

Comments

Thad Dunning: Academic perspectives on the effects of commodities booms have changed sharply in the last several decades. To analysts of the 1970s, a sustained petroleum boom implied an unwelcome source of inflationary pressure for oil-importing countries, at a time of slowing economic growth. Yet it seemed common sense that an oil boom could only boost the fortunes of petroleum exporters. During the oil-price shocks of the 1970s, some analysts even foresaw the twentieth century's largest transfer of wealth from developed to developing countries.

By the 1990s, scholars had begun to question the economic benefits of these oil shocks. Jeffrey Sachs and Andrew Warner, among others, presented research showing that the resource-rich countries had grown less, not more, than similar resource-poor countries.¹ In another influential early discussion, Terry Lynn Karl asked why, "after benefiting from the largest transfer of wealth ever to occur without war . . . have most oil-exporting developing countries suffered from economic deterioration and political decay?"² The answer seemed to be that a massive flow of natural resource revenues into the fiscal coffers of the state engendered perverse economic and political effects. Not only did natural resource booms cripple nonresource export sectors and inhibit various forms of productive economic activity, but they also fostered corruption, weakened accountability, and heightened incentives for rent seeking. The idea of a resource curse has gradually solidified into nearly conventional wisdom among political economists.

Lederman and Maloney take aim at this conventional wisdom. They identify significant problems with the copious literature on the resource curse, in terms of both theory and data, leaving us with a wide range of possibilities

1. Sachs and Warner (1995b).
2. Karl (1997, p. xv).

about the true effects of natural resources. One possibility is that natural resources hurt economic growth (along with democracy, transparency, peace, and other desirable outcomes); a second is that they help growth; a third is that they have little effect on growth one way or another. A fourth possibility that may be consistent with each of the first three is that the effects of resources are highly conditional—that is, whatever the central tendency or average of the distribution of the effect, there are conditions under which natural resources may enhance growth and conditions under which they will inhibit growth. Lederman and Maloney step energetically into this slew of possibilities, summarizing a large body of literature, contributing several different ideas, and estimating many of the conceivable econometric models linking natural resources to growth.

There are at least three main lessons to draw from their paper and their previous related work, in my view.³ First, findings in the previous econometric literature on the resource curse are not very robust. One of the earliest and most influential set of papers in that literature comes from Sachs and Warner, who find that natural resource exports as a percentage of GDP are negatively related to growth in both cross-sectional and time-series cross-sectional data.⁴ Sachs and Warner's independent variable is gross resource exports over GDP; consequently, resource transshipment points like Singapore and Trinidad and Tobago look like major exporters in the data. To deal with this, Sachs and Warner set the value of exports over GDP to zero for those two countries, without adjusting the values for other countries. In their earlier work, Lederman and Maloney show that Sachs and Warner's result does not hold when a measure of net resource exports over GDP is used in place of gross exports over GDP. Nor does it persist with the original unadjusted gross export measure, once the two excluded countries are included. In particular, the case of Singapore, with high exports over GDP and also high growth, appears hugely influential.⁵ They further show that Sachs and Warner's results are not robust to the inclusion of country fixed effects, suggesting a weak within-country relationship between natural resource exports and growth. While this could admittedly be due either to the relatively short time periods involved in the estimation samples or to the relative lack of within-country variation from which to identify the relationship of interest, it also suggests that omitted time-invariant, country-specific factors could be driving the result.

3. See Lederman and Maloney (2007a).

4. Sachs and Warner (1995b, 1997a, 1997b).

5. Lederman and Maloney (2007a); Sachs and Warner (1995b).

In their current paper, Lederman and Maloney emphasize the difficulty of finding good proxies for resource abundance. The early literature on the resource curse clearly did not use appropriate measures; for one thing, most of the measures are patently not measures of resource abundance, but rather measures of economic dependence on natural resources. This is true both for measures of resource exports as a percentage of GDP and for resource exports as a percentage of total merchandise exports. With alternative measures, such as resource exports normalized by population or by the number of workers as in the current paper, the negative relationship between resources and growth appears substantially attenuated. The econometric results in the previous resource curse literature thus appear quite fragile—shockingly fragile in fact, given the disproportionate influence of this literature on policy and in scholarly circles.

Lederman and Maloney's second main point is that natural resources may affect growth through a wide range of mechanisms. The authors lay out an aggregate production function for a two-sector economy, in which output in the nonresource sector is a function of labor and a productivity parameter, while output in the resource sector is a function of labor, the resource capital stock, and a productivity parameter for that sector. Totally differentiating this production function with respect to the resource capital stock yields useful observations about the variety of ways through which resources may shape output. For instance, resources may influence productivity in the nonresource sector as well as the resource sector, or they may affect the allocation of labor across sectors. They also directly and positively affect output, because total output is an increasing function of output in the resource sector, which in turn is an increasing function of the natural resource capital stock.

In this context, the claim that there is a natural resource curse amounts to the claim that the partial derivatives of productivity with respect to the resource capital stock and of the size of the resource labor force with respect to the capital stock are negative, and that these effects outweigh the positive marginal effect stemming from the fact that output increases in resource capital. These various partial derivatives have natural interpretations in light of the previous literature on the resource curse. For example, the (possibly negative) partial derivative of productivity with respect to resources can be conceived in terms of institutions or the effect of resources on rent seeking, as in the voracity effect.⁶ The effect of resource endowments on labor reallocation

6. Tornell and Lane (1999).

can be thought of as a Dutch disease effect. Simply specifying an aggregate production function and totally differentiating it with respect to capital therefore suggests a variety of mechanisms through which resources can shape growth.

The story may be even more complex than Lederman and Maloney suggest, because there are so many different channels through which resources might affect, say, productivity. Resources may shape rent seeking, but they could also influence the extent of taxation, the nature of spending on public goods, and other fiscal policies. The nature of these effects may, in turn, depend on large-scale institutions, like the political regime, or subtler institutions; much work in political economy emphasizes that these institutions may also be shaped by resource endowments in a multiplicity of ways.⁷ While Lederman and Maloney's total differentiation of a simple production function suggests several channels through which resources may affect growth, it may only begin to scratch the surface. Still, as a device for organizing thought, the approach is useful. In particular, it makes evident that the claim that the total or net effect of natural resources on growth is negative amounts to the claim that the negative partial effects outweigh the positive partial effects.

A third and final lesson to draw from this paper is that whatever the central tendency—that is, the average causal effect of natural resource endowments on growth—there may be substantial heterogeneity of treatment effects. In quantile regressions, the authors find different relationships between resources and growth at different quantiles of key conditioning variables; they also suggest that there may be substantial heterogeneity in effects across world regions.

Understanding the sources of these heterogeneous effects seems quite important. Lederman and Maloney focus mostly on the average effect of natural resources and growth. The average effect is surely an important parameter for both social-scientific and policy purposes, but the heterogeneity may be even more important. By way of analogy, the disciplines of political science and political economy have undertaken substantial efforts to understand heterogeneity in the effects of natural resources on democracy, violent conflict, corruption, and other political outcomes. Theoretical work in this vein suggests reasons why effects may differ and even change signs under different conditions and why these conditions may be proxied by, say, regional

7. Ross (2001); Dunning (2008a).

dummies. For instance, there may be reasons to believe that the authoritarian effects of natural resources are significantly lower than, and may even be outweighed by, the democratic effects of resource endowments in a region like Latin America. Could the same be true of the effects on growth? By contrast, are there other structural conditions under which the effects of resources would be substantially more negative? There is little in the paper in the way of empirics and even less in the way of theory to guide an inquiry into this topic.

In sum, Lederman and Maloney provide a framework that helps one think about the different channels through which resource endowments could shape growth. For instance, they contrast the direct, positive effects of resources on output with the indirect, possibly negative effects of resources working through productivity parameters or labor force allocation. It would be useful to know, as a theoretical as well as empirical matter, when each of these effects might be stronger or weaker. The authors take steps in this direction by looking at constraints on the executive, though one could imagine estimating a fuller set of interaction models in which the effect of resources is conditioned on executive constraints. The recent political economy literature suggests an array of other conditioning variables that should also affect the more proximate channels that Lederman and Maloney identify, including the political regime (the growth-relevant features of which go well beyond constraints on the executive), civil conflict, and so on. What is really lacking at this point is a deeper theoretical framework that would link the effects of natural resources to the mediating influence of this broader set of institutions. Lederman and Maloney provide an important starting point, contributing to an emerging research agenda that may lead to a deeper understanding of the conditional effects of natural resources.

Cameron A. Shelton: The paper by Daniel Lederman and William Maloney is part of a larger project of the authors.¹ Their broader goal is to drive home the point that the possession of natural resource wealth does not inevitably lead to lower growth rates and thus lower per capita GDP. In their words, “the central tendency is not negative” and natural resources are neither curse nor destiny.

1. See Lederman and Maloney (2007a).

Focus on the Conditional Effect

The authors identify four commonly discussed channels through which natural resources affect growth: secular decline in the terms of trade for natural resources; few beneficial spillovers (that is, human capital accumulation, technological spillovers, and productivity growth) generated by primary sectors; Dutch disease (in combination with the first two channels); and political institutions. The section on “clarifying the curse” then places different resource curse hypotheses into the context of a simple two-sector model. This helps relate these hypotheses to the standard cross-country growth regressions framework and, by nesting these models, enables intelligent simultaneous discussion of the multiple channels identified above.

The authors (and the contributors to this edited volume) have done a good job casting doubt on the first three channels by demonstrating that the results from Sachs and Warner and others, who contend that natural resource abundance is associated with poorer growth performance in the cross-section, are not robust to a variety of measures, techniques, and samples. Furthermore—and on this point a broad swath of the world’s population will no doubt agree for the moment—there seems to be little evidence of a long-range secular decline in primary sector prices.² The evidence of poor technological progress and few spillovers in primary sectors is inconclusive and does not seem to apply broadly across all or even most countries and sectors. Finally, as the authors point out, it is difficult to understand how Dutch disease—which implies that natural resources gain a share of domestic labor at the expense of manufactures and other export sectors—would be a problem for growth unless either of the first two channels holds.

If the mean effect of natural resources on growth is not robustly negative, then the ball is back in the court of those suggesting a curse. That ball has already been played, however. As the authors note, the resource curse literature has evolved and speaks now of a conditional resource curse; the current quest is to understand the conditions under which natural resources lead to counterintuitive poor performance rather than robust growth.

Lederman and Maloney argue that if the central tendency is positive—if, on average, countries with natural resources perform better than their

2. See Cuddington, Ludema, and Jayasuriya (2007).

resource-poor counterparts—then talk of a resource curse can be dismissed. They suggest that any industry may develop successfully or poorly as a result of other internal factors, so natural resources are no different than semiconductors or fashion.

I take a different view. My feeling is that whether or not the central tendency is positive, the large negative tail—those countries where natural resource wealth has led to growth collapses or prolonged stagnation—is of interest. There is now a great deal of careful and convincing evidence that natural resource wealth is intimately and causally connected to the poor growth performance of several countries. This alone belies the notion that “natural resource wealth is wealth nonetheless” and distinguishes the natural resource sector from the semiconductor or fashion industries. There are several distinguishing features of the natural resource sector: the volatility of prices and the relative magnitude of the sector for many countries imply huge swings in revenues, and the concentration of the rents and hence the ease of their control means these bonanzas are often funneled into the public coffers, invoking all the attendant complexities of public decisionmaking and the added risk of a single decision. In theory, other sectors could exhibit these characteristics; in practice, it is hard to think of any that do.

Consequently, exploring the conditions under which natural resources lead to good or bad performance is probably more important than proving the central tendency to be positive.³ It would more likely lead to useful policy implications. The authors have prepared us well for this task by pointing out one of the upcoming econometric difficulties.

Natural Resources as a Test of Institutions

The most promising explanations for natural-resource-driven growth collapses focus on interactions between natural resource wealth and institutions of governance. The first such explanation is that natural resource wealth promotes institutional weakness that leads to lower total factor productivity (TFP) or slower TFP growth. The second is that natural resource wealth is mismanaged by weak institutions, possibly leading to macroeconomic crisis and the attending persistent effects on output. The first category would include

3. Which is not to say that this latter is not also of interest. On the contrary, I very much believe that natural resources are not always and everywhere detrimental to growth.

Auty, Ross, Sala-i-Martin and Subramanian, and Isham and others.⁴ Happily, rather than simply making vague appeals to unspecified institutions, these contributions offer intelligent and intelligible arguments detailing the decisionmaking processes in question. While institutions often change only slowly, sudden collapses in institutional quality are not impossible. This channel may thus be the result of either continued extraction of riches or a sudden bonanza caused by discovery or, more likely, a jump in the commodity price.

Given that natural resources constitute a large share of GDP in some countries, and given that natural resource prices can increase sharply in a short period of time, natural resource bonanzas can lead to huge jumps in government revenues.⁵ The question is whether these revenues will be put to good use, wasted, or allowed to become actively detrimental. This highlights the importance of the institutions of public choice. Natural resource wealth may be simply embezzled by political elites, resulting in little benefit to the development of the economy as a whole (and possibly causing harm by diverting energy toward rent seeking, as per the first explanation above). The bonanza might be even more actively detrimental to growth, however. Tornell and Lane document what they call a voracity effect, whereby a sudden influx of riches leads to a more than one-for-one increase in spending as interest groups demand their share of the windfall.⁶ Because the process exhibits hysteresis—that is, downward adjustments do not occur as quickly—any ebb in the bonanza can lead to fiscal crises as expenditures remain high while revenues collapse.⁷ Alternately, if the bonanza is large enough, the domestic economy may not be able to absorb the additional spending immediately. When the revenue is raised without political cost, the motivation to restrain public expenditures is weak. If the windfall is not adequately smoothed into the future, the sudden influx of public expenditures is likely to be inflationary, since the domestic output of nontradables cannot compete with the sudden surge of demand for them.

4. Auty (2001b); Ross (2001); Sala-i-Martin and Subramanian (2003); Isham and others (2005).

5. Witness not only oil prices in 1973–75, 1979–81, and 2005–present, but also the fact that the price of gold more than tripled over the course of 1979; the price of copper doubled between December 2003 and December 2005 and then doubled again in the next six months to a level that has been sustained for the past two years; and the price of wheat almost quadrupled between January 1972 and January 1974.

6. Tornell and Lane (1999).

7. See Alesina and Drazen (1991).

It seems clear that natural resources provide a test: if spent wisely, they are a source of wealth and even innovation; if spent poorly, they can lead to fiscal imbalances and a politics rife with corruption, squabbling, and clientelism, which may in turn contribute to future macroeconomic mismanagement. The current hypotheses suggest that countries with good institutions (and good luck) pass the test. Those with poor institutions fail and may do worse in the long run than they would have without the natural resource wealth. At the moment, the literature has something of a more difficult time identifying exactly what makes institutions robustly good. For instance, Venezuela was able to use its oil wealth productively to fuel sustained growth from discovery in 1920 through 1970. Nevertheless, the immense bonanza delivered by the oil price shocks of the 1970s was mismanaged and perhaps led to the economy's sustained growth collapse.⁸ Why were the Venezuelan institutions robust enough to channel the steady flow, but unable to deal with the flood?

Lederman and Maloney state that this second channel is not a true natural resource curse. They acknowledge that a conditional curse may arise from mismanagement, but they argue this is vastly different than the specter of the resource curse; it simply represents poor macroeconomic policy. Again, I take a slightly different view. In those cases where the test is failed, the growth performance would presumably have been better in the absence of natural resources. It is therefore correct to view natural resources as one of the causal factors. Perhaps the language ought to be moderated to acknowledge the concomitant opportunity and danger.

The results in both this paper and their edited volume actually dovetail well with this notion of natural resources as a test for the political institutions. The findings of Manzano and Rigobon—that the curse operates through debt-overhang—essentially support the voracity effect.⁹ The quantile regression results of this paper clearly demonstrate that the growth effects of natural resources are conditional. Lederman and Maloney find that the richest countries benefited more from natural resources than the poorer countries. The classic derivation of the growth regressions imposes homogeneity of initial TFP and TFP growth. The introduction of institutional measures as additional regressors is an attempt to condition on the predictable components of the underlying heterogeneity in initial TFP. The next step is to identify exactly what is being captured by the heterogeneity, but it is quite possible that this heterogeneity springs from political institutions.

8. See Hausmann and Rodríguez (forthcoming); Moreno and Shelton (forthcoming).

9. Manzano and Rigobon (2007).

The Role of Growth Regressions

One relevant question is whether traditional growth regressions can move forward in addressing this conditional curse. Certainly one can reintroduce heterogeneity through carefully considered interaction terms between measures of institutions and measures of natural resources. There are (at least) two reasons for caution. First, Lederman and Maloney correctly point out that even their preferred proxy for natural resource endowment, net exports of natural resources per capita, is a function of per capita GDP and thus endogenous. Second, there are several reasons to believe that the Heckscher-Ohlin-Vanek (HOV) theorem is violated—that net exports and endowments are imperfectly correlated, even over horizons as long as a decade. Thus, even the authors' improved proxy falls short of the concept.

As the authors note, natural resource consumption increases with GDP. Since net exports are the difference between domestic production and domestic consumption, this implies that net exports are a function of GDP and thus endogenous in a standard growth regression. They correct for this by including a term for natural resource imports. The idea is to measure the consumption effect through the decline in natural resource imports, while the change in net exports of natural resources is due to changes in productivity. This implicitly assumes that a country does not consume the natural resource goods that it exports, so that the consumption effect can be measured separately from the production effect.¹⁰ Nonetheless, this is a clever step that probably goes a fair way toward addressing the issue. (It would be nice to see an analysis of how far.) More importantly, the technical appendix constitutes exactly the kind of clear thinking about the proxy that is required to navigate this econometric minefield.

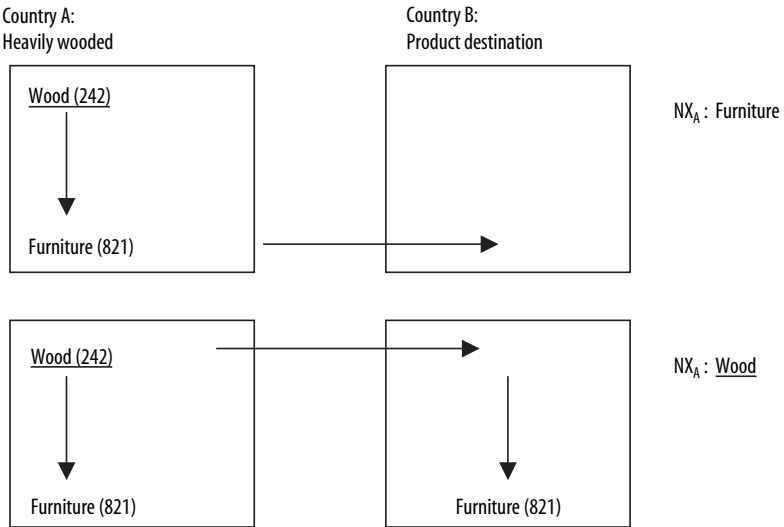
Another important issue is the applicability of the HOV theorem and hence the suitability of measuring endowments with net exports. There are several causes for concern. Fujita, Krugman, and Venables show that agglomeration effects in manufacturing can lead to symmetry breaking and persistent heterogeneity.¹¹ As transport costs fall, two identical countries become specialized—one in the primary sector, the other in manufactures. Thus one country exports

10. Consider the case of an economy with a single natural resource sector, such as oil. A country will either export oil or import oil, so there will be no independent variation in imports and net exports from which to separately identify consumption and productivity effects. The independent variation arises because the productivity effect hits only the sectors produced domestically, whereas the consumption effect presumably hits all sectors.

11. Fujita, Krugman, and Venables (1999).

FIGURE 3. The Effects of FDI on Measured Natural Resource Intensity of Exports³

A. Horizontal FDI: Wood and furniture



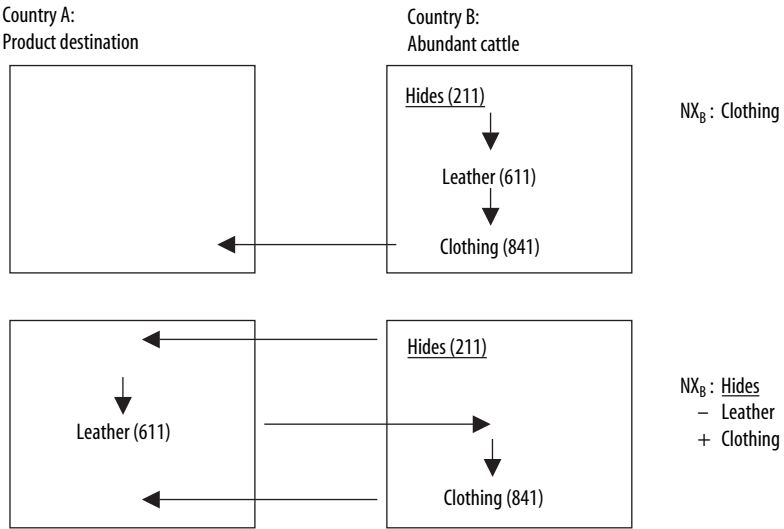
natural resources and the other manufactures, despite having identical endowments. One would have to further assume low rates of productivity growth in the primary sector to deliver a resource curse, but the point is that two countries with identical endowments and technologies can differ in their per capita net exports of natural resources in a world with agglomeration effects, suggesting a violation of the HOV theorem. Maloney contributes two further reasons for caution when invoking the HOV theorem: persistent current account imbalances (which are clearly in evidence) and nonhomothetic preferences (about which there is less evidence either way) upset the theorem.¹²

Finally, a model acknowledging certain frictions and returns to scale highlights the role of firms and foreign direct investment (FDI). In particular, changes in transportation costs can lead to horizontal and vertical segmentation of the production chain, as illustrated in figure 3. In the first panel, a heavily forested country domestically produces the final good, furniture, and exports it to country B. The furniture industry then spreads to country B, so that only wood is exported. On one level, this is a clear example of the duality between trade in goods and trade in factors. Nonetheless, because

12. Maloney (2007).

FIGURE 3 . The Effects of FDI on Measured Natural Resource Intensity of Exports^a (Continued)

B. Vertical FDI: Cattle and leather



a. When export industries are given a binary classification of resource intensive (underlined) or not resource intensive, changes in vertical and horizontal FDI, driven by changes in transport costs and the costs of long-distance management, can lead to changes in net exports of natural resources absent any changes in endowments.

Leamer’s classification counts wood (1) but not furniture (0) as a resource-intensive good, horizontal FDI alters country A’s net exports of resource-intensive goods, as defined by Leamer (and used by Lederman and Maloney).¹³ A similar measurement error is induced by vertical FDI. In the second panel, country B is endowed with abundant grazing land and many cattle; it generates the entire production chain from hides to clothing domestically, leading it to export the final good, clothes. When the leather industry migrates abroad, the production chain is broken up and both the intermediate and final goods are traded. As a result, the net exports of country B now include hides, classified as a resource-intensive good. This analysis shows that changes in the extent of vertical and horizontal FDI can alter the measured natural resource content of a country’s exports even when there is no change in the factor endowments. Indeed, in these examples the factor content of trade does not change. The binary measure of natural resource intensiveness simply

13. Leamer (1984).

leads to a measurement error that depends on the level of FDI. The extent of vertical and horizontal FDI depends on transport costs and the ability to coordinate a global supply chain, factors that vary independently from natural resource endowments.

One could argue that the choice between the different scenarios in the figure is caused by factor endowments. Furniture production will not take place in country B unless it has the proper factors of production. This is true, on average, but at the margin, changes in transport costs can enable a shift from one scenario to the other. Moreover, the location decision may be driven by factors of production other than the natural resources. For instance, the town of High Point, North Carolina, used to be the center of a U.S. furniture making industry, but over the past decade, that industry has largely moved to China . . . using wood imported from the eastern United States.¹⁴

Is this a serious source of measurement error? Is it more than simply white noise? Are there secular trends in outsourcing? These are important issues given that poor countries are relatively further away from the world's intermediate and final goods markets. Thus, transport costs and FDI constitute another channel linking Y and NX_{nr} .

Conclusion

I agree with much of the thrust of the authors' research agenda: the central tendency probably is not strongly negative and may even be positive. There is still evidence, however, that natural resources are not simply "riches nonetheless." From a macroeconomic perspective, natural resources provide an opportunity fraught with peril. I think the recent literature rightly focuses on the determinants of a country's ability to use the windfall productively. Perhaps *curse* is too strong a term, but there is clear evidence that some countries fail this test with disastrous results. Cross-country regressions with interaction terms may lead to a better understanding of the conditional effects of natural resources, with the caveat that the relationship between even these authors' preferred proxy and factor endowments is complex. Future work would do well to emulate Lederman and Maloney in thinking clearly and explicitly about endogeneity while extending their work toward explaining the sources of heterogeneity.

14. Pete Engardio, "Can the U.S. Bring Jobs back from China?" *Business Week*, 30 June 2008.

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