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Cross-Hauling in Input-Output Tables: Comments on CHARM

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Abstract

This brief note draws further attention to cross-hauling in regional input-output table estimation, and specifically identifies conceptual issues associated with Kronenberg's CHARM method for adjusting input-output regionalization methods. Despite the shortcomings of the CHARM approach as it now stands, this is a very important line of research. I believe that progress made on the CHARM method is encouraging, and hope that future work will resolve remaining issues.

Keywords: Input-output; Cross-Hauling; CHARM; Regional Economics
JEL Classification: C67,O18,R15,R1

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Introduction

The recognition of the critical role of cross-hauling in economic systems and its critical impact on input-output regionalization method results has become the focus of an increasing level of attention in the input-output literature. This is appropriate, because the underestimation of cross-hauling leads to an overestimation of regional input-output multipliers based on overestimated input-output coefficient values. This well-established fact was recognized in Jackson (1998), which also provided a cross-hauling adjustment mechanism for supply-demand pooling, commodity balance regionalization methods. However, because that paper did not provide any guidance or insight as to how levels of commodity-specific cross-hauling should be estimated, Kronenberg (2009) developed a method for estimating cross-hauling levels, resulting in a cross-hauling adjusted regionalization method with the memorable acronym CHARM.

Although the CHARM method is a step in the right direction, and its use is likely to be preferable to no adjustments at all for cross-hauling, recent attempts to apply the CHARM method to multiregional input-output table estimation have drawn into focus some conceptual shortcomings of the CHARM method itself. Below, I briefly characterize the CHARM method and identify the reason why the method fails the test of logical consistency.

The CHARM Method (CM)

The CM is founded on the premise that cross-hauling is due primarily to product heterogeneity. This is a reasonable assumption if product heterogeneity is defined in such a way as to include both product mix due to aggregation and product differentiation in more conventional usage. Kronenberg's (2009) reduced form expression for heterogeneity, h , for a commodity is as follows (p 51):

$$h = \frac{v - |b|}{x + z + d}$$

where v , b , x , z , and d , are trade volume, trade balance (exports less im-

ports), commodity output, intermediate commodity use, and commodity final demand. Next,

The national input-output table contains data for all the variables on the right-hand side of equation 22. We can use these data to acquire an estimate of h_i^R . Note that we allow the degree of product heterogeneity to be different in every sector (that is why h carries the subscript i), but we are imposing the assumption $h_i^R = h_i^N$. In words, the heterogeneity of commodity i is the same in the region as in the nation. This assumption is reasonable, because product heterogeneity is a characteristic of the commodity, not of a specific geographical location. (Kronenberg, 2009, p 51)

I suggest that although *product differentiation* might well be a characteristic of the commodity – though even the level of differentiation within regionally produced commodity might also vary by region – product mix most assuredly is a function of geographical location (region). Product mix will vary geographically for many reasons, including the simple fact that not all commodities within an aggregate commodity group will be produced everywhere. Consider the example of, say, commodity 7 in a simple two-region nation. At a finer level of detail – which can almost always be defined – region one produces commodities 7.1, 7.3, 7.5, and 7.7 while region two produces commodities 7.2, 7.4, 7.6, and 7.7. The national heterogeneity measure will reflect a composite commodity comprising all sub-types, which will be different from either region's composite commodity. Likewise, either region-specific heterogeneity measure will be expected to be different from its national counterpart.

Hence, the consequences of aggregation are fundamentally different from those of variation within a well-defined and narrow commodity class. Contrary to claims that cross-hauling is a function of the commodity and not region, regional differences in tastes and preferences, not just the nature of commodities and differences in regional production structures and intermediate demand are critical to the determination of cross-hauling levels. I disagree with the assertion that equality of national and regional heterogeneity is a reasonable assumption. The severity of consequence of this assumption will

depend upon a) the level of aggregation in the classification scheme used, b) the unique character of different commodities, and c) the economic size of the subnational regions in the system.

Multi-Regional Systems

A straightforward extension of the CM framework to a multi-regional system would be characterized by the use of the CM to identify the cross-hauling shares, implying that cross-hauling totals will comprise both domestic (interregional) and foreign trade. It would also have the implication, however, that since heterogeneity varies only across commodities and not geographical regions, regional cross-hauling shares for each commodity would be equal to their national cross-hauling share counterpart. But this gives rise to very peculiar conclusions.

To demonstrate that subnational cross-hauling shares should not all be expected to equal their national cross-hauling share counterparts, simply generalize the assumption to apply to a hierarchy of regional systems. For example, begin with country cross-hauling shares being the same as the counterpart EU shares. If the general sub-region super-region relationship holds, then all cross-hauling shares for all continents also would be equal to a global cross-hauling share; but of course there is no cross-hauling in the global economic system. Again following the CM relationships among sub-regions and super-regions (i.e., regions and nations), if global cross-hauling shares are equal to zero, then all geographical subdivisions of the global system would have expected cross-hauling shares of zero. Of course, we know this not to be the case.

Summary

Given that cross-hauling behavior is clearly so important to accurate input-output table estimation, its estimation methods also are in need of a great deal more conceptual and theoretical development.

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