that the Commission discussed in moving economic activities from the public to the private sector.

resulting redistribution; changes in wealth may not only inadequately reflect these changes in societal welfare—the two may move in different directions. For instance, measured wealth won't reflect the diminution of the present discounted value of what workers receive, while the effects on capital are ambiguous—the measured wealth of the economy will increase as a result of the increased flow of profits; but will decrease as a result of the higher after tax return. Tax changes which lower the average tax on capital but increase the marginal tax can, on this account, have a far greater impact on wealth—even if because of the increase in the marginal tax rate, the tax structure is more distortionary.

Consider, for instance, a neoclassical production function where output is a function of capital, K, labor, L, and land, T. Assume L and T are fixed. In the absence of taxation, wealth, W, is just the sum of the value of K and land:

$W = K + pT,$

where p is the price of land, which in steady state is just equal to the return on land divided by the return on capital: $p = F_T/F_K$.

It is easy to see that $dW/dK = 1 + pT (F_{TK}/F_T - F_{KK}/F_K) > 1$ provided only that capital and land are complements, i.e. wealth goes up more than the increase in capital stock.

But now assume that the government imposes a tax on the return to land at the rate t, but that the return to capital—and therefore the level of K—remains unchanged. Then $p = F_T(1-t)/F_K$. Wealth decreases, but the productive capacity of the economy is unaffected. In life cycle models, the lower value of land typically leads to a higher value of K. If so, W and K can actually move in opposite directions; the lower value of wealth is associated with an increase in aggregate output.[10]

There are many similar examples. Many of the changes in wealth, associated with human, social, and natural capital, may not be captured in our wealth metrics. The next section looks at one particularly important example.

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[10] For instance, in the standard overlapping generations model, where individuals live for two periods, working only in the first, the steady state value of K is given by $s(K)w(K) - (1-t) TF_T/F_K = K$, where s is the savings rate of workers and w is their wage. If $d\ sw/dK < 0$, then an increase in the tax rate t leads to an increase in K and a lowering of wealth.

III. Missing *real* capital: The destruction of human and other forms of capital in recessions

Recessions destroy capital and impede its accumulation. We can trace out the consequences for plant and equipment, as revealed by investment data.[11] (Even then, we may not do so fully: we don't adequately monitor maintenance expenditures.[12])

But we don't adequately trace out the other forms of capital, and in particular, human capital. There are several important effects.

The first has to do with education, and the effects would appear to be ambiguous: Some stay in school longer when no jobs are available. It should be clear that *a priori*, the effects on student enrollment are ambiguous: Does increased competition for jobs lead to greater incentives for formal education? Or do reduced employment opportunities reduce incentives? Does the effect of a lower opportunity cost outweigh these incentive effects?

On the other hand, with a prolonged downturn, many can't afford to stay in school. Many worry that if they have to borrow to go to school, if they can't get a job, the debt burden will be enormous. (These effects are obviously stronger in countries like the US where children and their parents have to pay the bulk of costs, where tuition is high and there is greater reliance on loan programs where repayments are not contingent on the borrower's income. In the case of the US, further discouragement results from a bankruptcy law that says that student debt cannot be discharged even in bankruptcy.[13] Still a further adverse effect arises from the particular way that government support is provided: by states, who have balanced budget frameworks, and who, accordingly, typically cut back support for higher education in a recession, forcing much higher tuitions.[14]

In practice, it appears that in normal downturns, the first effect (increased demand for education as a result of a lowered opportunity cost) dominates, but there is increasing evidence

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[11] We could also measure the increased *market* value of capital (including the increased value of equities) but for reasons that should be clear from the discussion of Part II of this paper, that would not be a good measure of the change in wealth. The economic downturn worsens the bargaining position of workers, lowering their real wage (increasing the ability of firms to "exploit" workers). The resulting increase in the value of *measured* capital is offset by a corresponding decrease in the present discounted value of wages (human capital), but the latter is typically not recorded. (Shapiro-Stiglitz (1984) provides a formal model showing how higher unemployment lowers the real wage.)

[12] Thus, traditional analyses describing the decline in productivity in recessions as a result of labor hoarding may not be quite correct: some of the labor was spent in maintaining plant and equipment—doing maintenance that had been deferred during the preceding boom. By the same token, the markedly different patterns of productivity in recent downturns—reflecting ruthless management that quickly trims any unneeded labor—may not be as positive as the numbers on their face suggest: they do not capture the impacts on the maintenance of either human or physical capital stocks.

[13] See the discussion in Stiglitz (2012).

[14] This has been especially true in the 2008 recession, because of its severity and duration. For a discussion of the impacts on tuition and student indebtedness, see Stiglitz (2013).

that in the current more extended downturn, at least in the US, over time the second effect has become more important, especially for advanced (graduate) education.[15]

Other Hidden Losses

In addition to the unmeasured change in societal wealth from these changes in investments in formal education, there are several other effects.

First, there is a reduction in the quality of education as government cuts back on funding, not only for tertiary education, but also for primary and secondary.

Secondly, other government cutbacks affect both learning and future productivity: Reduced access to health care and nutrition on the part of the poor can have life-long effects, including in the ability of children to learn; and these effects become especially important as the number of children living in poverty increase with an economic downturn.

Perhaps the most adverse effects are related to a decrease in job experience (learning on the job)—long recognized as a major part of human capital. There are especially adverse effects on young people who can't get jobs: in a period in which they should be accumulating skills and work experience, their skills atrophy. Several studies[16] have documented that those entering the labor market at a time when unemployment is high experience significantly diminished life time incomes. Such adverse effects are particularly significant, of course, among those who do not get jobs. And when these adverse effects are aggregated over the large fractions of young people who face extended unemployment (youth unemployment in Europe as a whole has been persistently almost 25%, and in the most countries most afflicted by the euro crisis, over 50%) one obtains significant losses in human capital.

But this is not the only loss: Those in their 50's and early 60's are forced to retire early. They had productive skills (human capital) which, in more normal times, would have yielded returns for years to come. As a result of the crisis, all of this human capital is written down to zero—or would be if we had a good set of accounts.

There is another effect in those countries where there has been a cutback in pensions and/or where individuals rely on their own savings: many who would have retired are forced to keep working (often at low skilled jobs), as their retirement income becomes greatly diminished (especially with QE, quantitative easing, those who had put their money into "safe" assets— government bonds—saw their incomes eviscerated).

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[15] Note that in any case, the market for education is distorted: there may either be too much or too little investment in education. Because of signaling/screening effects as well as societal benefits arising from a more education populace, social returns to education may be greater or less than the private returns.

[16] Khan (2010), Brunner and Kuhn (2010), Taylor (2013).

While as a result, labor force participation of the elderly might not have declined as much as it would otherwise, it is worth noting that there are adverse welfare effects both from the destruction of human capital from the premature retirement *and* from the "forced" labor force participation. Our standard metrics capture neither of these effects.[17]

When there is a deep and prolonged downturn, these effects on human capital can be very significant; and it would seem that the adverse effects far outweigh the positive effects that might arise from more extended enrollment in school. This is certainly consistent with hysteresis effects associated with extended periods of unemployment, and with econometric studies suggesting that prolonged downturns lead to a decrease in potential growth.[18] These unobserved wealth effects help explain why effects of downturns persist.[19]

Estimating the size of the missing capital—the magnitude of capital destruction in a recession

We can get a rough order-of-magnitude *estimate* of the magnitude of the capital destruction in a recession by estimating the difference between where the economy would have been, in the absence of the recession, and where it is today and is likely to be in the future. See Figures 1 and 2, which show that today GDP in the US is some 15% below what it would have been in the absence of crisis—in Europe some 17% lower—and that these differences, even if they don't become bigger, are likely to extend into the foreseeable future. The total *cost* of the crisis in terms of lost output is truly enormous—depending on the discount rate, possibly well in excess of $100 trillion. (A 15% loss in a $15 trillion economy amounts to a loss of $2.25 trillion. Even if the economy were immediately to return to a growth path of 2% growth, with a 3% real interest rate, the present discounted value—PDV—of the loss is over $200 trillion.)[20]

We can in principle measure the delta in "normal" capital K (the difference between what K, as conventionally measured, would have been but for the recession and actual K), that is, we can estimate, the consequences of reduced investment to the capital stock. Similarly, we can estimate the delta in normal human capital ("education") as conventionally measured, that is again, the difference between what the level of human capital, as conventionally measured,

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[17] There are a further set of complex adverse welfare effects, with potentially important implications for the stock of human capital. As the elderly, who otherwise would have retired, seek jobs, there are search externalities on other job-seekers. (See Greenwald and Stiglitz 1988.) If the economy is in a demand constrained equilibrium, firms that are capital constrained may decide to hire these older workers, rather than younger workers, adversely affecting the accumulation of human capital by the former.

[18] Reifschneider, Wascher, and Wilcox (2013).

[19] Indeed, there is a literature suggesting that the economy's dynamics exhibit near unit roots. See Campbell and Mankiw (1987).

[20] As Stiglitz, Sen and Fitoussi (2010) point out, GDP does not provide a good measure of the loss of well-being: it does not, for instance, include any valuation of the increased insecurity that the downturn has brought. Cutbacks in public programs are valued at the reduction in the value of the inputs, not the value to citizens of the services provided.

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would have been, in the absence of the recession, and its actual level.[21] We can then estimate the predicted effect of these changes on output. (For instance, if lower investment has decreased the capital stock from what would normally have been the case, in the absence of the recession, by some 5%, then if the share of capital is .25, standard analyses would suggest that output would be some 1.25% lower than it would have been on the normal path.)

The difference between the decline in GDP (relative to the normal path) that can thus be accounted for and the actual decline in output (relative to the normal path) is the result of missing "dark matter"—analogous to Solow's residual. The present discounted value of the difference is the value of the *missing capital*.

Back of the envelope calculations suggest that the magnitude of this missing capital is enormous. *True* GDP is the sum of consumption plus *true* investment. *True* investment is the difference in *true* wealth.   We have been ignoring the effect of the downturn on *hidden wealth*, and thus on *true investment.* The decline in GDP in the recession was, accordingly, much greater than the standard numbers suggest.

There is an important agenda going forward of trying to parse out this missing capital. The problem is analogous to that posed by Solow in his classic 1957 paper.[22] He showed that one could explain only about 12.5 percentage of the growth of output per capita by an increase in the capital-labor ratio. The rest was called "the residual," and considerable efforts were made in subsequent years to explain the residual, e.g. the movement of labor from less productive sectors (agriculture) to more productive sectors, the shortening of hours of work, and, most importantly, technological change.

Our earlier discussion helps identify some of this missing capital. We know that those who enter the labor force in a bad (recession) year have a significantly lower lifetime PDV income. And this is especially true of those who remain unemployed for extended periods—the decreased experience shows up in lower incomes throughout their lifetimes. We also know that those who get displaced from a job face a significant loss in PDV of income. We can use these numbers to provide an estimate of the value of the loss in human capital on this account.

There are other capital losses that are harder to measure. Bankruptcy results in a loss of organizational capital, including the tacit knowledge that resides within the bounds of a firm.

In recent years, there has been increasing recognition of the role of social capital for the well-functioning of the economy, and there some direct evidence of the erosion of social capital as a result of long-lasting deep downturns. Trust is too important, and the behavior of the banks in

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[21] As we have noted above, there may be significant measurement errors in both variables, e.g. because of hard-to-observe changes in maintenance.
[22] Solow (1957).

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the years before the crisis undoubtedly led to an erosion of trust. Quantifying these effects is an ambitious task for the future.

Even if we can't precisely parse out the components of this dark matter, this missing capital—partly due to the destruction of organizational and social capital, and partly due to the destruction of key components of human capital (experience)—is real and needs to be taken into account.

V. Concluding comments

The idea that there can be an increase in the value of wealth, without any change in the amount of productive capital is, of course, an old one: in developing countries, there has long been a concern that savings get transmitted only into an increase in the value of land or holdings of gold. Indeed, a key issue in the theoretical literature of the 1960s and 1970s was whether there was *any* meaningful measure of aggregate "capital." The reswitching literature (focusing on models in which there was production of commodities by means of commodities (Sraffa 1963), so that "capital" represented working capital) noted that an economy at a low interest rate and a high interest rate could look identical, though the value of capital might be markedly different. [23]

Another example of why metrics matter

One of the key messages of the International Commission on the Measurement of Economic Performance and Social Progress (Stiglitz, Sen, and Fitoussi 2010) was that *What you measure affects what you do.* This paper has argued that our standard metrics have not captured adequately the adverse effects of recessions.

If we don't measure the adverse effects on human capital, we won't do anything to ameliorate these effects, and we may even undertake policies which look good *in the absence of these effects,* but which would look disastrous in their presence.

This analysis emphasizes that there are long-term consequences of not taking strong counter-cyclical policies; and because of deficiencies in our wealth measures, we don't correctly assess these long term effect. If you focus on the liability side of the government—as those who have urged austerity in Europe and elsewhere have done—one may take actions that result in the *net* asset side of the entire economy decreasing, undermining sustainability. Austerity and the single minded focus on government debt has been short-sighted, besides being counterproductive. Better metrics might have noted that austerity reduces correctly calculated

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[23] For a brief review, see Stiglitz 1974.

GDP by far more than is widely recognized, and worsens national balance sheets, because of the resulting large amounts of *missing capital,* including hidden decrease in human capital.[24]

To put this another way: GDP is supposed to be measured as consumption plus the change in wealth. But if we don't measure the decrease in human capital and the other forms of capital (which together constitute the missing capital), we are underestimating the decline in the recession in GDP, and we are underestimating the adverse effects of the austerity measures that have been adopted in Europe, especially for Europe's future growth potential.

On the other side of the ledger, this short paper also provides an important cautionary note in the interpretation of wealth-income ratios, and the implication of these increases: they do not necessarily mean that the economy has become more productive, and that current levels of consumption are sustainable. A natural resource economy which uses the revenues gleaned from the extraction of its resources to fuel a real estate bubble might even show an increase in "wealth"—but its future productive capacities may well be significantly diminished. The increase in financial wealth that has marked many advanced countries in recent decades may similarly be a chimera, with the increase in real estate prices masking the far more important reduction in real productive capital.

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[24] These are effects that go beyond the often made observation that the improvement in the liability side of the balance sheet is often disappointing: because market GDP decreases (more than expected), tax returns are lower (than expected) and social expenditures higher.
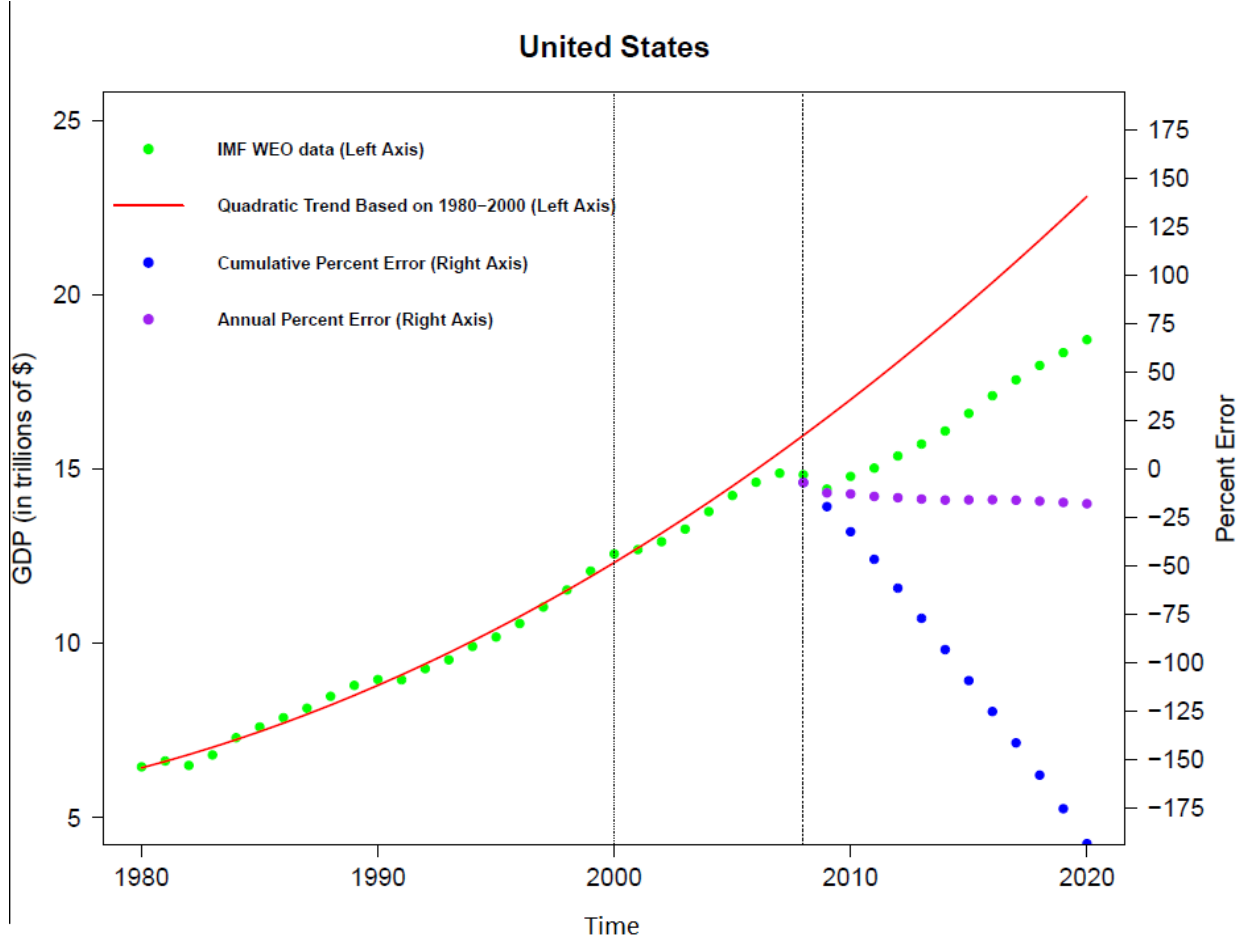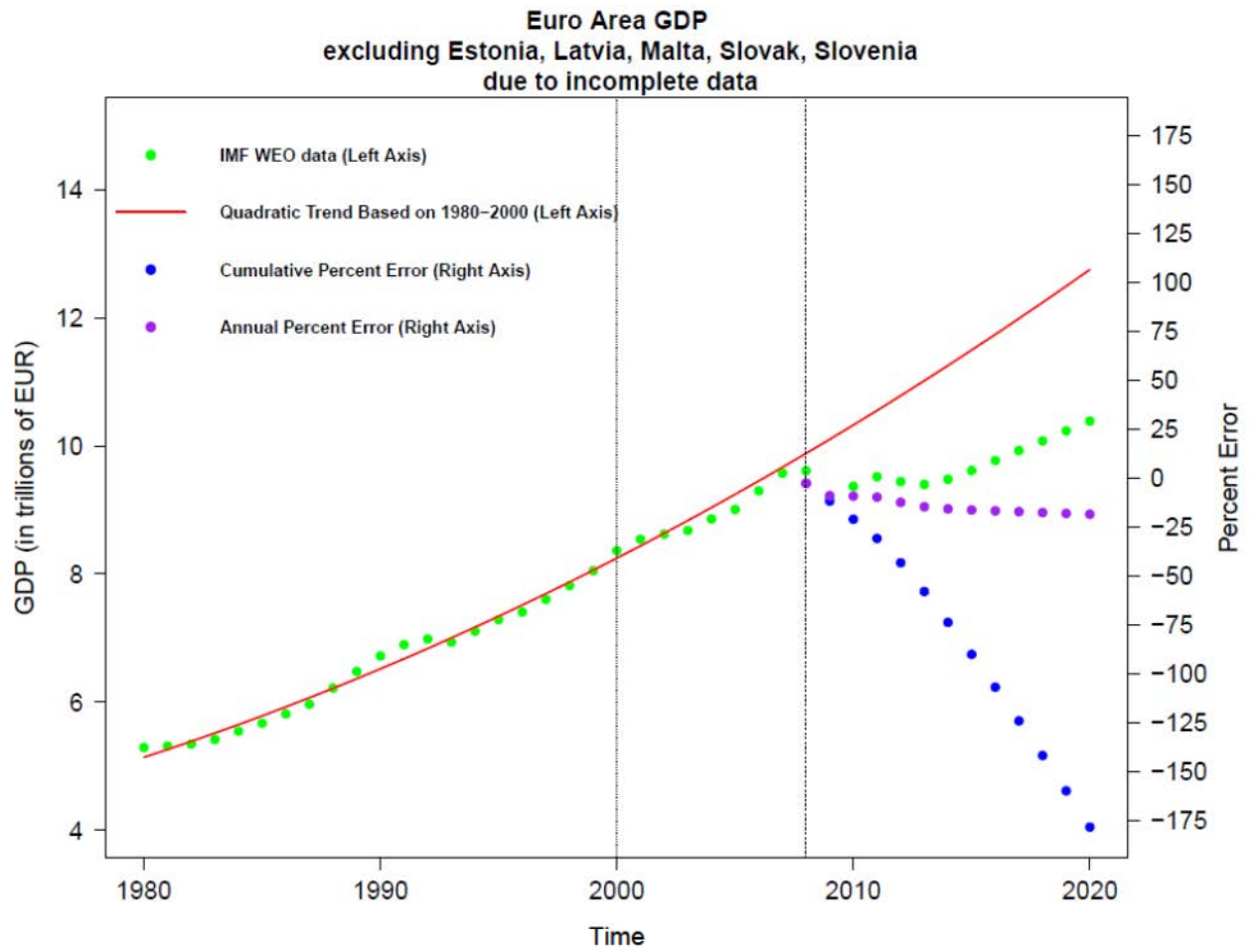
Figure 1: USA growth below trend

Figure 2: Europe growth below trend

Euro Area GDP
excluding Estonia, Latvia, Malta, Slovak, Slovenia
due to incomplete data

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