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ECONOMIC VULNERABILITY, RESILIENCE AND CAPITAL FORMATION

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Abstract. This chapter explores the links between mainstream economic growth theories and economic vulnerability. The author shows that vulnerability, defined as the inherent exposure to exogenous shocks, has important effects on per capita output levels and economic growth. The model discussed in this chapter assumes a pattern of shocks which is symmetrically distributed between adverse and favourable ones. However, the production and utility functions with diminishing marginal returns, as postulated in standard economic theory, allows downside shocks to have relatively stronger effects than positive ones. The author argues that economic vulnerability can lead to higher per capita output but lower consumption levels as economies invest in resilience-building to overcome the negative effects of exogenous shocks. The author further argues that these findings constitute a possible approach towards the resolution of the so called "Singapore paradox".

1. Introduction

The past decades have seen renewed interest in the study of economic growth. The basic analytical framework employed in this context is the so-called growth accounting exercise pioneered by Solow (1956; 1957) which aims to attribute output growth to changes in production factors and to technological development, the latter often referred to as total factor productivity growth. Recent comprehensive growth accounting exercises, most notably Senhadji (1999) and Bosworth et al. (1995), find that total factor productivity changes are not as important as changes in factor inputs in explaining economic growth. But total factor productivity growth is generally larger in developed than in developing countries, and it is more volatile in the latter, accounting chiefly for the fact that output growth in developing countries is twice as variable as in developed ones. Because of this, convergence between poor and rich countries occurs at a very slow

pace. Among the determinants of total factor productivity growth, the more important ones are found to be positive terms of trade shocks, which are exogenous, and stable macroeconomic and political conditions, which are a function of internal policy decisions.

A fairly recent debate on the economic performance of countries relates to economic vulnerability. Briguglio (1992; 1995; 1997) pioneered such research examining the proneness of countries to risks in their performance. There emerged a strand of literature proposing alternative measurements, and sometimes definitions, of economic vulnerability. A finding of this research is that a number of relatively high per capita income countries are more economically vulnerable than countries at a lower level of development. This gave rise to the so-called "vulnerability dilemma" or "Singapore paradox" as Briguglio (2004) preferred to call it.

So far research on economic growth and on economic vulnerability have tended to develop separately. An exploration of their possible links could therefore be warranted. The usefulness of the vulnerability concept would increase if it were shown to have a bearing on the more important determinants of human welfare. On the other hand, the study of economic growth could benefit from the consideration of a possibly important explanatory variable in the form of economic vulnerability.

This chapter contributes to this debate by hypothesising that the increased economic riskiness implied by vulnerability has important effects on per capita output levels, economic growth and the process of economic convergence. The chapter suggests a possible approach towards the resolution of the "vulnerability dilemma" which the present author intends to test in further empirically-based research. It also provides possible explanations to empirical observations regarding the development of total factor productivity growth and the heightened economic vulnerability of small states.

2. The Concept of Economic Vulnerability

The concept of economic vulnerability emerged from the study of the inherent high exposure to external shocks, which account for increased risks to economic growth and performance and which are not necessarily reflected in per capita output levels. According to Guillaumont (1999), "vulnerability means the risk of being harmed, wounded (negatively affected) by unforeseen events, in general and in economics as well". Vulnerability may thus be viewed as an

economy's proneness to downside risks.[1] The literature on economic vulnerability is still developing, with new definitions, determinants and measurement procedures being suggested.

In an attempt to measure the economic vulnerability phenomenon, economic vulnerability indices have been constructed, generally including a relatively small number of variables, often limited to three or four (see Briguglio and Galea, 2003). The components of the index measure features that are thought to lead to vulnerability. These include a high degree of economic openness that leads to susceptibility to economic conditions in the rest of the world. Lack of diversification of productive activities, especially in the export sector, is another potential source of vulnerability, as would be a strong dependence on imports with low price elasticities and limited import substitution possibilities. Insularity, peripherality and remoteness, leading to high transport costs and reduced attractiveness for business and investment are also recognized as important determinants of economic vulnerability.

Other approaches attempt to measure vulnerability in terms of the variability of output and similar indicators. An important consideration in this approach is that it is tantamount to measuring the manifestation rather than the actual causes of the phenomenon.

Briguglio (1997) argues that there are a number of measurement problems when computing the EVI arising, in part, from absence of data for certain variables or for certain countries; different methods of statistical compilation across countries; and errors in measurements of the variables. Composite indices are averages of different sub-indices, and the single value which they produce may conceal divergences between the individual components or sub-indices, possibly hiding useful information. Furthermore, a composite index implies some form of trade-off between the sub-indices and averaging would conceal, for example, situations where the effect of one variable cancels out the effect of another. In addition there is the problem of whether to take a simple average or a weighted average and, in the latter case, which weights are to be assigned to the different variables. In general, the weighting problem remains in the realm of subjectivity, with the simple average having a favourable edge on grounds of simplicity.

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[1] Cordina (2004) defined economic vulnerability as the susceptibility to economic shocks of an adverse nature which originate from exogenous factors outside the control of policy makers. In this sense, the conditions leading to vulnerability are assumed to be inherent and of a permanent nature.

Studies on economic vulnerability have generally concluded that there is very little correlation between vulnerability and per capita output or output growth. Indeed, Briguglio (1995) finds that certain economies with high per capita income such as Singapore or Malta are subject to a significant degree of vulnerability. This is not in conflict with the conceptual basis of economic vulnerability studies, in that per capita output is regarded as an incomplete indicator of human welfare in the context of economies that are prone to significant downside risks.

On the other hand, it may be argued that vulnerability per se does not enter the human welfare function at the same level as economic growth or development. The usefulness of the vulnerability concept would therefore increase if it is shown to have a bearing on the more important determinants of human welfare. This can be postulated a priori on the grounds that the increased economic riskiness implied by vulnerability would have an effect on economic growth and per capita output levels.

3. Incorporating Vulnerability in a Growth Model

Models of economic growth typically feature a production function with diminishing marginal returns. This implies that as an economy invests in physical capital in order to grow, the rate of return from such investment would diminish as physical capital is accumulated. A steady state is eventually reached where, in view of the relatively low productivity of capital, further investment in physical capital would only reflect the need for replacement. However, if technology improves, the marginal productivity of capital would increase, leading to additional investment and output growth. Economic vulnerability can be incorporated in an economic growth model by considering production and consumption possibilities as being subject to random exogenous shocks, which can be represented as stochastic disturbances within production and utility functions. This theoretical model is explained more rigorously in Cordina (2004).

The model assumes a pattern of shocks which is symmetrically distributed between adverse and favourable ones. However, the production and utility functions with diminishing marginal returns, as postulated in standard economic theory, would allow downside shocks to have relatively stronger effects than positive ones. In other words, in a production function with diminishing marginal productivity, a positive shock to the production factors would increase output by a smaller magnitude compared to

the reduction in output from an equivalent reduction in production factors. It is important to note that this asymmetry is not an effect which is in-built into the model by assuming that negative shocks are inherently more frequent or stronger than favourable ones, but is a direct consequence of the nature of standard production and utility functions. Such asymmetry would of course be even more pronounced if the negative exogenous shocks outweighted the positive ones.

In this model, the relevance of the concept of economic vulnerability would depend on the susceptibility of an economy's production technology and utility to such shocks, which is here termed as resilience. Resilience determines the extent to which vulnerability ultimately impacts on an economy's welfare. An economy may be highly vulnerable to exogenous shocks, yet this would not impact on its welfare if it is also strongly resilient. This is in line with Guillaumont (1999), who stresses that the risk of a country being harmed by an external shock is given by the size and the likelihood of the shock, the exposure to the shock and the ability of the country to react to it. Thus while random shocks may be regarded as purely exogenous factors, the economy's susceptibility to such shocks may be viewed to depend on the state of development and on policy responses.

Cordina (2004) shows that economic resilience increases with the accumulation of capital. This is because as capital stock increases, the marginal return on such capital decreases at a decreasing rate. In other words, the drop in marginal productivity following a unit increase in capital would be larger for an economy with a low stock of capital than for one with a high stock of capital. Thus, the asymmetry described earlier on, whereby adverse shocks would have stronger effects than favourable ones, diminishes as an economy accumulates capital stock.

Cordina (2004) also shows that economies which are relatively more vulnerable to external shocks, as manifested by relatively high volatility in their capital stock, tend to have, in equilibrium, a relatively higher per capita capital stock and consequently output, but a relatively lower consumption per capita, than other economies, everything else remaining constant. The reason for this is that such vulnerable economies would need to dedicate a relatively large portion of their resources to overcome the difficulties of economic vulnerability by building capital in order to enhance their resilience. As a result, the marginal productivity of their capital would be lower in equilibrium.

Cordina (2004) extends this discussion to the behaviour of economies as they grow to approach their equilibrium state, or in other words, their path to convergence to steady state. Convergence to steady state is here taken to imply that the economies which grow faster are those with the highest proportional difference between the initial capital stock and the final steady state value. This theory implies that relatively underdeveloped economies should grow at a faster rate than more developed ones, everything else remaining constant.

The model shows that economic vulnerability tends to slow down the output growth of relatively underdeveloped economies and accelerates the growth rate of more developed ones. This is because underdeveloped economies would have insufficient resource capabilities with which to develop resilience and could hence be significantly damaged by vulnerability. On the other hand, more developed economies would enjoy better resilience possibilities and have a steady state output which is relatively higher than that of less vulnerable ones, thereby accelerating their economic growth in a process of convergence. In this sense, therefore, vulnerability can be viewed as a factor that retards convergence between developing and developed economies.

4. Vulnerability and Total Factor Productivity Growth

Vulnerability considerations can play a role in explaining observations regarding total factor productivity growth. It is to be noted that since the effects of vulnerability cannot be attributed to the role of factor inputs within a neo-classical production function, they would fall within the nature of the residual typically defined as total factor productivity improvements in growth accounting exercises. Among the more recent and comprehensive of these is Senhadji (1999), who concluded, amongst other things, that total factor productivity growth is larger in developed than in developing economies, and that it is more volatile in the latter. The study also observed that (a) total factor productivity growth declines with an increase in the share of capital in output and (b) there is a very slow speed of convergence between countries at different levels of economic development.

These observations fit within the results of the economic vulnerability model described above. The low total factor productivity growth for underdeveloped economies can be attributed to adverse effects on their output growth of their increased susceptibility to downside shocks discussed in the preceding section. The more volatile total factor productivity growth of such economies is another manifestation

of their increased susceptibility to such shocks. The lower total factor productivity growth for economies with a higher capital intensity is consistent with the results obtained pointing to an increased susceptibility to downside shocks of economies which increase their capital share in output starting from a relatively low level. The slow speed of convergence can also be attributed to the effects of economic vulnerability, as discussed in the preceding section.

5. Vulnerability and Small Economies

Studies on economic vulnerability consistently show that this phenomenon is prevalent in small states. Using a vulnerability index based on the volume of trade to GDP ratio as a measure of exposure to foreign economic conditions, transport and freight costs as a percentage of exports as a proxy for remoteness and insularity, and the share of money damage caused by natural disasters in relation to GDP as an indicator of disaster proneness, Briguglio (1995) shows that out of 114 countries including both developed and developing ones, the small island states tended to show very high vulnerability scores. This conclusion is reiterated in Briguglio and Galea (2003). The vulnerability index proposed by the Commonwealth Secretariat (1997) composed of export diversification, export dependence and the impact of natural disasters shows that 26 out of 28 most vulnerable countries are small states.

The results of the model developed in Cordina (2004), briefly described above, show a theoretical association between economies with a relatively small capital stock and their lack of resilience to vulnerability. This could account for a heightened lack of resilience of small states characterised by scarcity of production factors including physical and human capital.

6. Conclusion

This chapter presents an approach towards incorporating economic vulnerability, within an economic growth model framework. The motivations behind this exercise originate from conceptual and empirical considerations. From a conceptual viewpoint, it is presumed that the literature on economic growth could benefit from explicit consideration of vulnerability issues. On the other, the literature on vulnerability, which has up to now been concerned mostly with measurement issues, could benefit from a more solid theoretical framework.

Vulnerability is modelled by means of postulating exogenous stochastic shocks to an economy's capital stock and consumption possibilities originating out of inherent permanent characteristics of an economy. Its effects on an economy's output and welfare are shown to be dependent on the economy's specific susceptibility to such shocks, that is, its resilience. Within the context of utility and production functions with diminishing returns, the susceptibility of an economy to downside shocks would be more accentuated than that to upside shocks, even if the nature of the shocks themselves is assumed to be symmetrical between those of an adverse and of a favourable nature.

This approach leads to the three principal conclusions. First, resilience tends to increase as an economy accumulates capital stock because the effects of asymmetry of adverse and favourable shocks on output and welfare would diminish.

Second, economies facing stronger exogenous shocks would tend to reach an equilibrium with a higher per capita output and capital stock but lower per capita consumption. This is because such economies have to invest more to overcome the effects of vulnerability and build resilience.

Third, vulnerability tends to retard economic growth in the initial phases of development where resilience is typically weak, thereby contributing to slow down convergence between developed and developing economies.

Further research on this matter can be expected to develop in a number of areas. In the development of vulnerability measurements and indicators, this research has highlighted the importance of extricating the effects of exogenous shocks from those of induced resilience. From the theoretical viewpoint, the model described here can be further extended to consider different aspects of growth theory, influencing mainly the nature of production functions, and possibilities regarding the distribution of exogenous shocks. From an empirical perspective, it would be useful to utilise a cross-sectional approach to test the theoretical results of the model described in this chapter.

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