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# ***POST HOC ERGO*?: A Reply to Craig Marxsen's "Fabricating the Doomsday Crisis"**

By

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## Abstract

Marxsen's contribution offers a provocative interpretation of the 2008-2009 recession and the role energy prices directly and environmental regulation

indirectly played in creating the downturn. While Marxsen draws a compelling link between energy costs and the recent recession, his link between 1) the recent spike in energy costs and environmental regulation and 2) the subsequent link between environmental regulation and the recent recession, is much less convincing.

## Introduction

*Post hoc ergo propter hoc*, a Latin phrase meaning "after this, therefore because of this," is often quoted to represent the idea that because an event “b” follows an event “a”, then event “a” must have caused event “b”. While we as social scientists often find great comfort in this notion, since, after all, we can certainly observe and measure temporal correlation, the idea that simply because one event precedes another as indicating a causal link between two events is almost never true. Hence, while his paper offers a very compelling and forcefully delivered argument, upon closer scrutiny, we fear that Marxsen (2010) may have fallen pray to this very same logical fallacy. [1]

Marxsen weaves a tale whereby early work by Meadows (1972) and the famous “Club of Rome” fueled an environmental movement that preached doom for our global economy unless greater efforts to preserve the natural environment were adopted by developed and developing nations. [2] He then proposes that this aggressively zealous movement led to too much environmental regulation that has now manifest itself as the worst economic recession since the Great Depression. [3] As a result, this environmental movement, Marxsen asserts, has fabricated a self-fulfilling “prophecy” that the Club of Rome was right and we are now in the throes of disaster. Yet, Marxsen argues, it is really exaggerated and over-reaching environmental regulation that is the true culprit. To generate this argument, Marxsen draws a link between accelerated energy costs and the current recession as well as attempting to link accelerated energy costs with too aggressive environmental regulation.

To be sure, Marxsen posits an interesting hypothesis: environmental regulations impacting the oil industry *caused* the Great Recession. However, the argument Marxsen offers, and the citations selected, tends to overlook research offering alternative conclusions. Overall, Marxsen’s argument that increases in energy prices (oil prices in particular) can be a principle cause of a recession is a plausible assertion when the historical connection of supply shocks and recessions is considered. [4] Marxsen further seeks to link energy costs with the recent crisis in the real estate markets, and his proposed linkages are also plausible. That said, however, we should not lose sight of the fact that "creative" mortgage terms and easy access to credit allowed many Americans to buy homes that were well beyond what their incomes and wealth positions would allow. [5] Further, consumer debt accumulation ought not be overlooked as another key element that in all likelihood made family budgets incapable of absorbing escalating energy costs. Marxsen focuses upon energy costs and does not dwell on fraud or total debt limitations as contributors to the current real estate crisis. Marxsen does not completely ignore all other forces contributing to the onset of the Great Recession, but his hypothesis is that over-zealous environmental regulations are both the cause of and the trigger of rapid and excessive market devaluations of real estate.

The challenge that Marxsen faces then is linking the energy cost increase between 2000 and 2008, and in particular, the "spike" that occurred in 2007-2008 with aggressive environmental regulation. Here Marxsen's argument is much less persuasive.

In what follows we address several major concerns with Marxsen's thesis. First, we address the relationship between productivity and environmental regulation. Then we address the issue of oil refinery capacity and environmental regulation. Then we focus on crude oil production as it relates to the recent escalation in energy costs. This is followed by a critique of his environmental policy evaluation and our conclusions.

## Productivity and Environmental Protection

It is true that compliance with environmental mandates can add to total cost. Many costs associated with compliance are front loaded, e.g. capital investments rather than operating costs. Hence, compliance costs can both redirect and restrict a firm's flow of investments into privately profitable projects. Since compliance costs often are up-front capital costs (e.g., construction of required components; bureaucratic costs associated with environmental impact assessments and permitting requirements), the redirection can be significant. Also, capital costs increase along with the magnitudes of front end uncertainties. Clearly, it is plausible that broadly defined regulatory compliance cost can reduce the flow of total private investments below a socially desirable level. For example, total business investment can be significantly redirected or can be reduced due to unintended consequences springing from either [i] regulatory structures or enforcement, or [ii] rent seeking business decisions reacting to those governmental actions. Also, regulatory capture might provide private origins for deleterious regulations. Given that the oil industry requires major quantities of technical and legal expertise and given regulatory decisions are remote from citizen control, it is plausible that environmental regulations of the oil industry exhibit a non-trivial quantity of regulatory capture.

When seeking to identify "excessive" regulation, or to identify "under" investment, it is critical to distinguish the investment process as viewed from the vantage point of the firm versus it as viewed from the vantage point of society. This distinction is central to an economic justification for environmental regulation (e.g., internalization into the firm of externalities previously imposed on society due to market failure). This is a distinction to which Marxsen gives only passing attention. Indeed, it seems from his article that Marxsen treats as axiomatic that all existing environmental regulations are excessive, wasteful, and therefore yields little, in any, economic benefit.

However there are examples where long-term benefits in productivity may outweigh the compliance costs of regulation. This is germane given Marxsen’s citation of Kahn (2009), who argues that accelerated housing costs resulted from productivity growth in the 1990s. The implication is that slower productivity growth, linked perhaps to environmental regulation, would cause housing values to fall. Yet, some recent empirical research is calling this into question. Repetto *et al*. (1997) find very little evidence that environmental protection reduces productivity. Indeed, in a detailed analysis of the petroleum refining industry that speaks directly to Porter’s hypothesis, Berman and Bui (2000) find that more efficient refineries are located in regions with more stringent environmental regulation. In short, the degree to which environmental regulations impact productivity is still very much an open research question. Hence, we should not conclude that environmental regulation must slow productivity and is thus necessarily excessive.

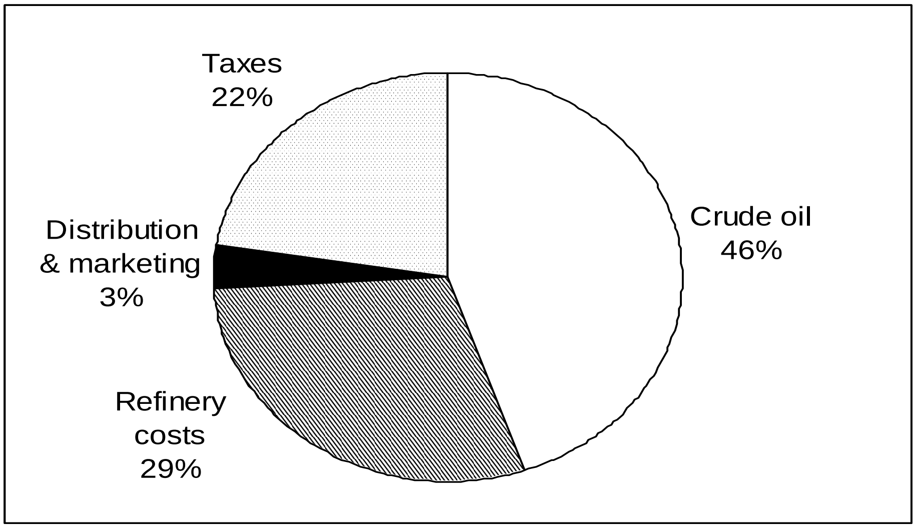
## Refinery Capacity, Energy Prices, and Environmental Regulation

Marxsen spends most of his time on issues related to refinery capacity. Marxsen points out that there has been a dearth of refinery capacity investment in the US, both in terms of new refineries built and additions to existing refinery capacity. Accordingly, Marxsen identifies refinery shortage as being the root cause of energy price acceleration. Once articulated, Marxsen then lays blame for this shortage on excessive environmental regulations that adds to cost and thus deters investment. There are several issues worth noting about using refinery capacity which are required for an accurate analysis of refinery capacity as a potential cause of escalating energy prices and thus the trigger of the Great Recession.

## Refinery contribution to energy prices

First, to be sure, refinery costs do matter. Unquestionably, compliance costs are not zero, and the aggregated compliance costs for the industry are far from trivial. However, to impact the price of gasoline, these compliance costs need to be a large percent of total gasoline processing costs.

**Figure 1: Composition of Gasoline Prices in the United States**



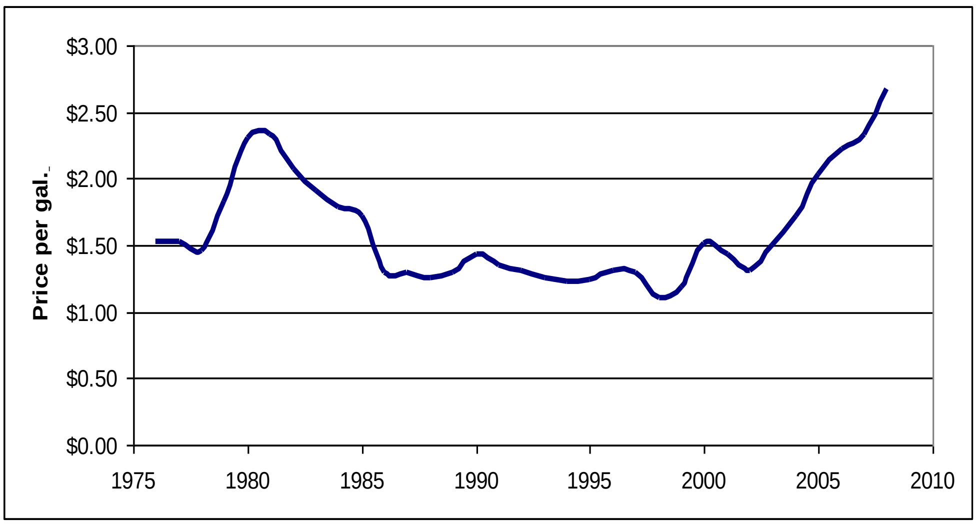

Source: US Department of Energy, Energy Information Administration, http://www.doe.eia.gov

This is hard to accept given the composition of gasoline prices. According to US Department of Energy, Energy Information Administration statistics, 29 percent of the price of gasoline is linked to total refinery costs, only part of which are costs associated with environmental costs. By contrast, 46 percent of the price of gasoline is the supply input of crude oil (see Figure 1 above). Hence, it would seem that more attention should be paid to the behavior of the worldwide crude oil market if we are to fully understand energy price spikes. This will be addressed further below.

## Refinery construction at new locations and capacity additions

Second, Marxsen is correct in pointing out that 1) there has been a dramatic decline in the number of operating refineries in the US and 2) no new refineries (or new locations) have been constructed in the US since 1976. However, is this really due to excessive environmental regulation? Evidence suggests not. For instance, according to Shurtleff and Brunett (cited by Marxsen) there was a dramatic drop in US refinery capacity locations in the early 1980s. However, this dramatic drop was not due to environmental regulation. Instead, this drop was due to the end of government subsidies that had supported small, relatively inefficient, refineries. Once those subsidies were eliminated, those refineries were no longer economically viable and their private owners chose to close those plant locations. Hence, it is correct that an action by government triggered those closures. Ending corporate welfare is an action of government, but it was not a governmental action (through either increased regulation or any other means) that increased these firms' costs. The point here, then, is that this drop in capacity was the result of market forces; not governmental intervention.

**Figure 2. Real Price of Unleaded Gasoline, US average (2000 dollars)**



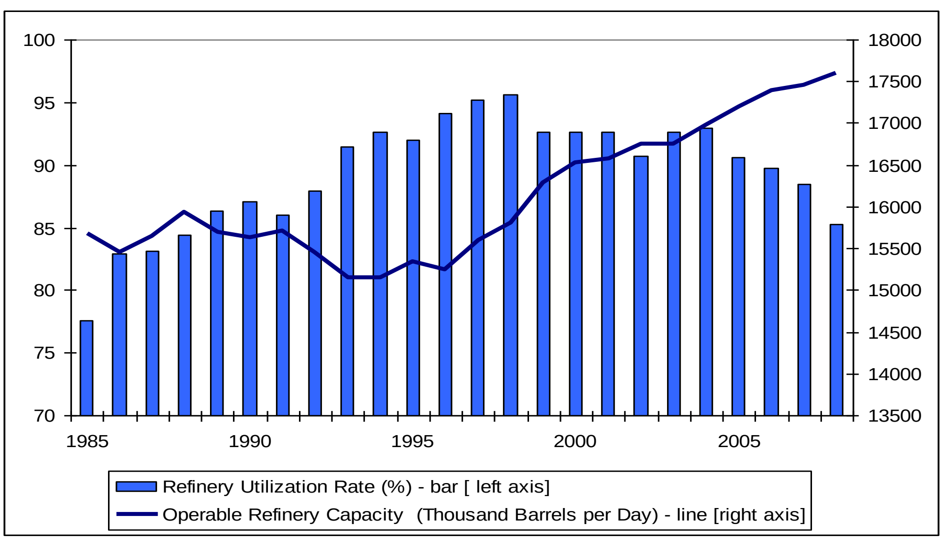

Source: US Department of Energy, Energy Information Administration, http://www.doe.eia.gov.

Turning our attention to the lack of new refinery construction, it is certainly plausible that a reason for not expanding the total number of refinery locations since 1976 in the US was in part due to costs associated with environmental compliance. However, as can be seen in Figure 2 above, gasoline prices were very low between 1986 and 2000. What market incentives were in place then to induce any corporation to build a new refinery irrespective of any compliance costs? Perhaps a major part of the reason for there being no increase in the number of refinery locations in the US in that period was because market conditions simply did not support a sufficient rate of return on such a large capital expenditure. [6]

Given the argument that low real prices for gasoline tend to depress incentives to construct new refineries, then it stands to reason that the market should have seen a surge in new plant construction between 2000 and 2008 when gasoline's real price was increasing; *ceteris paribus*. Marxsen asserts this was not observed. Why not?

Marxsen asserts that the amount of refinery capacity is substantially less than what would be expected in a competitive market, an outcome he attributes to aggressive environmental regulation. However, if the petroleum refining industry would otherwise be competitive without the presence of environmental regulation, then the substantial profits enjoyed by oil companies in the 2000-2008 period would have induced entry by, say, smaller independents. There is scant evidence that this was the case. [7] Moreover, there are substantial scale economies in petroleum refining, and as a result the industry is highly concentrated, a condition that would arguably persist even in the absence of any environmental regulation. In short, this industry is simply not a competitive one.

**Figure 3: US Operable Refinery Capacity and Refinery Capacity Utilization Rates**




Source: US Department of Energy, Energy Information Administration, http://www.doe.eia.gov.

Moreover, with higher and escalating prices that energy consumers seem to be willing to tolerate, the incentives to expand capacity via large new refineries is limited, especially when more modest, less expensive investments in capacity expansion at existing plants would allow refineries to maintain their higher margins. [8] More importantly, as shown in Figure 3 above, the total operating capacity increased while the number of locations decreased. There was indeed significant expansion of operating capacity.

## Operable capacity utilization

Third, when one considers refinery capacity utilization rates, one has to wonder about the tight refinery capacity argument that Marxsen asserts pushed gasoline prices skyward. Unquestionably, there have been, and (given the concentrated industry characteristics) will continue to be, localized gasoline price spikes attributable to refiners maintenance schedules and shifting capacity accordingly to seasonal fluctuations in demand (e.g., winter heating oil; summer driving). Further, without question, those localized supply constraints are magnified by regional variations in gasoline formulations chosen as the cheaper alternative method of local governments seeking to address localized air quality problems. However, environmental regulations do not cause the seasonal variation in refinery outputs. Now, environmental regulations downstream from the refinery do magnify those seasonal variations. Marxsen fairly ascribes those downstream regulations as regulations of refiners because the locus of the regulatory impact is at the refinery. However, these are distortions in local markets, rather than distortions of the national market. Yes, given the concentration in the industry, multiple localities are served from an individual regional refineryl thus those local distortions do get magnified into regional distortions in some seasonal and market contexts. But, the effect is still not the prime driver of national gasoline prices. The prime cause is seasonality rather than environmental regulations.[9]

Moreover, even on an annual basis, refinery capacity may not be the primary driver of gasoline price increase. Again, consider Figure 3. As shown in the bar graph portion (i.e., left axis), between 1995 and 2000, refinery capacity utilization rates were 94 percent on average. Between 2000 and 2008, utilization rates averaged only 90 percent. Obviously, even the most efficient firm must perform maintenance and must take equipment out of service in order to shift equipment to meet seasonal fluctuations in the demand for specific refinery products, thus utilization can not be 100 percent. But, if environmental regulations are causing and triggering a spike in gasoline prices nationally so as to also cause and trigger the Great Recession, then why is refinery utilization falling over the entire relevant period? Also, preceding that dip in utilization, as shown in the line graph (i.e., right axis), total capacity was increasing. Let's summarize: demand is increasing, supply locations decreased, total available supply increased, and utilization rates decreased; and, therefore, per Marxsen, environmental regulations created an operating capacity shortage that triggered a fuel price spike which in turn triggered a collapse in housing values which caused the Great Recession. Maybe we missed a variable, but those facts do not seem to form a coherent whole.

## Environmental regulation and capacity additions

Fourth, the effect that environmental regulation has had on refinery capacity additions has suffered from little empirical scrutiny. Some work on regulatory enforcement has been done. Indeed, Baum, Decker and Montoya (2009) found that increases in enforcement efforts did tend to reduce incentives to invest in capacity expansion. However, the effect was relatively small. A ten percent increase in enforcement leads to a modest 0.13 percent reduction in capacity additions, *ceteris paribus*. The largest determinant of capacity expansion was perceived increases in fuel demand. Again, we really cannot conclude that environmental regulation (at least as implemented via enforcement) is a major source of investment deterrence. [10]

## Did demand increase faster than supply?

All economists accept as axiomatic that price will rise when demand exceeds supply, *ceteris paribus*. However, sometimes other things are not equal. Accordingly, while demand exceeding supply is one cause of price rising, that is not the sole feasible cause, especially of a price spike. Nor does is follow that any and all supply constraints solely are due to regulation of any magnitude. Let's look at an array of supply and demand statistics to see where that data points. Does the data suggest a supply constraint as the prime culprit for a spike in fuel prices; or, does the data point towards other, perhaps more likely, explanations?

Marxsen focuses mostly on licensed locations in his analysis, noting, again, that there has been a dearth of new locations being licensed for refineries. However, not only can an existing location can be expanded, an existing location can be made more efficient. A broader definition of capacity addition would look at locations, expansions, and efficiency. So, let's look at a broader definition of supply and do so while also looking at demand.

EIA reports that the number of licensed refinery locations in 1982 was 263, but had dropped to 159 by 2002: a dramatic drop to be sure. [11] However, over the same date range, the total Crude Oil Distillation Capacity was 17.6 million barrels per calendar day in 1982 and was 17.2 million barrels per calendar day in 2002. Thus, there was a 39.5 percent drop in licensed locations but only a 2.5 percent drop in total licensed capacity. Which of those two numbers is the more important number when discussing regulation induced capacity reductions? [12] Marxsen stresses licensed locations rather than licensed capacity.

As we noted above, capacity utilization was dropping at the same time that total licensed capacity was dropping. There are some obvious potential causes of utilization decreasing while capacity increased. For example, if utilization drops when capacity drops, then that could mean that some combination of [a] a market shortage induced physical capacity exhaustion (e.g., unplanned outages due to deferred maintenance) when demand outstrips supply; [b] total demand for distilled crude oil is dropping, [c] the refineries gaining effective capacity through efficiency (i.e., less wasted output and/or capacity), and/or [d] imports of distilled products are used to fill demand not met by domestic refinery capacity. Two of those four obvious possibilities are consistent with Marxsen's assertion of shortage (i.e., [a] and [d]), while the other two of those four refute Marxsen's assertion (i.e., [b] and [c]). Accordingly, an important question is whether there was an unmet demand since capacity expansion, coupled with dropping utilization, does not square easily with an assertion of unmet demand.

Licensed capacity is not the same as operable capacity. Operable capacity cannot exceed licensed capacity; but more effective use of a given quantity of licensed capacity can increase the operable capacity. For example, reducing the down time cycle for maintenance increases operable capacity as a fraction of licensed capacity. That is, an increase managerial efficiency translates into an increase in the effective capacity. Alas, the operating capacity data range does not start until 1990. [13] The January 1990 operable capacity was 15.7 million barrels per calendar day while the December 2002 operable capacity was 16.8 million barrels per calendar day; or, a seven percent increase in operable capacity. Using Marxsen's logic, did environmental regulations cause the seven percent increase in operable capacity while there was a 2.5 percent reduction (over a longer date range) in licensed capacity? [14] Marxsen's hypothesis seems ill-equipped to explains this.

So far we have looked at supply. Let's now look at demand. Again using Doe EIA data, the January 1982 demand for finished petroleum products was 14.5 million barrels per calendar day, and in December 2002 it was 17.6 million barrels per calendar day; or, an increase of 21.4 percent. [15] Since EIA does not provide a demand statistic for refined products, we will need to use a proxy of all petroleum products that will increase the absolute size of our millions of barrels per calendar day numbers. In January 1982, the total demand was 16.1 million barrels, whereas in December 2002, it was 19.9 million barrels per calendar day; or, a 23.6 percent increase in this proxy for total demand. [16] Again, using a larger proxy of total petroleum products, rather than just refinery products that changes the absolute size of the numbers, in January 1982, imports of finished petroleum products was 34.2 million barrels per calendar day and in December 2002 imports were 47.5 million barrels per calendar day or a 38.9 percent increase. [17] Note that as measured in barrels, just the increase in imports was a greater magnitude than two-thirds of the domestic finished products.

Of course, comparing percentage changes without a shared denominator is hazardous work at best, but let's try it. Licensed locations in the USA decreased about 40 percent, while licensed capacity only decreased by about three percent, and demand for refined products was up over 20 percent. Accordingly, suspecting a shortage could be quite reasonable. However, effective capacity did not fall. Instead, it increased about seven percent, while at the same time utilization rates fell below 90 percent. Those two data don’t necessarily suggest a shortage in refinery capacity.

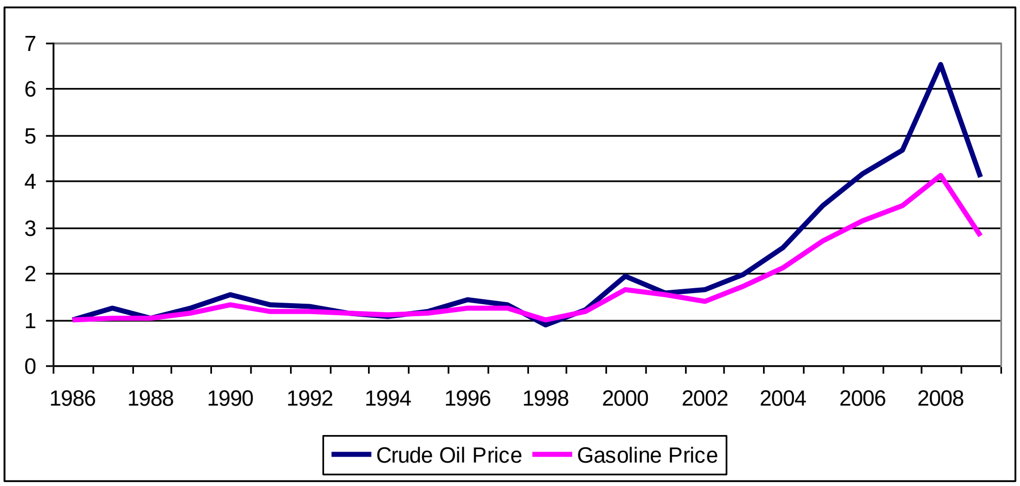
This array of data does not point clearly in the direction that environmental regulations constricted refinery supply relative to demand.[18] However, if excessive environmental regulations are to be the sole culprit, then Marxsen ought to have provided some evidence that in the absence of all regulation it was a physically feasible action for refinery capacity to have grown more than and faster than demand grew. He did not. Refineries are very complex and very large machines. Just completing the physical tasks of construction would require many months. Let's grant for the sake of argument that regulation might triple the physical minimum time requirements to a duration well north of 60 months. However, even at 60 months market entry is a challenge. Any market entry that must be fully invested multiple years prior to the first sale rarely is market entry that is calibrated to precede the arrival of demand. Private decision makers, especially in a concentrated industry, would rather reap economic profits from existing investments by having supply additions lag demand growth as opposed to experiencing economics losses in the event that supply additions are stranded by a failure of demand growth to appear as well as devalue existing investments.

## Is it Production or Refining Capacity Driving Prices?

Finally, the true story may very well be production of the input rather than the refinery capacity for processing of the feedstock: crude oil. Until now, the main issue plaguing Marxsen's thesis, and his subsequent analysis and supporting literature, that environmental regulation is indeed excessive rests in large measure on whether or not the production and refining of energy products generates a negative externality in the form of socially harmful pollution. We tend to embrace the notion that such productive activities do generate a negative externality, indicating the presence of a market failure and thus opening the door for some type of regulatory structure to induce capital investment in pollution control.

For now, however, let's set aside that critical issue and assume, with Marxsen, that no environmental externalities of oil production, refining, and consumption exist. To be sure then, without the existence of any externalities, then all environmental regulations necessarily are excessive. However, a serious issue remains; one that is still likely to generate substantial upward pressure on energy prices.

**Figure 4: Crude Oil and Gasoline Price Indexes (1986 = 1)**




Source: US Department of Energy, Energy Information Administration, http://www.doe.eia.gov

Consider Figure 4 above. Note the tight correlation between gasoline prices and crude oil prices (a similar pattern arises with other refined energy products such as home heating fuels). Most of the escalation in gasoline is clearly attributable to the run-up in crude oil prices. Recall from Figure 1 that 46 percent of the price of gasoline is the crude oil, while refinery costs are but 29 percent. Crude oil is traded on an international market and movements in its price to date are considered largely determined by worldwide supply and demand conditions. Is this upward spike in crude oil prices attributable to US environmental policy? During the period when crude oil prices were spiking, the demand for oil by China and by India was surging. US environmental regulation has been in place since the early 1970s, and while some changes in this policy have occurred over this time, it seems strange to presume only after decades of such regulation we would suddenly see an oil price spike reveal itself as a direct result of this regulation.

To be sure, there are a number of reasons for not only the rapid spike in oil prices shown in Figure 4, but also their recent steady increase, an increase that began around the year 2000. Clearly increased demand for oil due to the rapid growth in China and India is a major factor. Another factor may be on the supply side. Marxsen focuses upon the supply side as the cause of the price spike. Marxsen might be correct to focus on supply, but not correct to focus on refinery capacity. Is it possible that we are finally experiencing the market consequences of declines in the additions to proven oil reserves relative to the additions to demand?

The usual response to supply concerns is that technology will somehow save us. However, physical realities are hard to overlook. Even in the presence of technological innovation, total supply might not be sufficiently upwardly flexible to align with demand. Globalization, urbanization, and economic development of the relatively large populations of lesser developed countries can generate massive (and rapid) increases in demand. Are there really opportunities for massive (and rapid) increases in supply? Consider Hubbert's Peak. [19]

Hubbert's Peak is a theory. Like any good theory has its foundation in fact. The geophysical theory of Hubbert's Peak has several components:

- [i] the total supply of oil in the Earth is finite;
- [ii] the extractable fraction varies by available technology, but is less than 100 percent of that finite amount;
- [iii] no matter what level of technology of extraction is available, what is extractable will take the shape of a normal curve; and
- [iv] with quantity of output on the vertical axis and time on the horizontal axis, that normal curve will display the maximum feasible extraction per time period over all time.

Hubbert's Peak is theory of the Earth's total supply of oil. However, Hubbert's Peak is based upon the facts that all oil fields discovered and exploited to date have exhibited the traits [i], [ii], [iii], and [iv]; and, all physically adjacent oil fields collectively exhibit the traits [i], [ii], [iii], and [iv]. Accordingly, by extrapolation, Hubbert's Peak theorizes that the Earth as a whole will exhibit the traits [i], [ii], [iii], and [iv]. Note that Hubbert's Peak is a quantity of output rather than a price of output graph.

If Hubbert's Peak is an accurate theory, then a salient question for us today is: Where is the Earth on that normal curve of maximum feasible extractable oil? Is Earth [a] well to the left of the peak, [b] near the peak, or [c] well to the right of the peak? [20] In short, which expectations are rational expectations given demand forecasts predicated upon globalization, urbanization, and economic development of populations multiple magnitudes greater than the existing populations in developed nations?

If one assumes a constant technology of extraction, then the cost of extraction per unit of output will increase continually as one moves away from a position at [a] well left of the peak and moves past [c] and to complete exhaustion of the Earth's supply of oil. That is, with a given technology, the easier-to-extract sources will be exploited first. As one relaxes the assumption of constant technology the cost of extraction per unit of output might decrease relative to the past; but, as that "new" technology is continually applied its absolute advantage will decrease and the cost of extraction per unit of output will once again start to increase. Assume technology continually increases. At some point, the laws of physics will terminate technological improvement. We might or we might not reach the pinnacle of feasible technology. However, let's assume we do reach the very best technology for extraction that ever could exist, then temporary cost reductions will end and the future will only contain the prospect of increasing cost of extraction. [21] If there is a finite supply of oil, then technology cannot solve the problem of a finite supply.

Technology can offer the hope of a new substitute for oil. However, a new substitute for oil will be difficult since oil has a relatively high energy density as well as being relatively portable. [22]

All agree that worldwide demand for oil has increased tremendously in the last several decades. All agree that the annual maximum feasible output could increase from present levels, especially if all regulatory constraints were removed. However, all agree that engineering concerns constrain the world economy's annual maximum feasible output. For instance, it is feasible to increase the speed of extraction, but that speed comes at the price of *reducing* the maximum feasible total extraction (i.e., a greater fraction of the original total becomes unrecoverable). [23]

Finally, all agree that prior to the December 2007 official start of the Great Recession worldwide demand was threatening to exceed the ideal rate of production. That is, global demand, rather than domestic demand, was at least one major pressure prompting speculators to drive up the price of crude oil. With globalization the USA economy has shifted towards services and away from production of goods. This shift has contributed to reducing the USA's BTUs per real dollar of GDP by over 30 percent between 1982 and 2002. [24]

If Hubbert's Peak is an accurate theory, and if the world's aggregate consumption of oil, given existing technologies plus reasonably forecasted technologies, places the world at [b] near the peak annual extraction, and if the world's demand for oil continues to increase, then in the near future physical demand will exceed physical supply. That imbalance can only be eliminated via the rationing function of prices. Given that energy consumption patterns spring from a history predicated upon abundant and low cost oil inputs, the economic disruption of scarcity and/or high oil prices will be of large magnitude and sustained duration. The duration of disruption will be dependant upon the duration consumers of oil are tethered to existing capital investments and existing consumption habits. That is, in the short run, the physical demand for oil will be relatively inelastic which will foster price spikes to force the rationing function of prices. [25]

Could rational expectations related to Hubbert's Peak cause and trigger a price spike prior to the onset of the Great Recession? It would seem that the answer is unambiguously “yes”, and that is so even with zero environmental regulations.

Marxsen's approach is not totally inaccurate. Marxsen's hostility to environmental regulations denies him the opportunity to hear the canary in the mine. At the margin, environmental regulations do retard (from the firm's perspective) business investments in profit generating capital. At the margin, environmental regulations foster (from the society's perspective) business investment in value generating capital. As we hope we have shown above, the impact of environmental regulations on capacity is not absolutely large. Marxsen asserted it was large. However, the singing of the canary in the mine is becoming spotty. The spot market price is spiking; not because of environmental regulations *per se*, but because environmental regulations moved the reactive margin closer to today's market.

## Evaluating Environmental Regulation

Clearly we have reason to be skeptical of Marxsen’s thesis that environmental regulations are the reason, or even a major catalyst, for the current economic downturn. We also are skeptical as to the degree to which such regulations are, as Marxsen describes, “excessive.” In order to make such a claim, it is necessary to both demonstrate want an “appropriate” degree of regulation is and establish convincingly that the existing degree of regulation exceeds the appropriate level. There is little, in any, such analysis in Marxsen’s paper.

To clarify this point, consider the following. Shurtleff and Burnett (2007), cited in, and discussed by Marxsen, state that the oil industry has spent over $100 billion to comply with environmental regulation between 1992 and 2001. Clearly, that sum is more than a mere pittance. Moreover, they assert that 25 percent of capital investment by oil companies is directed towards environmental compliance. This information, as presented by Marxsen, might lead one to conclude that these amounts represent misdirected investment on the environment that could have been directed towards more productive activities. Surely, firms could have found investment opportunities for these funds that would have generated profits beneficial to shareholders, employees and other stakeholders. However, compliance expenditures may have *social benefit*. As we’ve suggested earlier, if refinery activity generates any negative externalities, then there is economic justification for some form of intervention such that the prices of refinery products increase and refinery production decreases.

The only way to assess the degree to which environmental regulation is excessive or not, hinges on a careful calibration of both costs to industry (which Marxsen stresses) and benefits to society (which Marxsen appears to set aside).

For instance, as suggested by Shurtleff and Burnett (2007), that about $10 billion is spent per year on environmental compliance. According the US Census, the petroleum refining industry earned $167 billion in revenue in 2002. Hence, the oil industry spent roughly 6 percent of revenues on environmental compliance. Whether or not this is excessive investment really depends on whether the external costs of pollution meet or exceed 6 percent of refinery revenues. If so, then one could effectively argue that $10 billion a year on environmental compliance either is at least efficient.

At the end of the day, while the impact any given policy on the business cycle is interesting to think about, the efficacy of policy should be evaluated based on accurate tabulations of benefits and costs. It is, to be sure, difficult at best to measure such external costs and benefits and we here are not suggesting that current US environmental policy necessarily reflects correct tabulations. Our point is simply this. Before we indict any policy as being excessive, or a group of interested stakeholders as zealots, it is incumbent upon economic researchers to supply an effective measure of both costs and benefits of such policy. Such empirical analysis is missing in Marxsen's analysis.

## Conclusion

In summary, it is simply not clear that Marxsen has made the case that environmental regulation is either excessive or made the case that environmental regulations are the reason, or even a major catalyst for, the current economic downturn. Again, it is interesting to think about, but much more research is needed to clarify they efficacy and consequences of environmental regulation.

## Footnotes

[1] Marxsen, C. 2010 "Fabricating the Doomsday Crisis", BQuest, this volume.

[2] http://www.clubofrome.org/eng/about/4/ .

[3] The Business Cycle Dating Committee of the National Bureau of Economic Research met at the organization's headquarters in Cambridge, Massachusetts, on April 8, 2010. The committee reviewed the most recent data for all indicators relevant to the determination of a possible date of the trough in economic activity marking the end of the recession that began in December 2007. The trough date would identify the end of contraction and the beginning of expansion. Although most indicators have turned up, the committee decided that the determination of the trough date on the basis of current data would be premature. Many indicators are quite preliminary at this time and will be revised in coming months. The committee acts only on the basis of actual indicators and does not rely on forecasts in making its determination of the dates of peaks and troughs in economic activity. The committee did review data relating to the date of the peak, previously determined to have occurred in December 2007, marking the onset of the recent recession. The committee reaffirmed that peak date." This report was issued April 12, 2010. http://www.nber.org/cycles/april2010.html.

In the 10 business cycles completed following the Great Depression and prior to the Great Recession, the contractions ranged from the shortest of 6 months and the longest of 16 months, with a mean of 10 months. As of April 2010 the Great Recession contraction stands at 29 months. See http://www.nber.org/cycles.html. Multiple other metrics of the magnitude of contraction (e.g., lack of recovery of jobs) also earn the appellation the Great Recession.

[4] For example, see, Figure 2.

[5] There are many examples that support this. Consider the following quotations from a variety of articles (listed below): "The mortgage lending operations of Washington Mutual Inc., the biggest U.S. bank ever to fail, were threaded through with fraud, Senate investigators have found."

"The panel said the bank's pay system rewarded loan officers for the volume and speed of the subprime mortgage loans they closed on. Extra bonuses even went to loan officers who overcharged borrowers on their loans or levied stiff penalties for prepayment, according to the report being released Tuesday by the investigative panel of the Senate Homeland Security and Governmental Affairs Committee."

"Senate Probe Finds Fraud in WaMu Mortgage Lending", Associated Press, *New York Times*, April 12, 2010. http://www.nytimes.com/aponline/2010/04/12/business/AP-US-Washington-Mutual-Investigation.html

"Goldman Sachs, the Wall Street powerhouse, was accused of securities fraud in a civil lawsuit filed Friday by the Securities and Exchange Commission, which claims the bank created and sold a mortgage investment that was secretly intended to fail."

[6] Note in January 1986 the S&P 500 was at 212 and had risen so that the S&P 500 was 1,320 in December 2000. Recall, the crash was in October 1987 and that S&P's time local peak was 1,518 in August 2000. Roughly, the S&P 500 offered provided 30 percent return per year in the period of no new refinery locations cited by Marxsen. Are environmental regulations the sole determinant of the opportunity costs confronting a firm?

http://finance.yahoo.com/q/hp?s=^GSPC+Historical+Prices

[7] Consider the following: "Exxon Mobil finished a roller-coaster year in the oil markets with an all-time record $45.2 billion in profits, despite fourth-quarter earnings that were a third lower than the same period a year before.

"With oil prices slumping, Exxon Mobil suffered a sharp drop in profits from producing oil and gas but higher profit margins at refueling pumps and refineries overseas helped offset the impact of lower crude prices.

"The world's most far-flung oil giant broke its own record for corporate profits in a year that saw oil prices climb to $147 a barrel in July then plunge to less than $40 a barrel. Despite falling prices, Exxon Mobil still beat analysts' expectations by registering $7.82 billion in profits, or $1.55 a share, for the final quarter of the year. Exxon Mobil and Chevron's revenue combined for 2008 exceeded the gross domestic product of all but 16 of the world's nations, according to Bloomberg."

Mufson, Steven. "Exxon Roars To Record In Oil Slump: Annual Profit Soars Despite Slip in Quarter", *Washington Post*, January 31, 2009.

[8] Of course, the relative effect of scale economies versus environmental regulation in inhibiting entry (or capacity expansion) is an empirical question that is completely un-addressed in Marxsen's analysis.

[9] Recall, Marxsen asserts as axiomatic that all environmental regulations are excessive. Accordingly, if one grants Marxsen that axiom, then all of the environmental regulation induced component of that seasonal supply constraint and concomitant price surges are to be ascribed as the fault of the environmental regulations.

[10] Further, do note that the price spike that Marxsen attributes to excessive regulation requires an interplay between legislation and executive enforcement. In Figure 2 note particularly that date range of this price spike. Marxsen's argument rests upon acceptance of the proposition that the administration of President George W. Bush (i.e., from January 20, 2001 through January 20, 2009) was a period of over zealous enforcement

of the environment regulations of the oil industry. Rarely have the detractors of Bush43 leveled that charge against his administration.

[11] "U.S. Refining Capacity, 1982 and 2002". This data can be obtained directly at http://www.eia.doe.gov/emeu/finance/mergers/refcap_tab2.html.

[12] Do recall that Marxsen did not choose to explore whether there was a market failure of monopoly power exercised that drove up gasoline prices. Also, recall, as we noted above, the refinery industry tends towards concentration due to high fixed costs attributable to engineering requirements of refineries; and, that we noted that compliance costs were likely to be disproportionately fixed costs rather than variable costs, which also would favor increased concentration. A 39.5 percent reduction in refinery locations coupled with a 2.5 percent reduction in total refinery capacity is consistent with increased concentration and increased likelihood of monopoly power available to remaining firms.

[13] "Weekly U.S. Refinery Operable Capacity (Thousand Barrels per Day)". http://tonto.eia.doe.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WOCLEUS2&f=W.

[14] Oddly, Marxsen does not stress the potential for private action increasing efficiency of available capacity.

[15] "U.S. Product Supplied of Finished Petroleum Products(Thousand Barrels per Day) http://tonto.eia.doe.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mtpupus2&f=m

[16] "U.S. Product Supplied of Crude Oil and Petroleum Products (Thousand Barrels per Day)". http://tonto.eia.doe.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mttupus2&f=m.

[17] "U.S. Imports of Finished Petroleum Products(Thousand Barrels)" http://tonto.eia.doe.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MTPIMUS1&f=M.

[18] However, there is reason to believe that global demand for crude oil did grow faster than global production of crude oil, thereby creating an upward pressure on price. This, as we show below, maybe the primary culprit in escalating energy costs.

[19] See Hubbert (1956). Also, Dreffeyes (2005) offers a clear review of Hubbert's theory.

[20] As far as the accuracy of oil extraction and production forecasts based Hubbert's model are concerned, it's difficult to assess with current data. However, in 1956, Hubbert did apply his model to the US and predicted that US oil production would peak in the early 1970s. With US production peaking in 1970, his prediction was stunningly accurate (see Dreffeyes, 2005, p. 41).

[21] This analysis solely looks at the seller's internal costs. The seller's internal costs are not the only determinant of market price. Relative scarcity of the item to be sold also influences market price.

[22] To grasp the magnitude of the difficulty of the required discovery one need merely look at electric battery research. There is a huge demand for high density power: both portable and not portable. Renewable energy sources like solar and wind would become vastly more practical when coupled with a storage capability. Electric cars currently labor under a huge dead weight loss due to carrying heavy (read: low energy density) batteries. But, that demand can not be met because of technological constraints. It is not regulation nor finance, but rather science that is hindering market access. Decades of research, by thousands of researchers, expending billions of dollars, has not made that discovery. Can that discovery be made? That depends upon physics and chemistry far more than economics. To be sure, major advances have been made for the smallest scale batteries (e.g., cell phone). But, for many decades, the holy grail of batteries capable of replacing it not immediately forthcoming. http://web.mit.edu/newsoffice/2006/batteries-0208.html. For further discussion along these lines, see: http://en.wikipedia.org/wiki/List_of_fictional_elements,_materials,_isotopes_and_atomic_particles.

[23] There are also non-engineering concerns. Indeed, it is generally accepted that the expected net-present-value of an existing inventory is maximized with an extraction rate that is less than the maximum feasible extraction rate. This is because the dollar value of the resulting flow of oil needs to be aligned with the owner's ability to profitably absorb an inflow of cash values. In short, the engineering maximum (much like capacity utilization) rarely is the ideal rate of output.

[24] See, "Table 1.5 Energy Consumption, Expenditures, and Emissions Indicators, 1949-2008" by the USA DoE, EIA. http://www.eia.doe.gov/emeu/aer/txt/ptb0105.html

[25] A relatively long short run can be expected since some capital investments are large relative to the owner's income and wealth as well as lack close substitutes in the eyes of those stranded owners (e.g., personal automobiles versus city buses versus bicycles).

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