EXAMPLES OF COORDINATION FAILURE

More elaborate versions of the coordination game in Table 1 with more than two players and two actions have been used to explain coordination failure in many contexts.

Teamwork Suppose two workers produce a joint output by providing costly effort and both are paid according to team output. Both workers are better off if both exert high effort (action B in the table) and coordination failure prevails if both provide low effort.

Education Acquiring education might be less profitable if others are not educated. If all agents expect others to acquire little education, investments in education might remain low.

Bank Runs If most creditors leave their savings in the bank, the bank is liquid and it is optimal to leave the savings in the bank. If all other creditors withdraw their savings, the bank becomes illiquid and it is best to also withdraw one's savings. A similar reasoning has been used to account for speculative currency attacks and decisions to refinance businesses on the verge of bankruptcy.

Search and Matching If few agents use a specific medium to search for a partner, the other players have little incentives to use this medium because of the low likeliness to find a good match in a "thin market." Coordination failure might therefore explain low intensity of search for employment. A similar reasoning has been used to explain failure to adopt superior technological standards or languages. Applications in development economics emphasize path-dependence and lock-in, suggesting that an economy might be stuck in a development trap today because agents failed to coordinate, possibly due to historical accident, on a Pareto-superior equilibrium in the past.

Macroeconomics Coordination failure has many applications in macroeconomics. A classic example refers to investments and expectations of future output. If most firms expect future aggregate demand to be low, they invest little today. This, in turn, induces low aggregate demand today, which might be interpreted as confirming low expectations. A recession might therefore result from self-fulfilling expectations. The literature on "sunspots" suggests that expectations might be coordinated by irrelevant events or information. For example, leading indicators of macroeconomic activity might be particularly accurate as long as economic agents believe they are good indicators.

The empirical relevance of these examples is contested in the literature because theories of coordination failure are difficult to test in the field. Economists have therefore sought to test the determinants of coordination failure in a broad range of coordination games in the experimental laboratory. Experimental economists have investigated elaborate versions of the game in Table 1, pure coordination games (in which equilibria are equally good, i.e., not Pareto-ranked), and asymmetric games (in which agents coordinate on different actions).

Coordination problems are related to but distinct from cooperation problems. The coordination game in Table 1 is transformed into a cooperation game (a prisoner's dilemma) if the payoffs in the lower left cell are changed to (0,3) and in the upper right cell to (3,0). Actions A and B are often called *defection* and *cooperation*. The resulting cooperation game has a unique and inefficient equilibrium [payoffs are (1,1)]. A rational and selfinterested player chooses A (i.e., free-rides) irrespective of what the other player chooses in the cooperation game.

SEE ALSO Multiple Equilibria; Nash Equilibrium; Prisoner's Dilemma (Psychology)

BIBLIOGRAPHY

- Camerer, Colin. 2003. Behavioral Game Theory: Experiments in Strategic Interaction. Princeton, NJ: Princeton University Press.
- Cooper, Russell W. 1999. Coordination Games: Complementarities and Macroeconomics. Cambridge, U.K.: Cambridge University Press.
- Fehr, Ernst, and Jean-Robert Tyran. 2007. Money Illusion and Coordination Failure. *Games and Economic Behavior* 58(2): 246–268.
- Mankiw, N. Gregory, and David Romer, eds. 1991. New Keynesian Economics: Coordination Failures and Real Rigidities. Vol. 2. Cambridge, MA: MIT Press.

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COPING

The stresses inherent in the daily challenges of life create a need for continuous monitoring and adjustment. *Coping* is the behavioral, cognitive, and emotional process of managing a stressful or threatening situation or circumstance. It is a nearly continuous process as people are frequently confronted with new and changing environmental demands that can lead to stress. Minimizing, mastering, or managing a situation in such a way as to render it less distressing is the goal of coping.

Richard Lazarus (1966) offered a three-process model of stress. *Primary appraisal* is the process of perceiving a threat to oneself. *Secondary appraisal* is the process of calling to mind a possible response to the threat. *Coping* is the execution of the response to the threat. The body has its own way of coping with stress. Any threat or challenge an individual perceives in the environment initiates a sequence of neuroendocrine events. These events are conceptualized as two separate responses: a *sympathetic/adrenal response*, in which catecholamines (epinephrine, norepinephrine) are secreted (i.e., the "fight or flight" response), and the *pituitary/adrenal response*, involving the secretion of corticosteroids, which act to restore the biological system to homeostasis (Frankenhauser 1986).

TYPES OF COPING

Lazarus and Susan Folkman (1984) were the first scholars to make the distinction between *problem-focused coping* and *emotion-focused coping*. Problem-focused coping seeks to ameliorate the stress being caused by a given situation by identifying and making efforts to deal with the source of the problem. It may involve taking action to remove a stressor or to evade a threatening stimulus. For example, changing trails to avoid a snake while on a nature walk would be an example of the problem-focused method of coping: By effectively removing oneself from the threatening situation, one lowers the stress it induces.

The goal of *emotion-focused coping* is to reduce the intensity of distressing emotions associated with stress—that is, the aim is to make oneself *feel* better about a real or perceived threat or stressor without addressing the source of the stress. Emotion-focused coping often occurs when problem-focused coping fails to reduce the stress in a situation or when the stressor is so great that problem-focused coping has no real likelihood of helping. It can also come into play when many aspects of a situation are out of one's control, such as when one is dealing with a terminal illness or the sudden death of a loved one.

Charles Carver and his colleagues (1989) developed an instrument to measure coping responses based on a number of conceptually distinct methods of responding to stressful life events. Active coping involves taking steps to remove oneself from a threatening situation. Planning involves generating strategies to cope with the stressor. Other strategies include reinterpreting the stressor as a positive or growth-oriented experience, suppression of competing activities (i.e., putting other concerns aside until the stressor sufficiently subsides), restraint coping (i.e., waiting for an opportunity to act effectively), focusing on and venting of emotions (i.e., expressing grief or "venting" anger), using humor to cope with the stressor, mental or behavioral disengagement (i.e., giving up on trying to solve a problem or reach a goal), seeking social support-either instrumental support, such as information or resources, or emotional support, such as sympathy and understandingturning to religion (i.e., putting the problem in God's hands), and *acceptance*, whereby the threat is accepted as unavoidable (as with, for example, terminal illness).

Sometimes the nature of a stressor is such that it overwhelms an individual's coping resources. When this occurs, rather than engaging in positive coping strategies, the person sometimes seeks to disengage from the stressful situation altogether. This emotion-focused strategy is called *avoidant coping*, and its goal is to escape or avoid feelings of distress. Denial of the existence of the stressor, for example, can be negative if it causes one to neglect to seek medical attention when symptoms of a possibly serious disease appear. Substance use (i.e., using alcohol and/or drugs) can aid in this disengagement from reality, but only for a time. People may also engage in "magical thinking" in an attempt to wish away a stressor. Unfortunately, in the end the stressor remains, and will inevitably resurface.

SOCIAL SUPPORT AND COPING

It is now widely accepted that receiving effective social support from one's social network can play a role in influencing health and well-being. The two main theories of how social support impacts stress and coping are the *main effect hypothesis*, which asserts that social support is beneficial whether or not one is experiencing increased stress, and the *stress buffering hypothesis*, which asserts that social support during time of elevated stress serves to protect an individual from a stressor's harmful effects (Cohen and Wills 1985).

Social support can take many forms. These include *instrumental support* (e.g., providing a family member with money to buy groceries), *informational support* (e.g., providing information about an illness), and *emotional support*—that is, providing care or comfort. For such support to be effective, however, it must be matched with the environmental demands causing the distress and be provided by the appropriate member of one's social network.

CONCLUSION

Often, the best coping strategies are a combination of problem-focused and emotion-focused strategies, which together engage the stressor in an effort to reduce both its force and the negative emotions it evokes. Seeking social support in times of elevated stress can also be an effective coping strategy. When one is faced with stress that greatly exceeds one's ability to cope, professional services may be helpful, both in strategizing ways to deal with the stressor and as a source of emotional support.

SEE ALSO Emotion; Mental Health; Mental Illness; Neuroticism; Resiliency; Stress; Vulnerability

BIBLIOGRAPHY

- Carver, Charles S., Michael F. Scheier, and Jagdish Kumari Weintraub. 1989. Assessing Coping Strategies: A Theoretically Based Approach. *Journal of Personality and Social Psychology* 56 (2): 267–283.
- Cohen, Sheldon, and Thomas A. Wills. 1985. Stress, Social Support, and the Buffering Hypothesis. *Psychological Bulletin* 98 (2): 310–357.
- Frankenhauser, Marianne. 1986. A Psychobiological Framework for Research on Human Stress and Coping. In *Dynamic of Stress: Physiological, Psychological, and Social Perspectives*, eds. Mortimer H. Appley and Richard Trumbull, 101–116. New York: Plenum Press.
- Lazarus, Richard S. 1966. *Psychological Stress and the Coping Process*. New York: McGraw-Hill.
- Lazarus, Richard S., and Susan Folkman. 1984. Stress, Appraisal, and Coping. New York: Springer.

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COPPER INDUSTRY

The copper industry's growth and prosperity are based on the metal's inherent properties: an attractive appearance, high conductivity, good corrosion resistance, ability to alloy with other metals, and ease of working. While there are substitutes in specific uses, copper has entrenched and expanding markets in the electrical, electronic, and communications industries. Electrical and electronic products, including power cables, account for over one third of total usage, and construction, including wiring and water tubing, for a similar share. Transport industries use roughly one eighth of the total, industrial machinery and equipment nearly one tenth, and a wide range of consumer and other products the remainder. Global demand, which moves in step with capital expenditure, especially on construction and infrastructure, and with spending on automobiles and consumer durables, has increased from 3.7 million tonnes in 1960 to 6.8 million tonnes in 1970, 9 million tonnes in 1980, 10.9 million tonnes in 1990, 15.1 million tonnes in 2000, and 16.5 million tonnes in 2005. The annual average rate of growth is 3.1 percent, but with marked annual and geographical variations. The geographical center of demand has altered, with the most rapid increases in China, India, and the countries of the Asia-Pacific Rim. In 1980 the main markets were the countries of the European Union of 15 (30 percent), the United States (21 percent), the USSR (12 percent), and Japan (13 percent). By 2005 China had gained first place with 22 percent and the Asia-Pacific region had 14 percent. These increased shares were only partially offset by the collapse of demand in the former Soviet Union and its European satellites. In recent years demand has flattened out, or even fallen, in the United States (14 percent of the 2005 total), Japan (7 percent), and many of the European Union of 15 (20 percent) as their economic activity has become increasingly dependent on service industries and imported manufactures. Global turnover amounted to \$21 billion in 2002 and \$60 billion in 2005, with increased prices explaining most of the rise. World exports of refined copper metal accounted for 38 percent of production, worth almost \$23 billion, in 2005.

Copper is priced on terminal markets, mainly the London Metal Exchange, and prices fluctuate with changes in the balance between supply and demand and with general economic and financial conditions. Whereas demand is cyclical, supply tends to be relatively inelastic as mines need to spread heavy fixed costs over as high an output as possible. The industry is a modest employer of labor, but is capital intensive at both the mining and refining stages. Volatile prices can be hedged in forward markets, but nonetheless create problems for producers and consumers alike. For example, the daily cash price fell from \$3065/tonne on January 20, 1995, to a low of \$1319/tonne on November 11, 2001, and rose to a high of \$4650/tonne on December 28, 2005. The annual averages were \$2934/tonne in 1995, \$1560/tonne in 2002, and \$3684/tonne in 2005. High prices both encourage substitution by other materials, and lead governments and labor to press for increased shares of profits. Weak prices inhibit exploration and new investment and may force the closure of higher cost mines.

The relatively strong growth of demand since the late 1980s has been facilitated by changes in the structure and nature of supply. Global mine production of copper was about 15 million tonnes in 2005, with the balance of demand for refined copper metal met from recycled materials. In many instances ores contain other payable products as well as copper, which can contribute considerably to mine profitability, and can influence production patterns. Because individual ore deposits are finite, continued spending on exploration and mine development is required merely to maintain output, let alone satisfy rising demand. Improved exploration techniques have partly offset the tendency for the average grade of copper ore to fall with the depletion of the richer and most accessible ore deposits. Also, technological improvements and rising mine size have tended to neutralize any impact of falling average grades on production costs. During the 1990s output became increasingly concentrated in large open-pit mines, where economies of scale more than offset the relatively low grades of contained metal in the ore. In 2004 the three largest mines produced about 2.5 million tonnes, or 15 percent of output. The annual copper output of the median mine grew from 75,000 tonnes in 1980 to 110,000 tonnes in 1990 and almost 200,000 tonnes in