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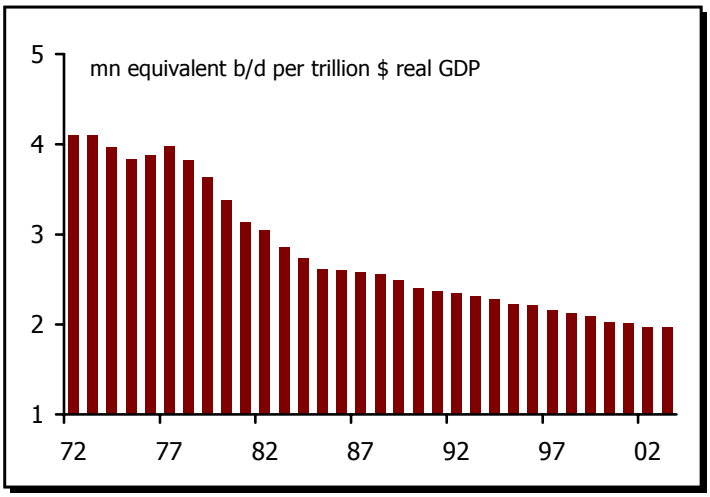
Is the US Economy Really Less Vulnerable to Energy Prices?

Jeff Rubin, Benjamin Tal and Leslie Preston

When it comes to the impact of oil shocks on the American economy, recessions are the norm not the exception. North America suffered its two worst post-war recessions following a dramatic surge in oil prices. Both the 1973 recession and the double-dip recessions in 1979-80 and 1981 are poignant reminders of just how sensitive our economy was to energy prices. Could today's run-up in energy prices take the economy to a similar place?

Most economists would argue no, not only because oil prices have not reached equivalent levels but also because the North American economy is supposedly much less energy intensive than it was in the past. The latter view is bolstered by falling measurements of energy consumption per real GDP. According to that measure the energy intensity of the US economy has fallen by roughly 50% over the last thirty years (Chart 1). If taken at face value, this measure would suggest that the American economy is half as sensitive to higher oil prices as it was during the oil shocks of the 1970s.

Chart 1
US Energy/GDP Ratio



The energy-to-GDP ratio is a convenient catch-all for measuring energy usage, but as is the case in many aggregate measures of economic performance, the cost of simplicity is high. While the ratio seems to give a good overview on general energy efficiency in the economy, a number of studies suggest that it may be of very limited predictive or analytical power[1]. One problem is the composition of the denominator, GDP. When comparing energy use to GDP between 1973 and 2003, we are ignoring the fact that the composition of GDP has changed dramatically. Hence, what we may be attributing to better energy efficiency may simply be a shift in favour of less energy-intensive industries in the make-up of GDP. A second problem arises from the aggregation of energy uses across different sectors, suggesting a homogeneity that masks fundamental differences in energy usage.

If instead of looking at the ratio of energy-to-GDP, we focus on energy consumption per household, we get a very different outlook on the economy's potential vulnerability. Particularly if we use the consumer expenditure survey to get a handle on household energy consumption, instead of the National Accounts data. In fact, most micro-based studies on energy usage prefer this data, as does the Bureau of Labor Statistics, which uses this more accurate measure in setting the expenditure weights for the CPI.

We may well consume energy more efficiently than in the past, but that doesn't necessarily mean we consume any less of it. In fact, on average, American households consume about 10% more energy than they did twenty-five years ago.

Residential Use Dwarfs Efficiency Gains

Residential usage accounts for more than one fifth of total energy usage in the US economy. Space heating and cooling are the largest single drivers, followed by water heating and lighting. American households have become more efficient in all of these uses of energy. Thermal insulation is far superior to what it was thirty years ago, and many household appliances ranging from air conditioners to furnaces are now subject to minimum efficiency standards.

But does improved efficiency offset the increase in usage? Take air conditioning, one of the biggest energy guzzlers in any American household. Today's air conditioners are about 30% more efficient than those that cooled households in the 1970s. But at the same time, the percentage of American households that have air conditioning has doubled. In other words, usage rose four times faster than efficiency (Chart 2). Not only was usage buoyed by an increasing percentage of households who had air conditioning, but also by the growth in average home size. Since 1970, the average size of a new house increased by 40% from 1500 square feet to 2100 square feet. 30% of new homes are more than 2500 square feet. As home size rises over time, so does the energy needed to heat, cool and light them.

Not surprisingly then, there has been a clear and significant upward trend in residential energy consumption per American household over the last two decades (Chart 3). During this period, actual energy usage by households grew by 27%, while energy usage per household has grown by 10%. Clearly, for at least the residential sector, improved energy efficiency has been more than offset by increased energy usage.

Transportation's Voracious Appetite for Gasoline

Transportation gobbles up a quarter of all energy consumption in the US, with most of it (60-70%) consumed in the form of gasoline. Fuel efficiency in cars is one of the most widely cited examples of improved energy efficiency in the economy. But again, improvements in energy efficiency only tell part of the story. While the gas mileage of individual vehicles has improved, Americans are driving their cars much farther these days. The average miles traveled per vehicle in the US is more than 25% higher than twenty years ago, keeping total motor fuel consumption growing faster than the number of cars on the road.

Not only are Americans driving their cars further, but they have also shown an increasing preference for gas-guzzlers. Light trucks, which include SUVs, vans and pick-ups, have accounted for 80% of the growth in vehicle registrations from 1982 to 2002 (Chart 4, left). In 2002, the average mileage for a light truck was 17.6 miles per gallon, 25% worse than the gas mileage of the average car on the road (Chart 4, right). When you combine the twin impacts of both greater miles traveled per vehicle and the trend towards less fuel-efficient light

Chart 2
Energy Efficiency Lags Usage in Residential Sector

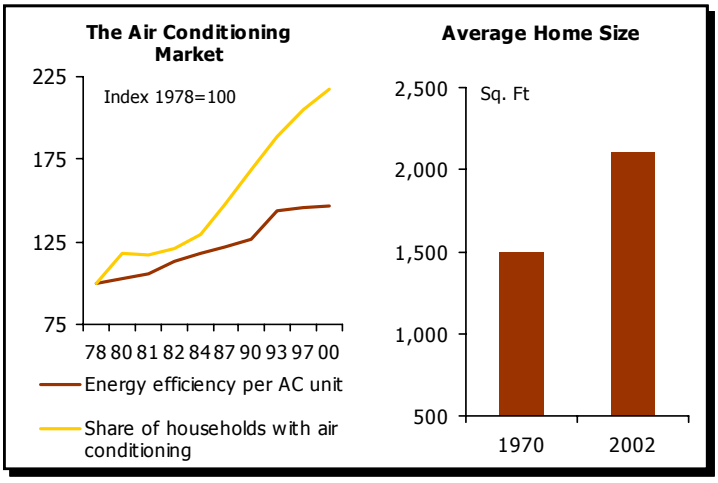


Chart 3
Residential Use of Energy is Rising

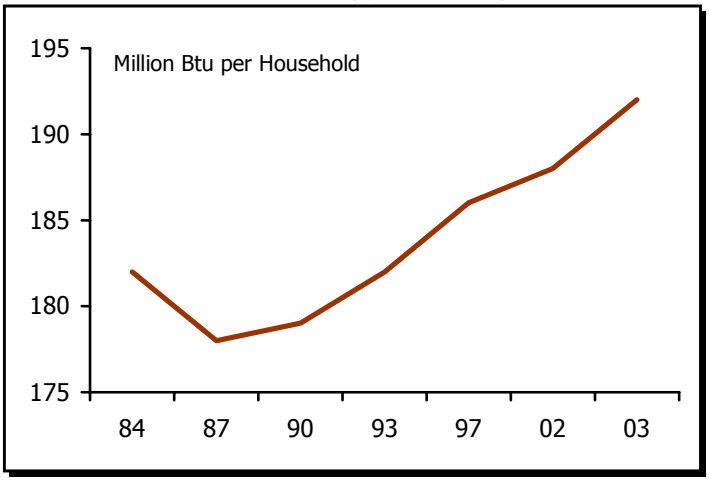
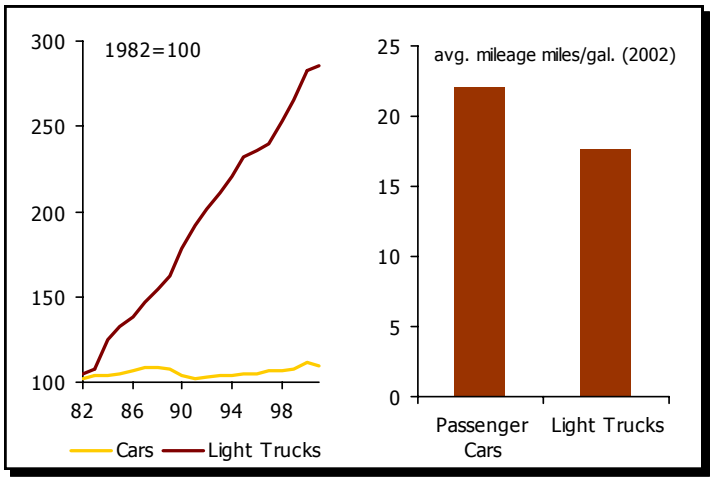


Chart 4
Low Mileage Vehicles Dominate Growth



trucks, you find that the transportation sector is more sensitive to swings in crude prices than it was during the second OPEC oil shock.

What's more, the median household's energy consumption on residential and transportation usage has not fallen as a percentage of household income[2]. From a behavioural standpoint, this is an important finding given how price-inelastic demand for energy is in the short-run. If the amount of energy typical households consume is, in the short-run, fixed, rising crude prices will act as a tax on non-energy spending by eating up more and more disposable income. How much of a brake this poses for consumer spending depends on how much of their income is spent on energy. And as of last year, median US households spent no less as a percentage of their income on energy than they did twenty years ago (Chart 5).

Industrial Usage Shifted Offshore

Ironically, the only area of the US economy that is less energy intensive today than it was in the 1980s is precisely the sector that most people think will be most affected—industry. The industrial sector's share of total energy usage has fallen markedly over the last twenty years, plunging from just over 40% in 1980 down to just above 30% today (Chart 6). However, even here, the apparent increase in energy efficiency is significantly overstated by underlying structural change in the composition of American industry. Many energy-intensive industries have migrated offshore in search of much lower wage rates overseas. They have been replaced by more knowledge-intensive industries that do not have the same heavy energy requirements. Consequently, high energy-intensive industries in the US have grown at only 1.7% a year over the last decade, compared to almost 6% average annual growth in low energy-intensive industries. As a result, big energy users as a share of total manufacturing output, fell from 45% to 35% in the last decade (Chart 7, left).

Much of this slower growth in energy-intensive industries in the US finds its counterpart in much more rapid growth of energy-intensive industries elsewhere, and in particular, China (Chart 7, right). For example, primary metal production in the US fell by an annual average rate of 2.3% over the last five years, while the same sector grew at an annual average rate of over

Chart 5
Energy Spending as a Share of Household Income

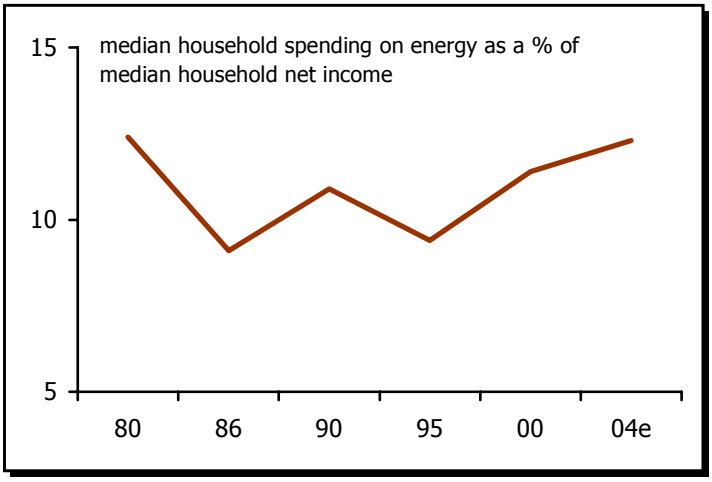


Chart 6
Energy Consumption: Industrial vs Non-Industrial Usage

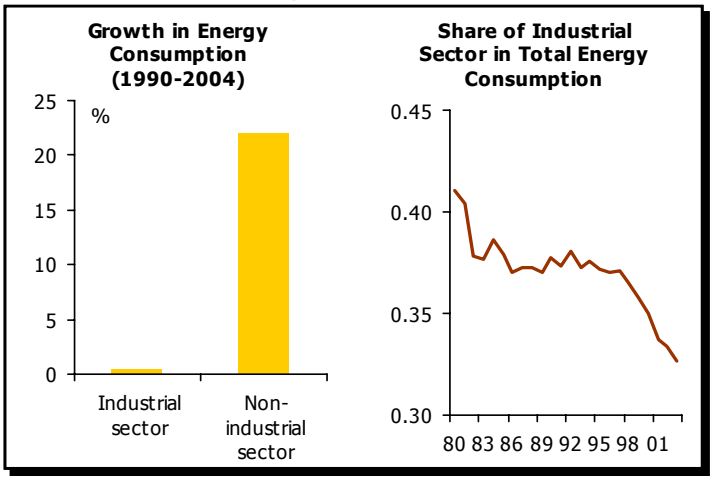


Chart 7
US Shifting Energy Intensive Production

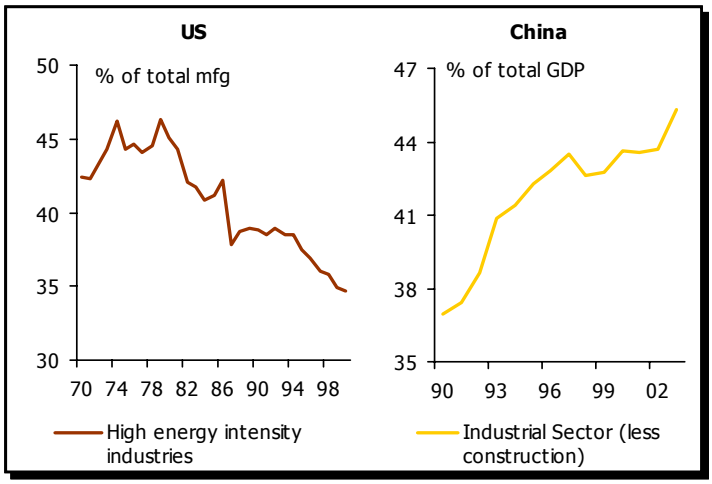
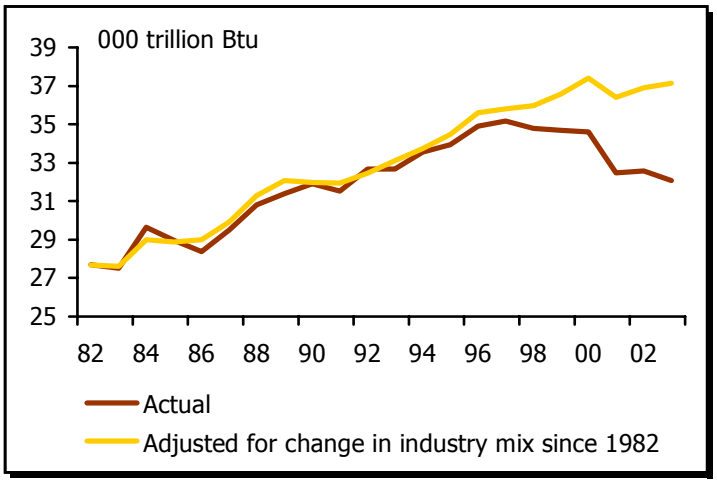


Chart 8
Energy Usage in US Industrial Sector



30% in China. Ditto for chemical production, which has averaged only 2.8% growth in the US compared to more than 15% in China.

In fact, if we hold the industrial composition of the US economy the same, as has been done in many input-output studies of the subject[3], we find that there has been no decline in energy usage but rather a significant increase—mainly in the past ten years (Chart 8).

The widely held view that the US economy is half as sensitive to higher oil prices as it was during pervious oil shocks simply does not jive with the trends in US energy consumption found here. Only one sector/ industry appears less vulnerable and that is due to compositional change. At the same time, residential and transportation usage of energy has made the economy more vulnerable.

Moreover, the median household spends no less of its income on energy than it did 25 years ago. Energy efficiency is fast improving, but energy usage is rising even faster. And while energy-intensive goods are no longer as likely to be made at home, the energy costs imbedded in their manufacture will still be borne by American consumers.

Notes:

1. *See for example Schipper, L 1997, "Indicators of Energy Use and Efficiency", IEA*
2. *Here we used Consumer Expenditure Survey data by relating median household energy consumption to median household net income. This approach is consistent with the micro framework adopted in this article, and in our view is much more appropriate than the widely used national account-based energy usage to income ratio.*
3. *See discussion in S. Murtishaw (2001) "Untangling Recent Trends in U.S. Energy Use. Washington, D.C.: U.S."*