Myths and Realities of U.S. Competitiveness

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Most discussion of U.S. competitiveness misstates the problem, focusing on the trade deficit and on fears that an economy whose productivity lags that of its rivals will face economic disaster. In fact, strong automatic forces ensure that the U.S. economy will remain in business and indeed roughly balance its trade even if its productivity performance is dismal. The real issue is the effect of international competition on the mix of goods that the U.S. economy produces. In some industries high productivity is an effect as well as a cause of international competitiveness. There is an intellectually respectable but politically problematic case for government action to create or preserve advantage in such industries.

A GENERATION AGO, INTERNATIONAL TRADE WAS LARGELY ignored by the U.S. public. Today, however, concern about international competitiveness pops up in virtually every policy discussion—whether the subject is education, the budget deficit, or pollution control. Unpopular measures are defended on the grounds that they will make our economy more competitive, and popular initiatives are opposed because they are alleged to threaten our competitive position.

The roots of public concern over the competitive position of the United States are obvious. International trade has become increasingly important to the U.S. economy: imports are three times as high a share of national income as they were a generation ago. At the same time, U.S. economic pre-eminence in the world has visibly declined: U.S. national income, once larger than that of the rest of the world's market economies combined, is now less than 30% of the total; U.S. leadership in advanced technology, once nearly total, has been challenged in a variety of areas; what was once an overwhelming U.S. productivity advantage over other industrial countries has given way to a rough parity, at least in manufacturing, with clear U.S. inferiority in some sectors.

In spite of nearly universal concern over competitiveness, however, there is surprisingly little coherent discussion of what "competitiveness" means. It is probably fair to say that most people who use the term think of a country as being like a business and of international trade as being like business competition writ large. In the business world, of course, competitiveness has a clear meaning: a firm that is uncompetitive—that is, which fails to offer a product as good as its rivals, or to keep its cost low enough—will lose market share and eventually go out of business. In fact, however, a country is not much like a business. Indeed, trade between countries is so much unlike competition between businesses that many economists regard the word "competitiveness," when applied to countries, as so misleading as to be essentially meaningless.

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Yet people who worry about U.S. competitiveness are not inventing their concerns out of thin air. They are responding to a perception that the United States has actually been losing something important in the process of international competition. And while the crude view that sees a country as being just like a business is wrong, the view that failure to cope with international competition can sometimes be injurious to a country's economic health is right.

My purpose in this article, is to offer a clarification of the issue of international competitiveness. First, I attempt to dispel some "myths" about competitiveness—that is, some widely held ideas that grow out of the false analogy between a country and a business. Then, I turn to the "realities" of competitiveness—the sources of valid concern.

Myths of Competitiveness

The issue of competitiveness is often presented in apocalyptic terms: If America does not shape up to cope with international competition, it will face some kind of economic catastrophe. This extreme view grows out of a false analogy between nations and businesses. A useful way to point up what is wrong with this analogy is by a simple thought experiment.

Imagine first a world in which labor productivity around the world grows at an annual rate of 1%, both in the United States and abroad. It would seem reasonable to suppose in that case that living standards, real wages, and so on would rise by about 1% per year everywhere.

Now suppose that U.S. productivity were to continue its 1% growth rate, but that productivity growth in other countries were to accelerate, say to 4% annually. What would happen to the welfare of U.S. residents as a result?

To many people it would seem obvious that the United States would be in serious trouble. After all, a firm whose productivity lags behind its rivals will find itself losing markets, forced to lay off workers, and eventually driven out of business. Won't the same happen to a nation?

The answer is "No." International competition does not put countries out of business. There are strong equilibrating forces that normally ensure that any country remains able to sell a range of goods in world markets, and to balance its trade on average over the long run, even if its productivity, technology, and product quality are inferior to those of other nations. And even countries that are clearly inferior in productivity to their trading partners are normally made better, not worse, off by international trade.

The classic analysis of the equilibrating forces in international trade is more than two centuries old. David Hume (*1*), living in a world in which precious metals were still the principal medium of exchange, pointed out that a country that had for some reason become uncompetitive, and as a result was importing more than it exported, would suffer a steady drain of gold and silver coins. This fall in the money supply, however, would lead to a fall in the level of prices and wages in that country; eventually goods and labor would

become sufficiently cheap in the deficit nation that its goods would again become attractive to buyers, and the trade deficit would be corrected.

In the modern world the adjustment process is more complex and less automatic. In a world of national currencies no longer backed by gold, deficit countries usually adjust by depreciating their currencies rather than by letting wages and prices fall. Also, international capital movements have as their counterpart trade imbalances: A country that is able to attract an inflow of foreign capital will (as a matter of sheer accounting identity) also run a trade deficit, whereas a country that is exporting capital will run a surplus. Nonetheless, over the long term, major industrial countries show a strong tendency toward equality of imports and exports, regardless of their productivity and technological performance. Table 1 shows the balance on current account (a broad definition of trade in goods and services) of the three major industrial countries as a percentage of their national incomes for selected time periods. The average imbalances over the long term are quite small. During the mid-1980s large imbalances emerged, attributed by many economists to the unprecedented U.S. budget deficit and other special factors. By early 1991 about half of this divergence had again been eliminated (due in large part to a sharp rise of the dollar value of the yen and the mark), and the United States in particular was experiencing a broad-based export recovery.

Suppose that a country lags behind other nations in productivity. The equilibrating forces first noticed by Hume ensure that it will nonetheless be able to find a range of goods and services to export. But what will it export? The answer, pointed out by David Ricardo (*2*) in 1817, is that a country whose productivity lags that of its trading partners in all or almost all industries will export those goods in which its productivity disadvantage is smallest. In the standard terminology of international economics, a country will always find a range of goods in which it has a "comparative advantage" even if there are no goods in which it has an "absolute advantage."

The classic empirical example of the principle of comparative advantage at work comes from the early post-war comparison of Britain and the United States (*3*). At that time, British productivity was far less than that of the United States—labor productivity in manufacturing was below U.S. levels in all major industries, and on average was less than half of the United States. The British economy, however, was much more dependent on foreign trade, and therefore was obliged to generate approximately the same dollar value of export earnings. If one looks at the comparative pattern of exports, one sees a clear picture of comparative advantage at work. Figure 1, plotted from data for a set of 22 industries, shows that there is a clear-cut association between relative productivity and relative exports. U.S. productivity was higher in all cases; but only in industries in which U.S. productivity was more than about 2.5 times U.K. productivity did the United States have larger exports. That is, Britain did not have an absolute advantage in anything, but it had a comparative advantage in those goods in which its productivity exceeded 40% of the U.S. level.

Britain's ability to outsell the United States in industries in which its productivity was inferior depended, of course, on the fact that British workers were paid less than U.S. workers—a pay differential that was greatly widened by the 1949 devaluation of the pound from $4.80 to $2.80. A common reaction to this observation, and to such events as the recovery of U.S. exports that followed the decline in the dollar between 1985 and 1988, is that coping with international competition by lowering relative wages must lower a country's living standards. Ricardo's 1817 discussion of comparative advantage showed, however, that trade between two nations ordinarily raises the standard of living of both, even if one must compete on the basis of low wages.

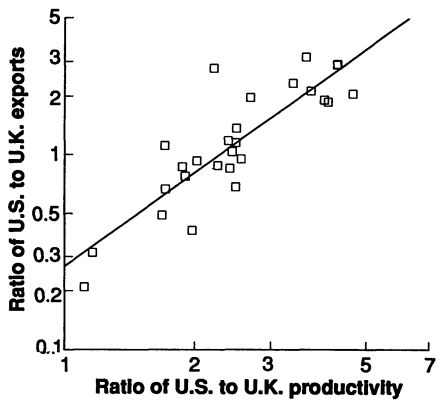

Fig. 1 Relations between U.S. and U.K. productivity and exports, 1950–1951 (*13*).

We may see this point with a hypothetical example, similar to one introduced by Ricardo. Imagine a world in which the United States and Britain are the only trading countries and that there are only two goods, wool and aircraft. Suppose also that labor is the only input into production, and that U.S. labor is more productive than British in both. The U.S. advantage is, however, much more pronounced in aircraft. Table 2 illustrates a hypothetical set of productivity numbers.

Clearly, if these two countries are going to be able to sell goods to each other, the U.S. wage rate must be at least 1.5 times that of Britain—otherwise both goods would be cheaper to produce in America—but no more than 6 times as high. The actual wage rate would depend on demand conditions and the relative size of the economies, but let us simply suppose that the relative wage rate is 3. At that wage rate, wool would be cheaper to produce in Britain, which would therefore export it, whereas aircraft would be cheaper to produce in the United States. If prices are proportional to labor cost, one unit of wool, which requires one-half unit of British labor, would trade for one unit of aircraft, which requires one-sixth unit of the more expensive U.S. labor.

Now we ask, "Is Britain better or worse off trading with the United States, on the basis of a wage rate only one-third as high, than it would be in the absence of trade?" The answer is that it is better off. In the absence of trade, it would take one unit of British labor to produce one unit of aircraft. By trading with America, Britain can acquire an aircraft by trading a unit of wool for it, which requires the use of only one-half unit of labor. That is, the opportunity to trade with America raises the purchasing power of British labor (*4*).

This is a grossly simplified example, but it makes a crucial point. A country that is less productive than its trading partners across the board will be forced to compete on the basis of low wages rather than superior productivity. But it will not suffer catastrophe, and indeed will normally still benefit from international trade. The point is that international trade, unlike competition among businesses for a limited market, is not a zero-sum game in which one nation's gain is another's loss. It is a positive-sum game, which is why the word "competitiveness" can be dangerously misleading when applied to international trade.

Table 1. Long-run self-correction of payments imbalances (*10*). Figures for 1991 are estimated.

Country	Current account balances (% of GNP)		
	1960–88	1987	1991
United States	−0.2	−3.6	−1.7
Japan	1.0	3.6	1.8
Germany	1.1	4.1	2.3

Country	Hypothetical productivity numbers	
	Aircraft	Wool
United States	6	3
United Kingdom	1	2

Table 2. Gains from trade in spite of lagging productivity.

Although this is a crucial point to appreciate, it is also important to understand what the example has and has not demonstrated. Returning to our thought experiment, we have not shown that the United States, with its 1% annual productivity growth, is as well off as it would be if it shared the rest of the world's 4% growth; clearly, it is not. Nor have we even shown that the United States is better off with the rest of the world growing at 4% than at 1%. In fact, it could be either better or worse off; this depends on details, specifically on whether rest-of-world growth is biased toward goods the U.S. exports (in which case the United States is hurt) or toward goods that the United States imports (in which case the United States is helped) (*5*). All that we have shown is that low productivity does not pose a worse problem for a country that is engaged in international trade than for one that is not. Britain in 1950 had a productivity problem (and still does); the negative impact of that problem on Britain's standard of living, however, was no greater, and in fact less, because Britain was a trading nation rather than a self-sufficient society.

We should also note that the discussion here has so far omitted a factor that is critical in the real-world politics of international trade: income distribution. Changes in international trading patterns often have strong effects on the distribution of income within countries, so that even a generally beneficial change produces losers as well as winners (at least in the short run). If foreigners are willing to sell us high-quality goods cheaply, that is a good thing for most of us, but a bad thing for the domestic industry that competes with the imports. This observation cuts both ways. On one side, economists sometimes blithely speak of the benefits of free trade, ignoring the sometimes substantial costs of adjustment. On the other hand, much opposition to free trade represents special interest pleading, and an appeal to the need for "competitiveness" is often used as a cloak for narrow self-interest.

Realities of Competitiveness

The discussion so far seems to suggest that competitiveness, if it means anything, is a non-issue: Even unproductive countries have a range of goods in which they have a comparative advantage, and more or less automatic forces will always ensure that a country is competitive in industries in which it has a comparative advantage. Yet we should not be too quick to dismiss the idea that there is some real problem to which concerns about competitiveness are a response. For in the discussion above I have made an implicit assumption that is clearly untrue in some instances—that countries' comparative advantages determine their pattern of trade, rather than the other way around.

Much international trade is driven by enduring national differences in resources, climate, and society. Brazil is a coffee exporter because of soil and climate, Saudi Arabia an oil exporter because of geology, Canada a wheat exporter because of the abundance of land relative to labor, and so on. Trade in manufactured goods among advanced industrial countries, however, particularly in highly sophisticated products, is harder to explain (*6*). In many cases industries seem to create their own comparative advantage, through a process of positive feedback.

The process through which comparative advantage can be created is illustrated in Fig. 2. Suppose that a country has for whatever reason established a strong presence in a particular industry. Then this presence may produce what in standard terminology are called "external economies" that reinforce the industry's strength. External economies come in two main variants. So-called technological external economies involve the spillover of knowledge between firms: to the extent that firms can learn from each other, a strong national industry can give rise to a national knowledge base that reinforces the industry's advantage. Pecuniary external economies depend on the size of the market: a strong domestic industry offers a large market for specialized labor and suppliers, and the availability of a flexible labor pool and an efficient supplier base reinforces the industry's strength.

When external economies are powerful, international specialization can have a strong arbitrary quality. During an industry's formative years, or during a transitional period when shifts in technology or markets have invalidated existing patterns of advantage, a country may establish a lead in an industry due to historical accident—or government support. Once this lead is established, it becomes self-reinforcing and tends to persist.

The importance of external economies is obvious in interregional specialization within the United States. Such famous industry clusters as Silicon Valley and Route 128, as well as less well-known examples like the cluster of carpet manufacturers around Dalton, Georgia (or the insurance cluster in Hartford, Connecticut) clearly reflect the self-reinforcing effects of success rather than underlying resources. International examples include Swiss watches, Italian ceramic tiles, and the role of London as a financial center.

It is probably true that external economies are a more important determinant of international trade in high-technology sectors than elsewhere, although they are by no means restricted to high tech. There is some dispute over whether the basis of international trade has shifted away from traditional comparative advantage toward created advantage. What is definitely true is that although the idea of external economies is an old one, going back to Marshall (7), recent developments in the analysis of international trade have placed increasing emphasis on the role of history, accident, and government policy in producing trade patterns (*8*).

The proposition that comparative advantage may be created rather than exogenously given somewhat qualifies the generally benign picture of international competition given in the first part of this paper. It suggests that under some circumstances countries may lose, or fail to establish, industries in which in the long run they might have been able to acquire a comparative advantage. This, in turn, provides a potential case for government intervention.

The traditional version of this line of reasoning is the infant industry argument for developing countries. Countries new to industrialization, the argument goes, face established competitors who already have the knowledge base, suppliers, and specialized skills in industries where these are important. Absent government

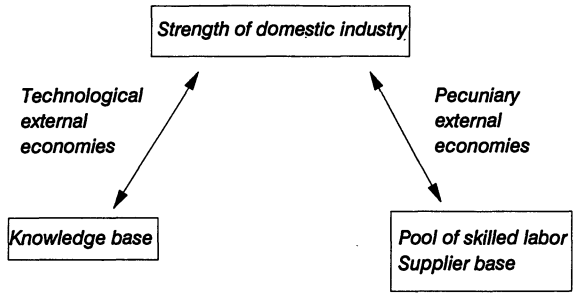

Fig. 2. Self-reinforcing comparative advantage.

intervention, the new entrants will therefore find themselves producing only goods in which external economies are unimportant, and will be stuck with permanently lower wages. By promoting targeted industries, they can in principle escape from this trap.

The new version of the argument involves established countries but new industries. Let us set up an exaggerated case, bearing in mind that it overstates the reality. Suppose that the United States trades with Japan and that Japan systematically promotes new high-technology industries as they emerge. This promotion may take the form of government subsidy, but it can also take the form of explicit or implicit protection of the domestic market, which both denies U.S. firms an important market and ensures Japanese firms of sales. Then, other things equal, Japan will tend to establish a competitive advantage in emerging high-technology sectors. This will not be catastrophic for the United States: the principle of comparative advantage still applies, and the United States will still find a range of goods to export. It will, however, increasingly be forced to compete on the basis of low wages rather than high productivity.

This story bears enough resemblance to reality to touch some raw nerves. Japan does not engage in extensive subsidy to industry, and on paper its markets are quite open to imports of manufactured goods. In practice, however, as indicated in Table 3, the Japanese market for high-technology goods has remained a virtually closed preserve for Japanese firms, whereas such markets have become increasingly internationalized not only in the United States but also in Europe.

This, then, is the real competitiveness issue: The possibility that international competition will exclude the United States from some industries in which it could or should have had a comparative advantage. Having identified this as a valid argument, we need to offer some strong warnings against overuse.

First, although government subsidy and unequal access to markets have surely played an important role in determining the outcome of international competition in a few industries, they are unlikely to be the major explanation of disappointing U.S. economic performance. Most of the output of the U.S. economy is not traded internationally: in 1990, imports and exports were only 13 and 12.3% of gross national product, respectively. Furthermore, as Table 4 shows, since 1980 the United States has actually experienced a striking revival of productivity growth in manufacturing, which is precisely the sector most exposed to international competition. To the extent that the United States continues to perform poorly compared with other major industrial nations, this has a great deal to do with a low national savings rate, low spending on R&D, and low-quality basic education. Failure to create advantage is at best a contributing factor.

Second, the national pursuit of competitive advantage should not be unrestrained, because unilateral pursuit of advantage can work to everyone's disadvantage. For example, the United Kingdom undoubtedly derives significant benefits from the London's role as the financial capital of Europe, benefits that would be lost if that capital were in, say, Frankfurt instead. Yet Europe as a whole would almost surely be worse off if nationalistic policies led to a fragmented financial system divided among Frankfurt, Paris, Milan, and London. That is, it is better for the British that the City be in Britain rather than elsewhere; but it is in the common interest that there be a City (or a Silicon Valley or Route 128) somewhere, so that the advantages of such a cluster's external economies can be realized.

Finally, competitiveness is one of those issues, like national defense, that can easily be used as a patriotic cloak for special interest politics. The infant industry argument, mentioned above, is intellectually impeccable. In practice, however, it has been used in many developing countries to justify policies that maintain highly inefficient industries and generate large economic benefits for a politically influential elite (*9*). The risks of a similar misuse of intellectually legitimate concerns about U.S. competitiveness mean that arguments for a more nationalistic trade policy, while they should not be dismissed out of hand, need to be treated with caution.

Year	Domestic share (%)		
	Germany	Japan	United States
1970	77	94	95
1980	59	93	89
1985	43	94	84

Table 3. Evidence of the closed Japanese market for high technology is shown by the figures for the domestic share of the home market for high-technology goods (*11*).

Table 4. Comparisons of major industrial nations.

Country	Net national savings % of GNP, 1980–1988 (*10*)	National R&D % of GNP, 1987 (*11*)	Rate of growth of manufacturing productivity (*12*):	
			1970–1980	1980–1988
United States	3.6	1.8	2.3	3.7
Japan	17.8	2.8	6.4	5.5
West Germany	9.8	2.6	4.2	2.8

Summary and Conclusions

There are valid reasons for concern over U.S. international competitiveness, but they are not what most people think. The common fear is that an economy that fails to keep up with its trading partners will suffer severe economic damage—incurable trade deficits, large-scale unemployment, perhaps economic collapse. This fear is unjustified. Both in theory and in practice, countries with lagging productivity are still able to balance their international trade, because what drives trade is comparative rather than absolute advantage. Maintaining productivity growth and technological progress is extremely important; but it is important for its own sake, not because it is necessary to keep up with international competition.

The real competitive issue is subtler. There is no question that in many cases comparative advantage arises from self-reinforcing external economies rather than as a result of underlying national resources. In such cases international competition may exclude a country from an industry in which it could have established a comparative advantage, or drive a country from an industry in which comparative advantage could have been maintained. In these cases, a intellectually respectable argument can be made for government policies to create or preserve advantage.

The fact that an argument is intellectually respectable does not mean that it is right. Concerns over competitiveness that are valid in principle can be and have been misused or abused in practice. Competitiveness is both a subtler and a more problematic issue than is generally understood.

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2. D. Ricardo, *The Principles of Political Economy and Taxation* (Irwin, Homewood, IL, 1963).
3. A similar relation between relative productivity and exports applies between the United States and Japan today. The U.S.–U.K. comparison from the early post-war period, however, remains a particularly revealing example, because Britain was able to export about as much as the United States in spite of an overwhelming U.S. productivity advantage across the board.
4. The converse is also true: the high-productivity, high-wage country also gains from

trade. It is commonly argued that industrial countries are hurt by competition from low-wage nations using "sweatshop labor"; this is just as wrong as the argument that being a low-wage country is worse than not trading at all.
5. For analysis of the effects of foreign growth on domestic welfare, see H. Johnson, *Manch. Sch. Econ. Soc. Stud.* **23**, 95 (1955). Any adverse effects would come through a worsening of the terms of trade, that is, the price of exports relative to that of imports. Excluding oil and agricultural goods, U.S. terms of trade have in fact shown a slight downward trend, but the trend is too small to have a significant negative effect on U.S. welfare [R. Lawrence, *Brookings Pap. Econ. Activity* **2:1990**, 343 (1990)].
6. Most trade in manufactured goods among industrial countries consist of "intra-industry" trade, that is, exchange of goods that seem to be produced using similar ratios of capital to labor and of skilled to unskilled workers. Thus it is difficult to explain the pattern of comparative advantage among industrial countries by differences in their resource mixes, which are in any case quite similar [H. Grubel and P. Lloyd, *Intra-Industry Trade* (Wiley, New York, 1975); E. Helpman, *J. Jpn. Int. Econ.* **1**, 62 (1987).
7. A. Marshall, *Principles of Economics* (Macmillan, London, 1920).
8. During the 1980s, the so-called "new international economics," which emphasized the arbitrary aspect of the international trade pattern, received wide academic acceptance. This is now a huge field; for surveys, see E. Helpman and P. Krugman, *Market Structure and Foreign Trade* (MIT Press, Cambridge, MA, 1985); P. Krugman, *Rethinking International Trade* (MIT Press, Cambridge, MA, 1990). In less academic contexts, M. Porter [*The Competitive Advantage of Nations* (Basic Books, New York, 1990) and B. Arthur [*Sci. Am.* **262**, 92 (1990)] have made the case for the crucial role of external economies. I borrow the useful analogy with positive feedback from Arthur.
9. India provides a particularly good (which is to say bad) example of disastrous economic policies justified in the name of economic development. See the survey of Indian economics in *The Economist* (3–9 May 1991).
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Molecular Basis of Latency in Pathogenic Human Viruses

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Several human viruses are able to latently infect specific target cell populations in vivo. Analysis of the replication cycles of herpes simplex virus, Epstein-Barr virus, and human immunodeficiency virus suggests that the latent infections established by these human pathogens primarily result from a lack of host factors critical for the expression of viral early gene products. The subsequent activation of specific cellular transcription factors in response to extracellular stimuli can induce the expression of these viral regulatory proteins and lead to a burst of lytic viral replication. Latency in these eukaryotic viruses therefore contrasts with latency in bacteriophage, which is maintained primarily by the expression of virally encoded repressors of lytic replication.

VIRAL INFECTIONS FREQUENTLY LEAD TO A PERIOD OF rapid viral replication that is rendered transient by an effective immune response. In many cases, this response eventually results in the complete clearance of the virus from the host animal. In some instances, however, the host immune response may be insufficiently rapid to prevent significant, even life-threatening, pathogenic effects. Historically, such acute viral infections have been the major cause of virally induced morbidity and mortality in humans. Most acutely pathogenic viruses, including the etiologic agents of smallpox, polio, measles, rubella, and mumps, can now be effectively controlled by immunization. Although some acute viral pathogens (for example, the influenza virus) remain of concern, the focus of public health interest in the developed world has increasingly been on viruses that cause long-term, chronic infections (*1*). These viruses have developed strategies to prevent elimination by the host immune response and, as a result, may also be more difficult to control by immunization (*1*).

Although viral infections have been termed latent (undetectable or asymptomatic) at the organismal level, the focus of this review is the mechanistic basis for latency at the cellular level. Here, we define latency as the reversibly nonproductive infection of a cell by a replication-competent virus. We therefore distinguish latency from irreversibly nonproductive (abortive) infections and also from persistent infections (infections that result in the continuous production of progeny virus). Mechanisms involved in the maintenance of such persistent infections, which are induced by several pathogenic human viruses, have been reviewed elsewhere (*2*).

To illustrate recent advances in the understanding of viral latency, we will focus on three human pathogens, the herpesviruses herpes simplex virus type 1 (HSV-1), Epstein-Barr virus (EBV), and the human immunodeficiency virus type 1 (HIV-1). In each case, we will identify candidate cellular or viral gene products involved in the three phases of viral latency. These are the initial establishment of the latent infection, the maintenance of latent infection, and, finally, the activation of productive infection. These viruses utilize latency strategies that are quite different in molecular detail. Yet each achieves the goal of maintaining viral infection for the life of the host.

Latency in HSV-1

The classic example of viral latency is that seen with HSV-1. HSV-1, the prototype of the α or neurotropic class of herpesviruses that also includes HSV-2 and Varicella-Zoster virus (VZV), causes an initial acute infection in peripheral tissues followed by a latent

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