An index of static resilience in interindustry economics

Topic: Input-Output Modelling: Industrial Policies
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We present a novel indicator of economic resilience that captures the ability of an economy to adjust and recover from a negative shock that may occur either on the demand or the supply side. In the construction of this index, we start from Leontief's Input-output model, expanding the concept of constrained multipliers in input-output first introduced by Guerra and Sancho (2011). We implement a linear programming (LP) problem that 1) computes the countervailing changes in the final demands (or in the total supplies) of the non-shocked production units that would keep total GDP at least at the initial pre-shock level and 2) maintains the adaptation as close as possible to initial final demand structure (or supply structure). Our proposed economy-wide resilience indicators are static or short-term resilience indices. In this sense, in the application of the methodology, we are also assuming that the technology and the endowment of factors are conserved. Furthermore, the fact that GDP remains unchanged adequately captures the concept of "resilience" as it ensures that the economy recovers from the negative shock.

In the construction of the resilience index, the linear programming problem minimizes the needed re-scaling in the non-shocked sectors when facing a given sector faces a negative shock. The endogenous re-scaling refers to the changes that would take place in the final demand (or supply) flows of the non-shocked sectors. The minimal change identified by the LP problem is the basis of the resilience index. If the index is larger than 1, this implies that the structure of the economy is insufficient to counteract the loss in total output from the negative shock. In other words, the economy would need more resources than the pre-shock to get the system back to its initial equilibrium. This reveals the fragility of the shocked sector in the context of that economy. On the other hand, if the resilience index is smaller than 1, the adjustment in the final demand (or supply) of the non- shocked sectors is less than the neutral scaling changes in final demand, revealing the strength of the economy to recover from the shock. In other words, the larger the scale of the needed adjustment in response to the negative shock, the smaller is the resilience of the economic system.

In showing the applicability of our approach, we compute and thus compare the demand and supply resilience indices for a group of ten OECD economies: Australia, Canada, France, Italy, Germany, Colombia, Mexico, Spain, United States and United Kingdom. Thanks to our approach, this empirical exercise not only allows ranking this group of economies in terms of their static demand and supply degree of resilience but also identifying in each economy which sectors are more or less sensitive to unexpected negative-shocks. In doing so we have used the most recent domestic Input-Output tables published by the OECD statistics.

In addition, we have extended our empirical exercise and we have applied our approach to two â€œrealistic scenariosâ€•. The first one refers to a demand shock that partially captures the COVID-19 crisis. In doing so, for the group of these 10 OECD economies, we have evaluated the resilience demand index introducing a simultaneous negative shock in the final demand sector that were most affected by the restrictions. Namely, the wholesale and retail, transportation and storage, accommodation and food services, arts, entertainment and recreation, among other â€œhigh-contactâ€• service sectors. The second scenario, instead, relates to a recurrent negative supply shock: an energy supply shortage.

In our view, the main contribution of our approach relies on the fact that it makes possible the

construction of an objective resilience index from a general equilibrium perspective, i.e., considering the existing interindustry linkages. As stated bellow, this index helps to identity which economies are more resilient and, in each of them, which sector or production units are more (or less) able to face negative economic shocks. Consequently, the information provided by this static resilient indicator can be useful to improve the design of those policies that search for making economies less â€œsensitiveâ€• to potential negative exogenous shocks.