

A Time for a Change in Economic Theory?

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ABSTRACT

Economic theory has gone through four major transformations since the 1600s in response to social and biophysical forces. We may be witnessing the beginnings of a fifth transformation as mainstream economics, committed to market efficiency and economic growth, may not be able to successfully address the dilemma of financial fragility and looming recession in the context of the reductions of material production and consumption needed to achieve a sustainable economy on a finite and non-growing planet.

INTRODUCTION

Economic theory has seen four major transformations since the 1600s. *Mercantile thought*, which dominated theorizing from the 17th to the middle of the 18th centuries gave way to *Classical Political Economy* by the late 1700s. Classical political economy was itself supplanted by *Marginalism* by the 1870s which solidified itself into a coherent *Neoclassical Economics* by the 1890s. Neoclassical thought reigned supreme until the middle of the Great Depression of the 1930s, eventually giving way to *Keynesian Economics*. Keynesian thought was brought into the neoclassical mainstream (Samuelson's Grand Neoclassical Synthesis) by the 1960s and remained the intellectual center of the profession until the era of stagflation in the 1970s. By the late 1970s and early 1980s the principles of Keynesian economics lost sway in the profession and were replaced by a new variant of neoclassical economics, often referred to as *Supply-Side Economics*, or *Economic Fundamentalism*.

Often time's economic theory changes because of social forces. For example, neoclassical economics lost its dominance during the years of the great depression (1929-1939) for three fundamental reasons. The abstract neoclassical framework could not explain prolonged and severe depression. The policies they advocated (fiscal restraint, tight money, liquidation of assets) were counter-productive. Finally an alternative viable explanation of the causes of, and the solutions to, the depression came from the writings of John Maynard Keynes. But other times the changes in economic theory are a result of changes in the relation between humans and nature. Specifically I want to focus this paper on a forgotten principle: how human beings have appropriated and harnessed energy. Energy plays a far greater role in the economy that most texts have considered in the past or are considering at the current time. Most of what we consider productivity increasing technological change is accompanied by a net increase in the use of fossil fuels (Cleveland, *et al.* 1984, Hall, *et al.* 1986). As the time of the end of cheap oil approaches we can no longer ignore the role that energy plays in both the economy and economic theory.

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Furthermore, the coming of peak oil coupled with the constraints imposed by looming climate change may serve as the basis to reconsider the basic premises of scarcity and economic growth that form the underpinnings of contemporary economics.

TIME FOR ANOTHER CHANGE IN ECONOMIC THEORY?

We may well be witnessing the beginning of the end of economic fundamentalism, or the belief that market outcomes are efficient by definition, government intervention generally distorts efficient market outcomes, and market processes will self correct and result in “the greatest good for the greatest number. Economic fundamentalism, which has been dominant in economic theory for nearly 30 years, will, sooner or later, see the end of its ideological and intellectual reign because it can no longer “deliver the goods” the way it did when underlying economic and environmental conditions were different. A growing number of American citizens, politicians, and even some in the financial community now call for the reregulation of financial markets. Advocates of the “free market solution” have little new to offer. Long-held concerns about deficit spending are rapidly vanishing as the current economic malaise deepens. In the end the monetary “brains trust” will either borrow the money or print it. Unfortunately: “Simple solutions to the intractable problems of markets do not exist” (Perelman, 2006: 161).

Among the most intractable problems is the need for a market economy to grow into a biophysical system that is finite and non-growing. Market economies must grow to provide opportunity, employment, profitable outlets for investment and the necessities and amenities of life. Yet at the same time the human economy must operate within the biophysical limits that nature will allow in the long term. If, as Mathis Wackernagel and others estimate, human economic activity, or ecological footprint, (measured by the amount of land needed to provide our food, fiber, and energy), already exceeds biocapacity on a global basis, with some wealthy countries exceeding it by a factor of five, a fundamental dilemma arises. How can the economy grow to provide employment and opportunity, while simultaneously shrinking to live within nature’s limits?

A BRIEF HISTORY OF PRIOR THEORETICAL TRANSFORMATIONS

Economic policy on theory emerged with the writings of the mercantilists (in the 1600s and early 1700s. Robert Heilbroner described mercantilism as an “extractive commercial nexus.” Craft workers could extract the sunlight appropriated by the earth’s biomass (i.e. trees) and fashion it into implements, lumber to build ships, and charcoal to smelt iron and other minerals. These ships voyaged to distant lands and extract precious metals that were returned to the imperial nation. The primary policy goal was to develop structures that resulted in a positive balance of trade, and value theory was grounded in the process of exchange.

By the middle of the 1700's this doctrine fell into disfavor, along supplanted by doctrines advocating the idea that value was determined prior to market by the cost of production. The earliest example was the French Physiocratic School. They contended value was the result of the natural bounty of the land and the application of agricultural labor. Physiocracy provided the first biophysical model. Not only was the economy grounded in the natural bounty of the land, but their famous *Tableau Oeconomique* was patterned after the flow of blood in the human body.

The most famous critique of mercantilism was Adam Smith's *An Inquiry into the Nature and Causes of the Wealth of Nations*. Smith, like every other Classical Political Economist, based his theory on the labor theory of value. Value and price were determined by the amount of human labor time embodied in production. Smith, writing before the consolidation of the industrial revolution, had difficulties reconciling fluctuating market price with the natural price determined by labor values. To reconcile the natural price determined by labor values with fluctuating market prices Smith had to develop subsidiary theories of wages, profits and rents. This did not lead him to abandon a cost of production perspective it just muddled his value theory. Smith was, above all, a pre industrial philosopher. The augmentation of the wealth of a nation was driven by organizational changes, specifically the division of labor, rather than by technology. Smith makes scant mention of "fire engines" although they were invented in 1698. Although Smith was well aware of its existence he attributed little productivity augmentation to this new technology. His only mention was in the context of the division of labor leading workmen to invent better machinery.

Ricardo and Marx wrote at a time in which they could observe, not just visualize, the industrial revolution. The industrial revolution depended upon the prior increase in agricultural productivity, the extensive use of mechanically powered machinery; the introduction of fossil fuels for power and energy, the widespread use of chemically synthesized elements, as well as advances in metallurgy. (Cameron, 1989, Rosenberg 1972).

Despite improvements in British agricultural productivity the later years of the 18th century witnessed substantial increases (136% from 1770 to 1813) in the price of food (Rubin 1979). Debates about food prices were at the forefront as Britain industrialized, not because of the dominance of agriculture as a sector, but because food prices determined the level of subsistence wages and low wages were essential to low cost production of mass production goods. As population grew and urbanized more food was required to support more people. With cheaper food from the continent cut off more domestic land had to be put into cultivation. Since the best, or most accessible, land was used first the extension of cultivation required the utilization of poorer quality lands. The conventions of British land used at the time allowed the worst land in cultivation to pay no rent. As even poorer quality lands were employed the former no rent margin now paid rent to the aristocracy. Moreover, additional human labor was required to improve the inferior lands, thereby raising the cost of food production in terms of labor expended. Ricardo's two great contributions to economic theory, diminishing marginal returns and comparative advantage were grounded in this debate. As output increases the entire aggregate income is eventually distributed between wages and rents, and the process of accumulation comes to an end, ushering in the dreaded

and dull stationary state. Ricardo set out to establish the idea that value was created by embodied labor even after private property appeared in land and capital stock. To be more precise, Ricardo posited that value depended upon embodied labor and scarcity, but relegated scarcity to *nonreproduceable commodities*. He showed little interest in these and concentrated on those goods that could be produced. From a biophysical standpoint Ricardo was clearly dealing with the notion of *absolute scarcity*, rather than with the idea of relative scarcity that permeates neoclassical thought. He makes no mention of unlimited wants and relegates nonreproduceable commodities to the status of being rare and uninteresting.

By establishing that the price of food was determined by the application of human labor to land of *the lowest quality* Ricardo was able to show that rent was a deduction from the economic surplus produced by labor that accrued to those who possessed land of higher quality. Ricardo addressed the problem that so vexed Smith by holding capital to be dated or congealed labor. Price now resolved to the component parts of wages and profits. Any increase in wages resulting from higher food prices simply diminished profits. However, Ricardo's abstract model only functioned adequately in the simplified world where all capital was circulating capital. Adapting this theory to the realities of emerging large scale production and the industrial revolution stymied him. If two firms have different capital-labor ratios an increase in wages will have a more profound impact upon the more labor intensive process. In order to equalize the profit rate the prices of labor intensive goods must increase relatively to those produced in capital intensive processes. But goods that possess equal amounts of embodied labor are supposed to command the same price. Ricardo was never able to solve the problem. In fact he died at his desk while working on it.

Marx, more than any other political economist of the classical period, had a keen insight into the role played by fossil fuels in the expansion of the scale of production. Only large-scale production made possible by fuels that could transcend the organic limitations of the human body, wind and water, would reveal the internal dynamic of capital as self-expanding value." This increase in scale unleashed vast potentials for increases in labor productivity that simply did not exist before the age of fossil fuels and before the machine age.

However mechanization also unleashed the tendency for the rate of profit to fall. An increase in the scale of production necessitates the investment in long lived fixed capital that only transfers its value to the final product. If the increase growth in the capital labor ratio exceeds the rate of increase in labor productivity profits will tend to fall. But a capitalist has little choice than to increase investments in fixed capital to increase productivity. Therefore the constraints of competition force capitalists to behave in manners contrary to their own will. While Marx technically resolved Ricardo's dilemma, the resolution was dangerous to the existing power structure. The labor embodied theory was a valuable tool in establishing the primacy of a hard working entrepreneurial class over that of a moribund rent-seeking aristocracy. In Marx's hands it no longer served to perpetuate a class of exploiting industrial capitalists.

The labor theory of value actually fell out of favor with the emerging capitalist class long before the publication of Marx's *Capital*. Writers such as William Thompson and Thomas Hodgskin reasoned that since labor was the source of all value that labor should receive the entire proceeds. Their followers took

direct action to achieve their goals and the period of the 1830s was characterized by labor unrest and mass strikes. Marx held just the opposite view. He begins his *Critique of the Gotha Programme* by asserting that labor is not the sole source of wealth. "Nature is just as much the source of use-values (and surely these are what make up material wealth!) as labour" (Marx. 1974: 341). Fossil fuel driven mechanization also played a role in extracting and processing the use-values created by nature and without some return to capital the reinvestment in new productivity-enhancing would grind to a halt. A society in which all remuneration accrued to workers would be a moribund stationary state. Marx's vision of socialism was quite different. It did not call for the elimination of exploitation but social, rather than private, control over the economic surplus. However, both of these positions, despite their distinct political differences, were dangerous as they were fundamentally grounded in the notion of class conflict. The rise of neoclassical economics was not simply a reaction to Marx. For example there is no evidence that William Stanley Jevons ever read Marx. Jevons' dispute was with the labor theory of value in general. "When at length a true system of economic science comes to be established, it will be seen that that able but wrong-headed man, David Ricardo, shunted the car of economic science onto a wrong line—a line, however, on which it was further urged toward confusion by his equally able but wrong-headed admirer, John Stuart Mill" (Jevons 1888: 72).

Marginalists and later neoclassicals however, were looking for more than accurate relative prices. Instead they were searching for a general theory that was applicable to any social system at any point in time. As such they de-emphasized the importance of the institutional context in which economic and social activity occurs, especially the role of class processes. This approach brought a wholesale shift in object and methods. While classical political economy focused on the point of production Marginalists and neoclassicals grounded their analyses in the processes of exchange. Classical political economists viewed value as being determined by objective processes grounded in the social division of labor. Neoclassical thought sees value (or price) as determined subjectively by mental, and not material, processes. In the end the dynamics of classical political economy were replaced by a search for static equilibrium. From the 1870s until the end of the 1920s marginalism was refined and synthesized into what we now call either neoclassical economics or welfare economics. Alfred Marshall developed a causal link between Jevons' principles of utility and the construction of a demand curve. Vilfredo Pareto adapted F.Y. Edgeworth's indifference curves to show that a series of voluntary exchanges will lead to an optimal allocation of consumer goods and productive inputs. John Bates Clark provided a non-exploitation based theory of distribution by refining marginal productivity and Philip Wicksteed freed Clark from the dreaded adding up problems (whereby more income could be distributed to factors than is produced) by substituting variable proportions for fixed ones. By 1920 A. C. Pigou had synthesized general and partial equilibrium approaches in his *Economics of Welfare*. The decade following the publication of Pigou's great work was one of economic expansion, at least until the middle years of the decade when crucial sectors of the real economy (housing, automobiles, steel) began to decline. Yet despite the decline in the real economy financial speculation kept expanding. The long boom of the post WWI era was to come to a

crashing denouement in October of 1929. Orthodox economics, unable to explain the depths of the depression, fell upon hard times. Belief in the self-regulating market was temporarily suspended and replaced with two options: social democracy, and a more regulated capitalism, or fascism. A second world war ultimately decided the outcome for some thirty years.

Keynes considered himself a “moderate conservative,” and accepted all of the classical Pigovian postulates except for Say’s Law and the self-equilibration of the labor market on the basis of the real wage. Keynes largely shifted emphasis from wages as a cost of production to aggregate wages as the primary component of effective demand. Interest rates could no longer be called upon to equilibrate the market for loanable funds, as savings and investment were functions of different variables. Rather than calling forth greater saving, increases in the interest rate would choke off investment, reduce incomes and thereby reduce, not increase, savings (Perelman 2006:38). If Keynes did introduce anything truly revolutionary it was to bring the concepts of irrationality (or animal spirits), uncertainty, and disorder into the highly ordered, absolutely certain worldview of orthodox economics of rational short-term decisions made on the basis equilibrium prices as carriers of perfect knowledge and perfect foresight (Shackle 1967). Uncertainty simply could not be transformed into calculable risk (Keynes 1937).

Keynes returned to the problem of long period equilibrium, and once again confronted the dilemma that has vexed orthodox economic theory since the time of Ricardo: How does one properly value long-term fixed capital assets under conditions of uncertainty? This recognition allowed Keynes to give primacy to the investment process as the motive force to changes in the level of effective demand. Yet economic policy in the post depression years focused mostly on augmenting consumption. Moreover, the work of Keynes was sanitized to remove traces of disorder. Savings as a joint function of the income and interest rates gave us the real side of IS-LM analysis, although Keynes himself was adamant that the system should remain open. Robert Solow removed the dangerous notion of explosive oscillations and potential secular stagnation inherent in the work of Hansen, Harrod and Domar. Solow also substituted a technical process for a social contradiction between the needs for a rather high MPS to stimulate investment and a low MPS to stimulate consumption. Samuelson took the process one step further relegating the volatility of the interaction of the multiplier and the accelerator to a rather simple second order difference equation. Finally Samuelson safely contained Keynes by means of the “Grand Neoclassical Synthesis,” whereby markets efficiently allocated resources and equitably distributed incomes. Keynesian economists needed only to fine tune the level of aggregate demand by means of subtle adjustments in monetary and fiscal policy.

A number of institutional arrangements evolved in the immediate post war era that helped establish the United States as an international power and as a growing and prosperous domestic economy. The Bretton Woods accords took the world off the gold standard and placed economic productivity growth as the base for fiat money. The United States clearly had the world’s most productive economy and the dollar became the world’s key currency. The Employment Act of 1946 required the government to utilize the new tools of Keynesian demand management to achieve “reasonably” full employment and stable

prices. The mechanism to achieve these goals was by means of economic growth. In addition, 1948 witnessed the signing of the epoch-making contract between the United Auto Workers and General Motors, establishing "productivity bargaining" as the norm. Increases in productivity translated into increases in wages. Regular wage increases turned into increased consumption and increased investment in residential structures, thereby maintaining effective demand and stimulating economic growth, as well as linking the interests of unionized workers to further increases in productivity growth. Finally the era saw the continuation of growth in domestic oil reserves as discoveries of new domestic sources of oil were greater than the depletion of older sources. Oil was increasingly utilized as an agricultural input both directly to power agricultural machinery and to dry crops, and indirectly as the petrochemical feedstock of herbicides, pesticides and fertilizer. Using 1996 as a base year, the use of durable equipment rose from 70 in 1948 to 142 in 1969, direct energy inputs increased from 66 to 94, and the use of agricultural chemicals nearly tripled in the same time period. Despite myriad fluctuations farm output nearly doubled by the beginning of the 1970s (Economic Report of the President. 2004).

After a theoretical reign of some thirty years Keynesian economics lost credibility in the profession, largely due to its inability to explain, or prescribe policy for, stagflation. The set of institutions that allowed the prosperity of the golden age began to decay. The capital labor accord could not withstand declining productivity. Industrial dominance declined as Europe and Japan rebuilt and newly industrialized nations added to basic capacity in fundamental industries such as steel production. As the productivity base of the United States fell, so too did the basis for monetary hegemony, and the Bretton Woods accords collapsed in 1971 when U.S. President Richard Nixon unilaterally announced that the dollar was no longer convertible to gold. Moreover, the U.S. production of oil peaked in 1970, verifying the position of M. King Hubbert, who predicted this event in 1956. From now on the United States would be a net oil importer. At home the energy return on investment began a precipitous decline. Having extracted the least costly, highest quality oil first, the remaining domestic supply declined in quality. The yield per effort began a long and secular decline. In 1970 drilling in deep water and hostile climates yielded approximately 17 barrels per foot. By 1980 that had fallen to less than seven (Hall, *et al.* 1986). After the peak the units of energy needed to extract, transport and refine the oil began to rapidly decline. In 1970 the estimate EROI for all hydrocarbons was 42:1. By 1981 it had fallen to 8:1 (Hall, *et al.* 1986). Imported oil was simply more cost effective, but the loss of a cheap domestic supply made the nation more vulnerable to dislocations in the world market. Furthermore the potential ability to raise productivity by simply throwing more cheap oil at the process began to see limits.

Productivity grew at an average annual rate of 2.7% in the golden age years of 1949-59. This growth rate slowed slightly to 2.1% from 1959-69. But once the domestic oil supply peaked in 1970 and the postwar social structure of accumulation began to disintegrate the rates of productivity growth plummeted, taking Keynesian credibility with them. Average annual productivity growth fell to 0.3% per year (Bowles, *et al.* 1990). Most mainstream studies have a difficult time explaining the decline in productivity growth by standard measurements.

However two heterodox approaches offered better results. Bowles *et al.* proposed a model of productivity, with social factors such as the increase in corporate control and the increase in work intensity, innovative pressure, and the role of citizen protest accounting for accounting for 84% of the decline in the productivity from 1948-1973 (Bowles, *et al.* 1990). Culter J. Cleveland and co-authors approach productivity from a thermodynamic perspective, asserting that economic production is work, and work requires free energy. Their linear regressions attributed 98% of the variation in real GDP from to the rate of change of fossil fuel use (Cleveland, *et al.* 1984). While seemingly opposite explanations, one must ask: what role does fossil fuel use play in the intensification of work intensity. Certainly the telecommunications led extension of the working day into former drive time and downtime that is now accessed by the internet would not be possible in the absence of substantial electricity, wi-fi and microwave grids. This connection deserves further study.

With productivity in decline and labor and material costs rising, the economy became vulnerable to simultaneous recession and inflation. With the U.S. no longer being an oil exporter and with the exporters now organized into an effective cartel (OPEC) the timing of economic downturns with “oil shocks” became a permanent feature of the economy. In 1973 Saudi oil was withheld from the U.S. market as a result of the resupply of Israel during the October war. Within the year the economy plunged into the worst economic downturn since the Great Depression. In 1979 Iranian oil no longer flowed to the US. Within eighteen months the even more severe recession of 1981-82 commenced. As oil prices collapsed the long period of 1980s prosperity emerged. A recession followed the run-up in oil prices surrounding the first Gulf War, and prosperity returned in the 1990s as oil prices fell to \$10 per barrel. Prices peaked again in 2000 as OPEC cut back on production and a recession soon followed.

Keynesian policy offered no relief. Expansionary policy was offered to counteract rising unemployment resulted in increased inflation. Contractionary policies exacerbated unemployment. Rather than a smooth Phillips curve relation both macroeconomic problems spiraled upwards. The large integrated corporations of the 1970s did not compete on the basis of marginal cost, but rather on cost markup pricing designed to achieve target rates of profit determined by financial interests. As interest rates rose in accord with tight money policy, those additions to prime cost were passed along in the form of higher consumer prices. In that sense tight money policy actually exacerbated, rather than corrected inflation (Wachtel and Adelsheim. 1977).

The program known as “Supply Side Economics” was advanced to address the causes of productivity decline and input cost increase. Remilitarization became part of the answer to the raw materials shortages as well as to effective demand. The National labor Relations Board was staffed by those hostile to the notion of collective bargaining, and enforcement of environmental laws declined. Taxes fell on upper incomes as the progressivity was removed from the tax codes, while payroll taxes increased. The process of deregulation commenced during the Carter administration was augmented and extended to financial markets, as the Garn-St.Germain Act removed the New Deal era restrictions on investments for

the Thrift industry. Tight money policy was advanced to quell inflation. The Federal Funds Rate rose from 5.82 at the trough of the 1974-75 recession to 16.38 in 1982 (Economic Report of the President. 2004).

Yet the supply-side program had limited impact, despite the achieving political victory on nearly all of its aspects. Productivity growth averaged only at 1 percent between 1979 and 1989. Corporate profits averaged only one half of one percent higher in the decade of the 1980s than they did in the stagnant 1970s as debts, both domestic and foreign soared. The trade balance as a percent of GNP fell from 0.4% in 1948-66 to -1.8% in 1979-89. The Federal budget deficit increased by 125% in the same time period while the national savings rate fell from nearly 10% to a little over three percent. It hovers close to zero at the current time (Bowles, *et al.* 1990). Bowles and his colleagues attribute the somewhat lackluster performance to contradictory aspects of critical tradeoffs. The “monetarist cold bath” of high interest rates helped discipline labor to accept a reduction in wage growth. But the same high interest rates reduced investment and increased excess capacity, thereby depressing profit rates. High real interest rates strengthened the dollar but simultaneously increased dollar denominated raw material prices, thereby raising business costs (1990). These contradictions have not disappeared in the current era of the celebration of the “magic of the market.”

SUMMARY AND CONCLUSIONS

Recent unemployment and GDP data indicate that the U.S. economy has entered another recession. This follows closely on the heels of yet another dramatic run-up in fuel prices, which peaked at \$147 per barrel in July of 2008, and subsequently declined to less than \$40 per barrel in January 2009. One awakes to the news of systemic financial fragility as well as volatile equities markets and frozen credit markets. The solution offered by the FED and the new administration is the time honored Keynesian path of growing one’s way out of depression, in this case by providing sufficient liquidity to the credit markets so growth can proceed once again in the absence of domestic savings and consumer confidence can return. Will Keynesian economics be recredited as the market fundamentalist solution can no longer “deliver the goods?” Or will this be a minor bump in the road of smooth macroeconomic adjustment by means of transparent prices that carry sufficiently perfect knowledge?

My fundamental question lies deeper below the surface, buried in the biophysical benthos so inaccessible to mainstream economists and social critics. If we retain the same institutional structures based on the notion of self regulating markets, how will we cope with the problems the next generation will face: problems born of biophysical limits? If the end of the age of cheap oil arrives in the same historical time frame as climate disruption they will impose absolute, biophysical limits to continued growth. But under the current set of social arrangements desirable social and economic goals such as full employment, financial stability and retirement security are all dependent on economic growth. How to resolve this seeming contradiction will constitute a fundamental theoretical issue of our time.

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