# Vulnerability and Resilience: Two Dimensions of Rurality[1]

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The objective of the paper is to describe how the concepts of vulnerability and resilience can be applied to economic development in rural regions, but the starting place for the analysis is the idea of risk. Risk is one of the basic concepts in economics, but it has rarely been formally introduced into studies of regional development. Consequently, the first part of the paper examines how explicitly introducing risk alters how we understand economic development. Only then can we think about how vulnerability and resilience can be used in constructing economic development strategies in rural regions.

Following the discussion of how risk is considered by economists, and how it is incorporated into theories of economic development the next section connects the concept of risk to various approaches used by other disciplines in examining the role of vulnerability and resilience in regional studies. While economists rarely use these terms, they are the main way that other disciplines approach the consequences of risk. The next section of the paper describes three bodies of economic literature that offer useful ways to understand how risk can be introduced into regional economics. This provides a connection to the ideas of vulnerability and resilience used by other disciplines. Finally the paper offers a synthesis of the four concepts of: vulnerability, resilience, growth and rurality, as a way to think holistically about rural development in an uncertain world.

The main message of the paper is that rural economic development is inherently a process of risk management. When compared to large urbanized regions, rural regions face more risk (increased vulnerability), but in many cases higher risk is associated with faster growth, and there is often the possibility for effectively managing risk (improved resilience). While downside risks are problematic for rural regions, reducing exposure to these risks, when it is possible, can lead to lower rates of economic growth and a lower level of development. In rural regions economic opportunities may well be restricted to choosing among relatively high risk alternatives, making risk mitigation difficult. In this situation the result may well be a wide range of outcomes among rural regions when observed at the

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[1] An earlier version of the paper was the basis for a keynote address at the European Society for Rural Sociology 25th Annual Congress, Florence Italy, July 29-August 1, 2013. Helpful comments and questions by the audience have led to this revised version that hopefully provides more clarity on how economists understand and approach the role of vulnerability and resilience in influencing rural development.

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national level. Successful – perhaps lucky, places will exhibit high rates of development and unsuccessful- perhaps unlucky, places will exhibit economic decline.

**Risk and Regional Economic Development**

Surprisingly, regional economic analysis places little emphasis on the effect of risk. Texts on regional economics either fail to have risk identified in their subject index, or give it a minor role in their exposition (Blair and Carroll, 2009; Capello, 2007; Capello and Nijkamp, 2009; Dicken and Lloyd, 1990; Heijman and Schipper, 2010; Pike, Rodriguez-Pose and Tomaney, 2006; Shaffer, Deller and Marcoulier, 2004). Dicken and Lloyd have a brief discussion of risk in the context of location of the firm, where locating near rivals may offer some assurance that this is a good place to do business (p. 209) and in the context of how alternative public policies affect firm outcomes (p.274). Shaffer, Deller and Marcoulier, also discuss risk in the context of capital market failures, once again in the context of the firm (p.135). Heijman and Schipper introduce risk as an element of benefit –cost analysis for regional infrastructure projects (p.173). The other books are silent on the place of risk in regional economics.

Broadly speaking risk reflects the fact that we cannot know the future so most of our choices have some probability of different outcomes than those expected. Box 1 provides some basic concepts of risk that are used in the balance of the paper. Firms and individuals make decisions each day based on expectations about the future, and only later do they find out if the outcomes are favorable or unfavorable. The link between risk and theories of economic development can be traced back to Schumpeter's concept of the destructive process of capitalism where new firms innovate, and in doing so destroy established firms (Schumpeter, 1983). Clearly risk extends beyond the individual and firm to the region, if only because there are clear regional consequences stemming from how well local firms perform. Low or high levels of output and performance directly affect regional economic growth, and indirectly affect: population growth, the tax base of local governments and quality of life. This makes the absence of risk in discussions of regional development even more surprising.

In most instances discussions of local economic development options are framed in terms of choices. Communities or regions choose among strategies – such as, industrial recruitment (inward investment), improvements in amenities, investments in building infrastructure, efforts to stimulate local entrepreneurship, or strengthening existing business clusters. For the most part these decisions are framed as choices among certain outcomes. The focus is on which is the "best" development strategy, implicitly supposing all strategies have equi-probable outcomes or even that all offer certain outcomes. Yet, in reality risk exists for any investment and the risk levels among alternative investments can vary considerably. This suggests that differences in variance among outcomes should matter when making a choice.

Further, from a local economic development perspective it is important to distinguish between the effects of systemic risk and idiosyncratic risk. Diversification of the economic base is often advanced as a development strategy. Inherently, "not having all your eggs in one basket" seems a sensible strategy. But diversification can only address idiosyncratic risk. Business cycle risk is not diversifiable if it affects all firms. Similarly, if firms in the community/region buy and sell a significant quantity of total output to each other then they are linked through supply chains. These supply chains offer higher local multipliers, which is desirable in good times, but undesirable in bad when adverse effects cascade through the supply chain. For diversification to be effective the main source of risk facing the firms in the community/region has to be idiosyncratic.

Box 1: Some Basic Concepts of Risk

Risk is a measure of variability in outcomes. Often it is poorly characterized as only the negative outcomes, but ignoring upside benefits results in a distorted perspective of risk.

The inherent risk in any activity is a given. It is possible to transfer the risk to another party, but the underlying risk remains. Only by altering the action in some way is it possible to alter the risk.

While risk is given, the ability to bear risk can vary among individuals, with some being more able to do so. This creates the opportunity for payments to accompany risk transfers that make both parties better off.

Most individuals are risk averse. Given two prospects with the same expected value and different degrees of risk, a risk averse individual will always choose the lower risk prospect.

Given risk aversion, a prospect with higher risk has to offer a higher expected return for it to be selected. This leads to the risk-return trade-off.

Combining risky assets or actions into a portfolio can significantly reduce total risk exposure, even when these risks are somewhat positively correlated, because for the majority of the potential outcomes only some will be negative.

Risk can be broken into two types. Idiosyncratic risk is specific to a particular prospect and is independent of other actions and outcomes. Systemic risk is risk that is common across multiple prospects. Portfolios offer a way to reduce the impact of idiosyncratic risk, but systemic risk is not reduced by diversification.

Most importantly, diversification typically has a cost, especially in a small rural region where resources are limited. Specialization is a means to achieve efficiency and increased productivity that increases competitiveness for both the firm and the region in which it is located. Conversely, distributing resources among multiple

activities can reduce risk but can also result in weaker growth because at a small scale none of the firms are efficient producers

Risk in the context of regions and communities can have a "zero sum" aspect. Some examples clarify this point. Several firms may bid for a contract to supply a part or service to another company or government. The winning firm and its host community experience a favorable outcome in this competition, while the losers experience unfavorable outcomes. When a new major controlled access highway is constructed by a government, only some communities will be near an interchange and benefit from this proximity, while their more remote peers will be disadvantaged. When Wal-Mart, or some other major retail store, chooses a community for its location that community will experience a surge in retail activity, while nearby communities will suffer a retail collapse.

*Risk Mitigation Strategies*

Conceptually there are five basic ways of dealing with risk. Each has benefits and each has costs. The first is to do nothing and accept fate. The second is to alter behavior to avoid any exposure to that particular risk. These are polar extremes in terms of response. The other three alternatives occupy an intermediate ground: self-protection, self-insurance and market insurance (Becker and Ehrlich, 1972).

Accepting risk without a mitigation strategy may be optimal, especially for small risks that can be easily managed without significant consequences. In this case both upside and downside outcomes are not materially significant to welfare. In the realm of economic development it may not make sense to have a strategy to deal with the opening and closing of small retail establishments in a community or region because whether there are one or two more or less has little significance to the local economy. In addition, it may also be optimal to ignore some low probability high consequence events because they are both very low probability and the cost of reducing exposure is so high that the outlay imposes a greater burden than the expected loss. For example, in regions subject to flooding any structure built to protect the region has a design threshold – typically the 100 year flood. More severe floods will overwhelm the control structure, but a judgment has been made that the cost of building additional protection exceeds the benefits, which is implicitly equivalent to ignoring these low probability risks.

Eliminating exposure to a risk is the polar opposite strategy. Clearly this approach involves giving up the benefits associated with the opportunity as well as the inherent risk. Where a region has multiple opportunities and they all offer similar outcomes but some are less risky it may make sense to avoid the more risky ones. GM crops offer farmers the potential for higher yields and lower costs of production but they bear some risk of adverse human and environmental consequences. Giving up GM crops eliminates the risk, but also the benefits. It should be recognized that in giving up an opportunity one also gives up the potential for that risky opportunity to be part of a portfolio. If the high risk option is negatively correlated with other choices than aggregate risk can be reduced by including it in the portfolio. This leads

to the important point that in risk mitigation the focus should be on total, or portfolio, risk and not on individual risks.

Self-protection involves modifying behavior to reduce the consequences of exposure to a risk. The most obvious way of doing this is through diversification where creating a portfolio of risky actions results in a reduction of aggregate risk exposure. Typically diversification results in a reduction in aggregate return. If expected returns vary among options then specializing in the highest expected return opportunity will result in the largest return over time. Economics recognizes that specialization can increase productivity and increase average returns. But specialization also leads to higher risk than having a more diversified economy. This is consistent with the existence of a risk-return trade-off. Unless risk reduction is the main strategy there may be limits to how much diversification is acceptable in a region or community.

Self-insurance involves holding sufficient cash or other liquid reserves to offset downside risks. Holding cash is a low return investment and as cash reserves increase there will be a significant reduction in aggregate expected return because a larger share of the assets of the community or region are being set aside. Local government's may allocate a portion of their annual tax revenue to a "rainy day" fund that acts as a liquid cash reserve for periods when tax revenues are lower than anticipated. Similarly, Norway and the Province of Alberta, Canada have created investment funds that accumulate a portion of oil revenues for use when oil reserves are depleted. In this case high revenue from oil extraction is used to establish a mechanism to maintain income once the resource is gone. But, once again, holding cash reserves means lower levels of investment in activities that are intended to increase economic growth and the quality of life.

Market insurance can be loosely interpreted as risk transfer. With this strategy some or all of the risk associated with an action is transferred to another party. Clearly the transfer also requires a payment to that party for accepting the risk. Market insurance works when the party absorbing the risk can do so at lower cost than the original holder. Market insurance works best when risk for an individual is idiosyncratic but it becomes predictable for large numbers of individuals. No individual knows if their house will catch fire and the consequences of a fire are catastrophic. But an insurer can predict the average incidence of fire in a community and establish cash reserves funded by modest premiums paid by individual homeowners. Outreville demonstrates that the existence of a well-working insurance market facilitates economic development by providing individuals' and firms with a way to transfer and aggregate risk (Outreville, 2013).

**Risk and Rural Economic Development**

Because they are small open economies, rural regions are highly exposed to risk – variability, but they may be able to find ways to adapt to risk – resilience, which can allow them to improve their economic condition over time. Variability is inherently

a discussion of the effects of risk, in terms of its consequences for performance measures, say, per capita income or growth rates of local GDP. Resilience is a measure of how well a particular set of investments position a community or region to allow it to respond to risk, either by returning to its previous growth path or by shifting to a more appropriate path in response to altered circumstances. Both concepts are explicit recognition that risk management has to be a central element of any rural economic development strategy. Another way to characterize the situation is that communities and regions make investments in their future on the basis of some expected outcomes, but in reality the expected outcomes are unlikely to occur – things may be better than expected or they may be worse.

In making choices among investment the variances as well as the mean values have to be considered. In a series of papers Kostov and Lingard make this specific point by saying that a main consequence of rural development is that it reduces risk (2001, 2003, 2004). The core of their argument is that at the individual and community level the high degree of economic specialization that is found in weakly developed rural regions results in high levels of risk. The process of rural development involves economic growth, which in turn allows diversification of the local economy, leading to a reduction in risk. For example, an agricultural community where farmers all produce the same crop has a high level of risk, both for individual farms but also for the community and region. Because the farmers are all geographically proximate they experience the same climatic events, and because they produce the same crop they experience the same market risks. Because the community relies upon farming as its economic base, it too is subject to the same shocks as the farmers. If the community diversifies its local economy by adding an unrelated manufacturing sector[3], which creates off-farm employment opportunities for farm households then risk is reduced for both farmers and the region. Implicit in this process is the requirement that the community has to first find some "spare resources" that can be diverted to start the new activity. Without net new investment simply diverting resources from agriculture may lead to a decline in total output that makes the community worse off.

*Risk Mitigation and Economic Development Strategies*

Economic development can be thought of as an investment process. People, firms and governments spend money now to improve: natural capital, human capital, social capital, built capital and the financial capacity (profits) of firms. They make these investments because they expect to generate a positive return on their investment. This may be the most important message of the OECD New Rural Paradigm- that rural development should be based on investments and not on subsidies (OECD, 2006). However, expectations of higher returns may not be realized for a variety of reasons. A poor investment choice was made, the project was poorly implemented, conditions changed, fewer resources were available than were anticipated, or bad luck occurred. Or, conversely, the investment may be far

[3] Notably, if the region adds fertilizer manufacturing to its economy it may not achieve much risk reduction, even though it captures value-added benefits.

more successful than was anticipated and the region is even better off than it expected to be.

Given the pervasiveness of risk, the evolution of regions and communities is inherently a matter of chance, but the investments made in places can alter the odds of success by changing the likelihood of potential outcomes, or even the set of potential outcomes. In a sense the specific set of firms in a community forms a portfolio of individual economic prospects. And, how well this portfolio performs determines community economic performance. Individual firms each have some distribution of future outcomes, but the specific portfolio of firms results in a particular distribution of aggregate outcomes for the community. Risk for this community portfolio mainly reflects the correlation among the risks affecting individual firms. In this context a high risk enterprise may actually reduce aggregate community portfolio risk if the risk distribution of the enterprise is negatively correlated with the risk profiles of other firms. Conversely, adding another firm to an existing business cluster, where firms are tightly linked, will increase risk. This makes it important for a community not to simply assess the prospects for different enterprises, but to think about how the prospects for new firms or activities correlate with their existing economic structure.

When common approaches to economic development are considered in the context of risk management important new perspectives can occur. Consider the case of an industrial cluster. Cluster advocates emphasize the benefits from coordinating the actions of small firms that have strong linkages either because they are part of a local supply chain, or because they all are involved in the same business. Collaboration is seen as providing important opportunities for joint learning, joint marketing and sharing workers and other resources. But from a risk perspective close integration of independent firms reduces idiosyncratic risk and increases systemic risk. An adverse event that hits one firm now has consequences for them all because of the tight coupling of multiple firms.

Similarly, the desire of individuals and organizations that are engaged in economic development efforts to emphasize multiplier effects as a way to capture more local benefits from adding a new firm also has an additional risk implication. Once again, the stronger the linkage among firms, which increases income and employment multipliers, the greater the systemic risk. Failure of any component in the local supply chain has implications not just for that firm, but for all the members of the supply chain. In essence, with strong local supply chains we get the possibility of a higher rate of expected growth in the local economy, but only at the cost of a higher degree of risk. This is consistent with the existence of a risk-return trade-off.

Finally, it is well known that new entrepreneurial ventures have high failure rates in their first years, and that few of these firms ever employ more than one or two people. This has weakened the interest of those responsible for local economic development in entrepreneur-based strategies, because, not only is it hard to identify potential entrepreneurs and encourage them to act on their idea, but the

returns to the community or region seem to be small given the effort required. However, if risk at the individual entrepreneur level is mainly idiosyncratic, so the failure or success of any single firm is uncorrelated with the fate of others, then from the community or region perspective aggregate risk from this strategy is lower than the consequences facing a single entrepreneur. For each firm risk is a binary event – either it fails or survives, but for a community/region with many entrepreneurs the majority will survive and the place will be better off.

In the balance of the paper the role of risk is developed as an important factor that should be considered in thinking about how to achieve economic growth objectives. Because the focus is on rural regions and communities the magnitudes of the risk is typically large. Small, open, rural economies face two important disadvantages when compared to larger cities or bigger regions. The first is the necessity to specialize in order to be efficient. In a small economy there are insufficient resources to be good at many things. Vulnerability in rural regions is inherently high because the cost of diversification (forming a portfolio) is high (low productivity and competitiveness). The second is the high exposure to the outside world, once again because a small economy can only produce a fraction of the goods and services its people want to consume and its firms need as inputs. This leaves the region inherently exposed to exogenous shocks caused by its trading partners.

## Connecting Concepts of Vulnerability and Resiliency to Risk

The concept of vulnerability is used by a number of disciplines in a variety of ways. Alwang *et al.*, 2001 provide an overview of how the term has been used in: anthropology, economics, sociology, disaster management, health and nutrition studies, and ecosystem analysis. While the common element underlying a concern with vulnerability is the potential for exposure to a negative shock, the various disciplines use the idea in different ways (Alwang *et al.*, 2001, p. 4). Some disciplines focus on individual risks while others look at pooled risk, some focus on identifying all the attributes of risk and its underlying probabilities while others treat risk less formally, economists and experts in disaster management tend to rely mainly on monetary measures of vulnerability while other disciplines use multi-dimensional measures of vulnerability (Alwang *et al.*, 2001, p. 24). More recently, economic geographers have begun to examine vulnerability at the spatial level (Dawley, Pike and Tomaaney, 2010; Martin, 2012; Miller *et al*., 2010; Simmie and Martin, 2010; Smit and Wandel, 2006). But their work has largely adopted an approach grounded in ecosystem analysis and not economics.

A useful extension to the current literature on vulnerability and resilience, which mostly looks at responses to a single shock, is to think in portfolio terms. Obviously, this is only useful if the shocks a region experiences are not highly positively correlated. But, if risks are weakly correlated the value of diversification is much higher. In addition the other concepts of risk management are directly applicable to improving resiliency.

For economists the natural interpretation of vulnerability is through the effect of risk or uncertainty. While the finance literature has developed the most comprehensive measures of risk, the concept of risk is found in most branches of economics. In macroeconomics the study of business cycles is a recognition that even if the macroeconomy follows a trend growth path it experiences positive and negative disturbances from this trend that can have major impacts. Following World War II these cycles were relatively infrequent and moderate prior to 2008, and there was a belief that monetary and fiscal policy had tamed the business cycle and we were in a period of "Great Moderation". Similarly, within agricultural economics there was an early appreciation for cyclical prices in certain commodities, particularly corn and hogs (pigs), that were triggered by adaptive price expectations of farmers.

In an economic development context it may be more useful to focus on volatility than on vulnerability. Volatility encompasses both the upside and downside possibilities, while vulnerability only looks at downside risk. Even though the consequences of a loss may be more damaging to, an individual, a region or a nation than a gain of equal magnitude we typically make decisions based on an examination of all possible outcomes not just in terms of reducing exposure to adverse ones. Rural economic development strategies are rarely conceived in terms of loss minimization, but are typically structured as maximization efforts in terms of income growth or standards of living. In this latter case risk plays a role in choice, but there is a balancing of risk and expected return.

An important dimension of volatility is not just the probability of exposure to shock, but the magnitude of the impact of the shock. Regions of all types are exposed to shocks, and these shocks can lead to spurts of growth or decline. The size of the region affects the influence of individual shocks, both positive and negative. For example, suppose we have a small rural region with 5000 workers and a city region with 500,000 workers. Suppose each has a firm employing 500 workers. If the firm closes in the rural region 10% of the local jobs will be lost, but in the city region only 0.1% of jobs are lost. Similarly, if the firm doubles its work force, then the rural region will experience a 10% increase in employment and the city only a 0.1% increase.

The example shows that equi-probable events of equal absolute magnitude have very different consequences for regions of different size. In a city the consequences for the expansion or contraction of a specific firm are small, but they are large in a small rural region. If size is measured by GDP the same results apply – individual economic events have less impact on large economies than on small ones. Rural regions are also typically exposed to a wider range of shocks than are larger more urbanized regions. Rural regions tend to be more influenced by fluctuations in nature, such as, droughts, floods, unusually good growing conditions, excellent snow conditions in ski resort areas, and other climatic effects. By contrast, much less of urban activity takes place outdoors where nature plays a significant role in

outcomes. Rural regions tend to have more open economies so their firms are more exposed to trade effects than are firms in cities that serve the local or home market.

This suggests that the vulnerability of a region relates to: the types of external shocks it experiences, the size and frequency of these shocks, and the impact that the various shocks have. Regions where: there are not many types of shocks, they occur infrequently and they have little impact may experience economic development as stable growth along a trend line, but regions of this type are rare. In practice if regional development is to be sustainable, it will require finding ways to manage the negative effects of downside risks and capture the benefits of upside risks. Importantly, the optimal development path may not involve minimizing exposure to risk, but it will involve managing risk to reduce vulnerability.

Resilience is typically used as a way to describe positive responses to vulnerability, either by restoring a previous equilibrium or by moving to a new situation that reduces the effect of a negative shock. Resilience is an infrequently used concept in economics. In theory well functioning market price signals provide ongoing information about the future and suggest how individuals and firms should act, thereby creating a well defined set of future actions. With efficient markets if opportunity costs do not alter there is no reason to change planned behavior, and if they do there is a clear signal on how to change. Resilience only becomes interesting when shocks come from outside the price system. This suggests the value of resilience is associated with market failure. In this situation resilience can be thought of in terms of game theory, in particular a game against nature. Nature chooses an outcome from some set and the individual simultaneously chooses a strategy after having examined the set of possible choices by nature. Since individuals do not know which choice nature will make they have to make choices that are desirable under a range of possible outcomes. Clearly, the big behavioral difference in this game is that the individual makes purposive choices while nature behaves randomly. The individual is adaptive and nature is not.

Simmie and Martin assess the resilience of regions (2010). They employ the idea of external shocks as triggers of change, but only negative shocks. While risk averse individuals and firms might well focus more on downside risk, excluding any discussion of positive shocks associated with alternative growth paths is inappropriate. Indeed upside shocks are one important way that regions can adapt because they provide additional resources that can be invested in further growth or development. Smit and Wandel discuss adaptive capacity of human systems in the context of climate change (2006). In their context resilience is interpreted as adaptability – the ability to quickly react to a shock and in doing so choose the best future path (p.283). This idea extends resilience from the simple ability to return to the previous state. However, once again the only context for their analysis is a negative shock. Given the ability to learn and plan in human systems it could be instructive to examine how the ability to adapt to positive and negative shocks conditions the choices that are made. Dawley, Pike and Tomaney focus on the adaptation of peripheral regions to adverse shocks (2010). They endorse strategic

responses by local authorities that identify new economic opportunities, rather than simply trying to rebuild the past. Importantly they see the importance of sufficient funds to allow new investment as a crucial constraint on restoring the regional economy (pp. 10-11).

## Economic Approaches to Understanding Vulnerability

Although there is very little literature in economics that directly addresses risk as it affects economic development in rural areas there are three related bodies of literature that can be used to help introduce the idea of vulnerability into rural economic development strategies. The first of these involves the study of how households are affected by risk. Much of this work focuses on limited income households in developing countries, but some addresses poverty in developed countries. Much of the literature focuses on coping strategies that can be used to reduce the impact of vulnerability. Because the households are largely exposed to exogenous shocks and many of them are in rural areas this literature has a direct connection to rural development. Macroeconomic studies of volatility in economic growth provide another entry point. While economies with higher volatility grow on average at slower rates than countries with less volatility, there is more variability in growth rates among high volatility countries and some of these grow very quickly. This literature provides the important idea that vulnerability involves a distribution of outcomes, only some of which are negative, and that if undesirable effects do not materialize growth can be rapid. The last body of literature deals with economic growth in small nations. Small nations in many ways resemble rural regions within a nation. Like rural regions they have limited populations, truncated economies and are highly exposed to external shocks. Importantly they also have a high degree of variability in their levels of economic growth. And, like rural regions, some small states grow rapidly while others do not.

### *Household Level Studies of Vulnerability*

Alwang *et al.* review a large body of literature that examines the vulnerability of households and individuals, particularly in terms of poverty and food security in developing countries. One stream of this literature focuses on alternative approaches to reducing vulnerability, including Sen's asset based analysis and the sustainable livelihoods approach. Formal microeconomic models underpin much of this analysis, and the focus is on identifying ways to manage risk to maximize expected household welfare. They identify a few important themes from this literature. The first is that vulnerability comes from multiple sources of risk that are correlated in various ways. The second is that even if a negative shock does not manifest itself in the current time period it does not mean that the individual household is not vulnerable. A third is that vulnerability is a relative term and this requires that a benchmark or reference point be identified.

Ligon and Schecter (2003) employ a broader measure of well-being to examine vulnerability at the household level. In their model vulnerability is a function of poverty level, aggregate risk and idiosyncratic risk. Poverty is measured in terms of

the deviation from some fixed standard of income. They focus on limited resource households where the risk of a decline in income or consumption is high. The risk, or vulnerability, alters the level of welfare even if the decline does not materialize. Risk has two components, systematic and idiosyncratic. Using household survey data from Bulgaria they find that the largest contribution to vulnerability comes from the starting degree of poverty, accounting for about half of all vulnerability (p. C99). Households with income and expenditure below the reference level have the highest vulnerability. The second most important source of vulnerability comes from aggregate risk – risk that affects all households, at about 15% of all vulnerability. Idiosyncratic risk accounts for about 1% of vulnerability and the remaining vulnerability reflects unexplained effects. This last point suggests that for the individual unit systematic risk has the biggest impact on welfare.

Households are often able to mitigate vulnerability by adopting coping strategies. These include: diversifying income sources, holding cash or food reserves, obtaining insurance, improving human capital and building stronger social networks (Naude *et al.*, 2009, p.185). These mitigation strategies either alter the probability of a decline in income or they reduce the impact of a decline when it materializes. In this vein Kostov and Lingard propose that integrated rural development approaches are in fact risk mitigation. They use the example of CAP reform to argue that while reductions in price supports increase the vulnerability of farmers because they are exposed to greater price risk, this risk can be mitigated by improving income diversification opportunities for farm households through investments in rural development.

*Macroeconomic Studies of Volatility and Growth*

A useful macroeconomic literature on the linkage between risk and growth suggests the general result that countries with more volatile levels of GDP grow at a slower rate (Ramey and Ramey, 1995; Martin and Rogers, 2000). However subsequent studies suggest that the relationship between volatility and growth is less clear once national data is disaggregated by sector. Imbs finds that at the sector level there is a positive relationship between higher rates of volatility and higher rates of growth (2006). This result is consistent with the standard finance model that higher risk activities must command higher rates of return (Imbs, p.1). More volatile sectors are associated with higher rates of investment because they offer higher returns, which in turn leads to their higher rate of growth. Imbs explains the difference between the sector level results and aggregate national results as reflecting an aggregation effect and the possible impact of national macroeconomic policies (p. 3).

Koren and Tenreyro extend this decomposition of aggregate effects (2007). They look at three components of volatility in GDP growth rates: sector specific shocks, aggregate country specific shocks, and the covariance between sector and country shocks. Their findings are that :

- as countries develop they move toward sectors with lower intrinsic volatility,

- sectoral concentration declines with the level of income at early stages of development but in more developed countries sectoral concentration increases, but in low volatility sectors,
- country specific volatility falls with stage of development and
- there is no specific relationship between sector specific shocks and country specific shocks. p. 245

They note that developing countries tend to specialize in a small number of highly volatile sectors and they experience more frequent and severe country wide shocks, some of which reflect their sectoral dependence (p. 282). With development countries are able to first introduce more sectors – diversify, and then increase their specialization in lower volatility sectors. Importantly, they find that agriculture, mining and quarrying are more volatile than various types of manufacturing and that services are the least volatile (p. 262).

The importance of natural resource specialization on volatility is explored by van der Ploeg and Poelhekke (2009). They note that:

- countries that specialize in commodities with high price volatility experience lower growth rates, and
- countries on the periphery with volatile commodity prices and undiversified economies lag in economic development. p. 727

The conventional interpretation of natural resource dependency is that of the "natural resource curse" - a natural resource specialized economy has high earnings from natural resources, but weak prospects for other sectors. Prior analysis had already demonstrated that resource abundance has a positive effect on economic growth, even when resource dependence had a negative effect (p. 737). This suggests that natural resources are not inevitably harmful. Further, when both resource dependence and underlying aggregate volatility are included in a simple model of growth only aggregate volatility is significant (p. 738). Only if natural resources are the cause of aggregate GDP volatility would the natural resource curse still hold. Their subsequent analysis finds that commodity price volatility is a significant source of volatility in aggregate per capita GDP in some countries. But they also show that in other countries with a high dependence on natural resource exports that: better access to markets, reductions in ethnic tensions, prudent government spending and strong financial markets all reduce the volatility of per capita GDP growth rates (p. 754).

*Small States, Volatility and Economic Growt*h

A limited body of literature examines the economic performance of small nations – those with low population and relatively small and specialized economies. The main concern of this literature is whether small states have systematically lower rates of economic growth because they: are unable to take advantage of a large home market and are remote from large international markets; are buffeted by external economic shocks due to their open economies; and are unable to achieve minimum efficient scale in many sectors, which leaves them with a truncated economy. Small

nations also tend to have a higher dependence on natural resources than large nations. They have less efficient governments than large states because the pool of high quality potential civil servants is small and the best candidates emigrate to take advantage of better opportunities in larger countries. Small nations are more open with a higher share of imports and exports to GDP, which exposes them more to exogenous shocks than is the case for large countries. These are all attributes of rural regions.

Easterly and Kraay examine World Bank data to look the performance of nations with populations of 1 million or less. When compared to their larger peers, small states have higher per capita GDP, higher productivity and grow at roughly the same rate (p.3). They do exhibit higher volatility because they are much more dependent upon world trade, but their volatility is largely uncorrelated with global business cycles (p. 3). Easterley and Kraay note that while small states may have limited opportunities for reducing their dependence on external trade, because their home market is small, but that they have considerable opportunities for using financial risk management strategies to offset much of this risk (p. 14).

Briguglio *et al.* examine economic vulnerability and resilience with a focus on small states (2008). Economic vulnerability increase with the degree of openness of the economy since this increases exposure to exogenous shocks (p. 1). Small states are inherently more exposed to this form of vulnerability, yet there is the "Singapore paradox" where Singapore is economically vulnerable but has a high and growing per capita GDP. The paper develops a typology of vulnerability and resilience that shows how small states can manage their risk exposure in ways that allow economic growth. Vulnerability increases with economic openness, export concentration and dependence on strategic imports. To manage this risk nations must:

- adopt stable macroeconomic policies that act in counter cyclically.
- ensure that microeconomic policies support efficient markets with strong price signals
- establish strong governance institutions , including well established property rights and a sound legal system, and
- ensure social development that fosters inclusion and a good health and education system pp. 7-11.

These are broad development objectives that might be expected to be recommended in any case, but Briguglio *et al.* show that countries that adopt these approaches are able to better manage a high degree of economic vulnerability, and, like Singapore, have high rates of economic growth.

Armstrong and Read extend Briguglio *et al.* by introducing additional sources of vulnerability in small states beyond economic ones, and include political forces and natural hazards. However, their main contribution is to distinguish between vulnerability as an exogenous force and economic growth as an endogenous process (p. 436). They note the dilemma of small states is that they are exposed to vulnerability because of their open economies, but it is exports that account for the

majority of their economic growth (p. 440). Small states are seen as facing political vulnerability because they are minor players in geo-political discussions and have few strategic options. Similarly, because they are geographically small any significant natural hazard or change in resource availability has a major consequence.

Armstrong and Read examine real GDP per capita growth rates for 93 states. They find that including vulnerability, as defined by Briguglio *et al.*, has a significant effect on growth in their base model, but that it has a positive effect(pp. 445-446). Their explanation is that while remoteness and the presence of natural disasters have negative effects on growth the interpretation of openness to trade is ambiguous. Briguglio *et al.* suggest that a larger role for trade increases exposure to adverse shocks. However, Armstrong and Reid find greater openness to trade is consistent with stronger economic growth and economic success. (p. 446). To examine this result they develop a model similar to that used by Briguglio *et al.* but which controls for the type of sectoral specialization by country (tourism, agriculture, resources, financial services, and manufacturing). In this model sectoral specialization is a strong predictor of GDP variability, but the vulnerability measure developed by Briguglio *et al.* becomes insignificant (p. 451). Note that these results are largely consistent with the findings of Koren and Tenreyro, and van der Ploeg and Poelhekke, as described in the previous section.

The analysis confirms the logical conclusion that some sectors in which small nations and rural regions specialize have inherently higher risks than others. While the obvious response is to find an alternative economic base to reduce vulnerability this may not be possible if the nation or region is not a competitive provider of anything but the high volatility output.

**Vulnerability, Resilience, Growth and Rurality**

The fundamental nature of rural regions makes them inherently more vulnerable to economic and environmental shocks than are large urban regions, just as small nations are more vulnerable to economic shocks than large nations. Rural regions may be large in geographic area but they have relatively small populations, undiversified economies and are highly open to trade. These are also characteristics of many small nations, but small nations have at least some control of their monetary and fiscal policy, whereas rural regions have monetary and fiscal policy regimes imposed upon them by national governments that typically have other priorities than rural development. This makes rural regions even more exposed to systemic external shocks than small nations.

However, just as some small countries grow faster than large countries we find that there are rural regions that grow faster than most urban regions in the OECD countries. Indeed, the OECD Rural Programme has spent the better part of two decades demonstrating that rural is not synonymous with decline. Starting in 1984 with *Creating Rural Indicators for Shaping Territorial Policies* and most recently with

*Promoting Growth In All Regions* in 2012 there has been clear evidence that there is higher degree of variability in economic performance in predominantly rural regions than in predominantly urban regions. While the average growth rate in predominantly urban regions is higher than in the predominantly rural regions, the higher variance in the latter case results in some high performing rural regions.

Parallel work by Freshwater, Simms and Ward in Atlantic Canada also shows that smaller rural regions based on local labor markets have far more variability across a number of economic metrics, including productivity, GDP growth rates and employment rates, than is the case for urban regions (Freshwater, Simms and Ward, 2013). Once again, lower average levels of performance in rural regions are associated with both very high or very low levels of performance in specific rural regions. High performing regions are characterized by a very high degree of economic specialization in a high value resource extraction economy – typically mining, oil and gas, or a highly productive fishery. Low performing regions seem to have no strong export sector and rely on transfer payments for much of their income.

These findings are consistent with basic concepts of risk management. If the usual risk-return relationship holds for small countries and rural regions, then we should expect to see higher rates of return for those countries/regions that have successful outcomes, simply because they face higher risks of bad outcomes. And, we should also expect to see similarly specialized regions with poor outcomes simply because they "drew" the unfavorable outcomes. Specialization conveys benefits, as well as higher risk. Being more open and more specialized with a small nontradable sector means that rural regions are indeed more vulnerable to shocks. The risk of disruption is higher, but until an adverse event occurs they have a higher growth path and the possibility to build financial reserves or make other investments that can mitigate risk. Whether they do this or not is of course the crucial question.

Why would a rural region not adopt risk mitigation approaches? One plausible explanation is the cost associated with diverting resources to this purpose. While Kostov and Lingard correctly demonstrate that rural development is an inherently risk reducing process, there have to be sufficient "free resources" to invest in a new activity that reduces risk without simultaneously causing a major decline in income and employment. In small disadvantaged rural regions where savings are low there may be insufficient capacity to make these risk reducing investments. This suggests that a necessary condition for a region to be able to manage risk is some source of investment capital that can be generated from savings in good times or transfers from an external source to make new investments.

Clearly, thinking seriously about risk raises questions about the validity of two standard recommendations for rural development – diversification and clusters. Both of these are often advanced as alternatives to specialization. Diversification faces the challenge of reaching efficient scale in a number of uncorrelated activities. First, a small economy has limited capacity to diversify because it lacks the labor

supply and other inputs as well as local markets. Second, it is exceedingly difficult to find sectors where risk is largely idiosyncratic and uncorrelated. Rural regions face a lot of systemic risk – all sectors are impacted in the same way at the same time, and diversification provides few benefits in this environment. In this circumstances going for higher growth rates may be the most sensible strategy. Similarly, the idea of clusters loses much of its appeal once risk is formally introduced. By definition firms in a cluster face a high degree of correlated risk. If the cluster leads to higher growth rates by bringing about greater specialization it may still be desirable, but a cluster by definition is not a strategy for reducing specialization.

Given this high level of vulnerability, how should rural regions approach resilience? Simply focusing on specific sources of downside risk can make the condition of rural regions seem worse than it may be. Two important qualifying factors must be considered. The first is that high exposure to negative shocks may be offset by equi-probable positive events that lead to relatively strong performance on average. Importantly, an interval of high average levels of growth can provide the resources to manage risk. The second point is that regions can manage risk by adopting simple portfolio approaches, and this provides an important resilience capacity that is ignored if resilience is defined in terms of reacting to individual risks in an independent manner. The best way to do this is to explicitly incorporate risk management in regional economic development strategy.

All risk mitigation strategies for rural regions fall within one of the five categories described previously. One option is to ignore the effects of risk, including its portfolio effects. This unfortunately seems to be the most common approach at present. The second option of eliminating exposure to risk is clearly unattainable, because all a region or community can do is alter the forms of risk to which it is exposed, and some of these risks – climate change, for example, or macroeconomic policy risk, cannot be avoided. This leaves self-insurance, self-protection and "market" insurance as the available options.

Self-insurance in the form of building reserves in good time to cover costs in bad times is a well-understood public management practice and a useful strategy for individual firms and households. However these reserves are typically not sufficient to cover anything but relatively short and minor downturns. Regions typically benefit from national governments providing them with resources in times of major economic disruption, and this assistance can be thought of as constituting a form of market insurance, although there is typically a zero price for this insurance. These can include general counter-cyclical policy responses, such as, higher national government outlays on local infrastructure projects, cash grants to local governments, or extended periods of unemployment compensation.

But the main form of adaptation for a region is self protection. How does a rural region assemble a portfolio of economic activities that provide sufficient growth at an acceptable level of aggregate risk to the region? Economic development is typically characterized as a purposeful activity in the sense that the region has some

sense of its objectives. Part of the development strategy should include efforts to balance volatility (risk) and growth. This is captured by the argument of Koslov and Lingard that rural development is a process of risk reduction. But the questions are, how to best reduce risk , and how much should risk be reduced? It also has to recognized that regions operate in an environment where their choices can be highly constrained – some alternatives are not practically available. Rural regions specialize because they have to - to be competitive in national and international markets. Similarly, rural regions often have a high dependence on natural resources because they have an absolute advantage in resource production, reflecting site specific locations.

Vulnerability in the sense of exposure to risk is unavoidable. And risks come in many forms including natural hazards. From an economic development perspective though, the main sources for risk are economic in nature. This suggests that a focus on evaluating risk using models developed in ecological studies may be misleading. These models rarely capture strategic behavior by actors and the essence of economic development is that it involves games with strategic behavior by the players. Regions and firms have objective functions, different risk tolerances and different endowments. The resulting complexity makes it impossible to define a "best" strategy, but a few basic principles can be identified. These principles can form the basis for a better understanding of resilience and include:

- The importance of adopting a portfolio approach that looks at how risks from individual options combine (covariance effects) to generate an aggregate risk exposure,
- Recognizing that risk and opportunities evolve through time, if only because other regions make decisions that alter risk exposure and opportunities for your region,
- The importance of recognizing the difference between systemic risks and idiosyncratic risks facing a region,
- Understanding that higher risk may be associated with a faster rate of growth and the benefits from growth can be used to offset risk exposure,
- Considering that minimizing risk can place a region on a slow growth path that means it will perpetually be dependent upon transfers being available from national government
- That at the national level a larger version of the game is being played where regions that engage in different activities are formed into a national portfolio that has its own inherent degree of risk.
- In this national game the wellbeing of any particular region may be sacrificed to achieve greater national wellbeing.
- Understanding that focusing strictly on mitigating down-side risk in any prospect ignores the possibility that this risk could be uncorrelated with other actions and that the incremental return from the prospect could be great enough to justify accepting the additional underlying risk to the portfolio.

From a national perspective it is important to realize that the inherent volatility of small regions means that some will thrive and others will not. These places are in direct competition with other regions in the nation and in other countries to fill an economic niche. If individual regions are not competitive they will not survive. Resilience strategies can improve the odds of survival if they ultimately improve competiveness, but if responses to risk involve reducing competiveness then efforts to mitigate risk can reduce long run viability.

**Concluding Comments**

The current focus on vulnerability and resilience by rural sociologists, economic geographers and other disciplines with an interested in regional development is valuable because it addresses a fairly gaping hole in how the topic of rural development has been examined in the past, particularly by economists. While economists incorporates risk and uncertainty in much of their work, there has not been the same attention paid to risk in regional economics. Yet, especially in rural regions, risk is pervasive and there are strong trade-offs between risk and return in most economic growth strategies.

While examining sources of vulnerability is an important exercise in planning development strategies it is only a first step. Simply avoiding risks may not be the best development strategy if it leads to forgoing opportunities for growth. By contrast managing risk, which is the underlying theme of most economic analysis of dealing with risk offers a perspective that can help improve conditions in rural regions.

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