Economic Resilience in the Food and Agriculture Sector

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The term “resilience” has much currency in the context of homeland security as a shorthand way of characterizing the behavior of complicated systems when confronted with a shock, an unexpected event, perhaps a bioterror incident. This presentation will be my view of economic resiliency in the food and agriculture sector. I will also discuss how the Economic Research Service approaches the analysis of the nation’s vulnerability and of possible economic consequences of different kinds of shocks.

Let’s start with some definitions. Flexibility is adaptability, the ability to respond to change. Resilience is the ability to recover from or adjust easily to misfortune or change. Alan Greenspan, outgoing chair of the Federal Reserve, has recently been using these terms in an economic context. He has said that our most valued economic policy asset is the “increased flexibility of our economy, which has fostered our extraordinary resilience to shocks.” And, “The more flexible an economy, the greater its ability to self-correct in response to inevitable, often unanticipated, disturbance.” He goes on to say, “Enhanced flexibility provides the advantage of allowing the economy to adjust automatically, reducing the reliance on the actions of monetary and other policymakers, which have often come too late or been misguided.”

So, resilience relates to the ability of an economy to bounce back from adversity, essentially on its own. This is fundamentally an economist’s view that individual actors in the economy, if permitted or encouraged, will be able to make choices that moderate the impacts of a surprise, adverse event. Economic resilience is the availability of substitutes in production and consumption. Substitution is an economic concept but also obviously familiar in everyday life. It is well understood, and certainly we can all appreciate the notion that the more substitutes there are—that is, the more options exist for meeting a need—the more flexibility there is in meeting the need after the first or preferred option has been taken away.

Consider first the resilience of agricultural production by analyzing the number of crops produced in a region. In some counties in California, anywhere from 36 to 74 crops are grown. Similarly, in the northeast, there are large numbers of crops grown. Spatial concentration in crop production ranges from rapeseed, produced in only 3 counties, to hay which is produced in 97 percent of counties. Other factors affect resilience such as the length of the production cycle (very long for orchard crops compared to poultry). For the nation as a whole, the availability of imports can also provide substitutes to domestically produced foods. The duration of the shock is also important. Also note role of regulations—or lack—per Greenspan, so earlier changes to farm programs that loosened planting restrictions are important in this context.

Americans of all ages have a diversified diet, that is, they have many substitutes in consumption. This diversity suggests that if one source of protein were suddenly to become unavailable, consumers would “make up the slack” by increasing consumption of another source. They are flexible in this respect because alternatives are already part of their diets. In economic terms, they have a high elasticity of substitution among protein sources.

In between producers and consumers are processors. Meat processing is spread geographically across the country. Slaughter and meat processing plants are spread across the country. Poultry processing is rather more concentrated east of the Mississippi, and, not surprisingly, seafood processing is found along the coasts. This geographic spread emphasizes the importance of transportation infrastructure, a complementary input or asset. Again, there is flexibility in the processing sector in the sense that plants are dispersed and so a shock or bioterror event would have to have huge geographic scope to affect any significant portion of meat, poultry, and seafood processing capacity.

At the national level, there are many alternatives available should one area—state or region—be affected adversely, such that production or processing has to be shut down. What does this mean for economic resilience? Some suggest that the US food and agricultural sector is very vulnerable, because of this dispersion. It would be hard to provide uniform levels of protection. That may be true, but from an economic point of view, and considered at a national or regional level, this dispersion implies the availability of substitutes in production, processing, and consumption. I don’t mean to suggest we should be complacent about consequences of bioterror just because the ability, at the national level, to recover might be judged fairly robust. First, for the people affected, an adverse event can be a catastrophe. Second, even if physical disruption is limited to a commodity or a region, ripple effects of consumer reaction could be felt nationally.

This survey of adaptability suggests some lessons for analysts. For starters, don’t view any part of the food and agricultural sector in isolation. The parts and subparts are connected to each other through these substitution possibilities. Looking at just dairy products, for example, in considering economic consequences is tantamount to assuming that the elasticity of substitution both in production and consumption is zero. Clearly, it is not, especially when viewed across the country or across all consumers. Behavior changes after a bad event, and instead of a single event, there may be a cascade. The interconnectivity of the system is the key issue here.
event, the elasticities of substitution are the guides to understanding what changes will take place.

What analysts should take away from an examination of substitution possibilities is an assessment of where they are most limited. These are then the true economic vulnerabilities because producers or consumers will have limited alternatives. Examples in production would be agricultural commodities with highly specialized, site-specific production requirements, such as Kona coffee in Hawaii. There are not many alternatives to producing coffee on those slopes. Viewed in terms of consumption, of course, imports are good substitutes. In consumption, consider consumers who must eat restricted diets. Infants and small children would together represent one category, the immune compromised another. Their latitude in substituting among foods is more limited than that of other consumers. So particular attention to the mainstays of their diets would be important.

Putting resilience in this context provides the basis for explaining how economists approach the analysis of the potential and consequences of bioterror events. If we knew all the substitution possibilities in the sector, we'd be in good shape. But, while we know about many, we do not know them all. Moreover, our knowledge about the past may not be a good guide to the future. As Greenspan has pointed out, knowledge of critical linkages is incomplete, and models are vastly simplified representations of the real world. Quantitative models are necessary but not sufficient for the analytical task. We need to temper their results with knowledge. This is the blueprint that ERS has followed.

What ERS has constructed over the past three years is a platform for collaboration. The first component is a Geographic Information System that attempts to cover the food and agricultural sector. To this, we add quantitative economic models that characterize market behavior, embodying these substitution possibilities we have been discussing. And then the key ingredients are the ERS analysts, whose institutional knowledge and insights are critical in leveraging the conclusions of maps and models. This capability is in fact quite different from what we had in the past. Why? Because bioterror events require that we add another dimension to our economic analyses: spatial. Where something happens is now very important because it affects the range of substitution possibilities. Traditional economic models have no spatial dimension, don't need it to find market equilibrium. If there's a drought in Kansas, the supply curve for corn shifts inward, and we get a new equilibrium price. Different also in that time is of the essence in per-forming the analysis, so we have tried to gather information in advance. But this approach is not different in the sense that ERS takes the national perspective. It is our charge to look at economics that way.

In closing, I want to share our view of priorities as we move forward with our geospatial economic assessment work I think the biggest blind spot we have is with respect to consumer response to a bioterror event and the factors that affect it. I don't think it's meaningful to say an event would cause consumers to “lose faith in the food supply.” What does that mean? There is no substitute for food! Most likely the damage would be confined to a subsector. But what form might responses take? Would consumers simply make the substitutions as they have in response to historical price and quantity changes? (See charts.) Or would they behavior in an altogether different manner? It's hard to say. While we are blessed with copious amounts of data on agricultural production, we do not have much in the way of food consumption. Therefore, we do not even have the historical record to consult.

With respect to consumer reactions, we have some notion that the source of the message matters. If resilience is keeping substitution possibilities open, then messages about the extent of contamination or damage in food would be very important. In this respect, it is interesting to note that the Dept. of Homeland Security has taken on as a consultant a behavioral scientist, Baruch Fischhoff. Fischhoff has thought a lot about how people understand risk and respond to it. He wrote a nice column in the Washington Post after Hurricane Katrina, in which he considered how individuals understand risk and respond to it. He concluded by saying, “Communication is part of any relationship. After Katrina and Rita….indeed after any public crisis…citizens will ask ‘Did you listen to us, so that you could tell us what we needed to know?’ When the answer is yes, the authorities increase their standing as information providers. When the answer is no, the authorities undermine our resilience as a society.”

There's the term resilience again. Here Fischhoff is saying that without good information people cannot make the choices that help them adapt to disaster. Adaptation is only possible if there is a database to consult that allows identification of substitutes. Good communication married to a good understanding of options and consequences is a key part of preparation for any bioterror event or, indeed, for many of the unforeseen disruptions we can expect as part of modern life.