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Oil and the economy: A systematic review of the literature for ecological economists

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ABSTRACT

This article offers a systematic review of the mainstream literature in oil economics, macroeconomics (international and financial economics) and political economy, complementing and complicating the way ecological economics understands the links between oil and the economy. We look at the supply and demand factors that affect oil prices; the ways oil prices affect the economy; the effect of interest rates, capital flows and exchange rates on oil prices and extraction; and the role of (geo)politics in governing oil and money flows. We develop an illustrative system model of the causal pathways that link oil and the economy and compare alternative explanations of the oil price shocks of the 1970s and 2000s. The emphasis of ecological economics on peak oil and resource limits to growth may be relevant over the long run, but is less capable of explaining precisely how oil contributes to concrete economic short-run crises now.

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The current (2008) financial debacle is not a 'liquidity' crisis as it is often euphemistically called. It is a crisis of overgrowth of financial assets relative to growth of real wealth ... Can the economy grow fast enough in real terms to redeem the massive increase in debt? In a word no ... Growth in US real wealth is restrained by increasing scarcity of natural resources, both at the source end (oil depletion), and the sink end (absorptive capacity of the atmosphere for CO₂).

[Herman Daly (2014, p. 211)]

Peak oil also contributed to the current crisis. The spike in oil prices to greater than \$140 per barrel and the spike in gasoline prices it caused was a trigger to expose the house of cards that the housing market had become. The recession eased demand and brought oil prices down, but if the stimulus packaged work, then demand will outstrip supply again, another oil price spike, and another recession.

[Robert Goodland (2016, p. 42)]

The present economic crisis is not only a financial crisis, and it was not caused only by a supply of new houses in the United States that exceeded the demand that could be financed sustainably. It was also caused by high oil prices. The stock exchange started to drop in January

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2008 but until July 2008 the price of oil kept increasing. As the crisis deepened, the price of oil went down but it recovered in real terms. There is here an automatic de-stabiliser for the economy. It is difficult to find new oil as we go down the Hubbert curve.

[Joan Martinez-Alier (2016, p.287)]

1. Introduction

In July 2008 the nominal price of oil reached USD 133.40 a barrel, a five-fold (500%) increase from 2002. In September 2008 Lehman Brothers declared bankruptcy, marking the abrupt beginning of a global economic crisis from which advanced economies have not fully recovered. Prominent ecological economists such as Herman Daly, Robert Goodland and Joan Martinez-Alier suggest a direct causal link from peak oil to high oil prices to low growth and economic crisis.

In contradistinction to neoclassical resource or environmental economics, a core thesis of ecological economics is that “increased energy use is the main or only cause of economic growth” (Stern, 2011, 30) and that abundant and cheap energy has been historically a major driver of economic growth (Ayres and Warr, 2009; Cleveland et al., 1984). Peak oil and declining energy returns on energy investment for oil and other primary energy resources (Murphy and Hall, 2010) are then likely to limit economic growth and cause recession (Martinez-Alier, 2016; Tverberg, 2012). Mainstream economics is more optimistic about the capacity of advanced economies to overcome resource limits given technological change and the possibilities of substitution. Ecological economists instead argue that fossil fuels had remarkably high EROIs and substitute energy sources will not be able to sustain contemporary levels of economic output. There are limits also to the substitution of energy by other factors of production (e.g. capital or knowledge); such substitutes require substantial amounts of energy too. Technological change does not alter these limits, since it is just another name for substitution (see review in Stern, 2011). The end of cheap oil, ecological economists argue, therefore will bring the end of the era of dramatic, continuous economic growth.

Ecological economists may be right that limits in oil supply will limit economic growth in the future, but is this sufficient proof that the 2008 crisis resulted from increasing oil scarcity, as Daly, Goodland and Martinez-Alier suggest? The 1970s oil crisis gave birth to the “limits to growth” movement, and to the community of ecological economists. However, by now we know that that crisis had little to do with depletion or ‘running out of oil’ (though domestic peak oil in the US may have arguably contributed to a massive global economic change); the primary causes of the economic dislocation of the 70s were geopolitical and economic (Mitchell, 2011). Today oil prices are low while the global economy grows: is this proof that ecological economists were again too quick to presume that physical oil scarcity was an enduring reality, producing perpetually high oil prices, which in turn caused financial and economic crisis?

Beyond predicting ultimate limits to growth, ecological economics has less to say about the interdependent factors that connect oil and the economy in the short-term, and the role of political and monetary forces. Ecological economics for example is mute on how monetary policy, interest rates, or capital flows affect resource markets and resource use. It treats these factors as epiphenomena, a “virtual economy” top resting upon the base of the “real-real” economy of biophysical stocks and flows (Daly, 2014; Martinez-Alier, 2016). We believe, however, in the spirit of Keynes, that the financial economy is integral to the understanding of the physical economy; we find it useful, however difficult, to try to understand and explain the complex interrelationships between resource and money flows, and the role of (geo)politics and power in governing them. Toward this end, this article offers a systematic review of the literature in oil economics, macroeconomics (international and financial economics) and political economy, complementing and

complicating the way ecological economics understands the links between oil and the economy.

An oil price shock preceded all but one of the eleven U.S. recessions since World War II (Hamilton, 2012). Fig. 1 illustrates the direct correspondence between high oil prices (indicated here relative to gold prices to distinguish between oil and general price increases) and US recessions. One might deduce from this that a rise in the price of oil causes an economic downturn. Yet oil prices are endogenous to macro-economic conditions (Kilian, 2008), making it hard to infer directionality. In other words, the causation may be inverse: it could be that an economic boom increases the demand for oil and its price and an economic downturn reduces it. Or it might be the case that both oil prices and economic output respond to some third variable, such as interest rates, capital flows or a structural or policy change. Interest rates and capital flows—or oil investment, extraction and trade—are not pure market outcomes; they are influenced, if not determined, by politics and geopolitical relations.

This paper sets out to enrich the standard causal model implied by ecological economists, according to which the depletion of oil resources increases their prices and acts as a brake to the economy (Fig. 2). We engage first with the complex mechanisms through which oil prices affect the economy and the evidence that there is in their support (Section 2). Next, we review evidence about the demand and supply factors that influence oil prices (Section 3), before turning to the ways in which capital flows and monetary policies influence prices and extraction (Section 4). Sections 2 and 3 comprise in essence a review of the literature of oil economics, with some focus on Lutz Killian and James Hamilton, two key researchers with some differences of view in certain aspects. Section 4 is a review of the literature in international and financial economics, where the contributions of economists such as Jeffrey Frankel or Ricardo Caballero stand out. Section 5 provides a briefer and more selective review of the complex geopolitics of oil and money flows. Section 6 compares the insights from these different scholar communities and from ecological economics, concluding with key lessons for the latter. We focus not only on the 2008 and 1970s crises, but also on the periods of low oil prices that dominated in the later 1980s and from mid-2014, as well as the early 2000s when prices reached record highs without noticeable effects on the economy.

Three disclaimers: first, this literature review addresses ecological economists with some degree of affinity for the opening statements by Daly, Goodland and Martinez-Alier; our purposes and line of arguing will make less sense to those who take it for granted that there is definitely no peak oil and that an economic crisis has nothing to do with resource limits. Second, this is a selective review: the intention is to enrich the ecological economic model, rather than exhaustively cover all literature on oil. The reader interested in more technical reviews may consult Kilian

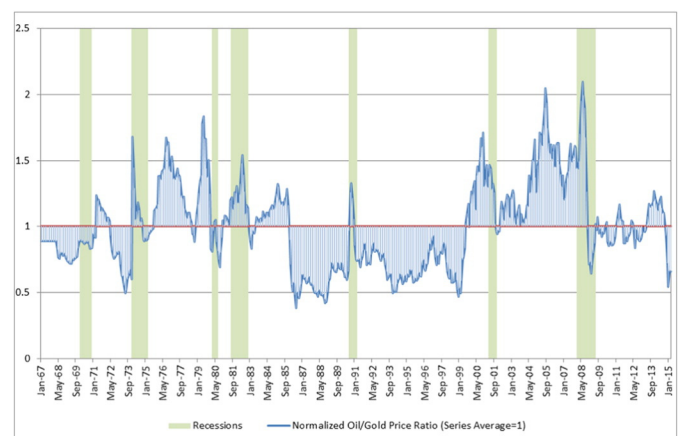


Fig. 1. Oil/gold price ratio, 1967–2015 (normalized), with US recession bars. Source: Sager (2015) from IMF data.

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