Spatial Market Integration

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spatial market integration

Markets aggregate demand and supply across actors distributed in space. Well-integrated markets play a fundamental role in ensuring that macro-level economic policies change the incentives and constraints faced by micro-level decision-makers, in distributing risk and in preserving incentives to adopt improved production technologies. Yet the literature is replete with evidence of forgone arbitrage opportunities in both intra- and inter-national trade. Given limited data and the restrictive assumptions of existing empirical methods, economists still have only a fragile empirical foundation for reaching clear judgements about spatial market integration as a guide for corporate or government policy.

Markets aggregate demand and supply across actors distributed in space. At the international level, monetary policy, exchange rate adjustment and the distribution of the gains from trade depend fundamentally on how well prices equilibrate across countries, as vast literatures on the law of one price and purchasing power parity emphasize (Froot and Rogoff, 1995; Anderson and van Wincoop, 2004). At the national level, well-functioning markets ensure that macro-level economic policies (for example, with respect to exchange rates, trade, and fiscal or monetary policy) change the incentives and constraints faced by micro-level decision-makers. Macroeconomic policy commonly becomes ineffective without strong market transmission across space of the signals sent by central governments. Similarly, well-functioning markets underpin growth stimuli originating in micro-level phenomena. For example, without good access to distant markets that can absorb excess local supply, firms' adoption of improved production technologies will tend to cause producer prices to drop, erasing the gains from technological change and thereby dampening incentives for firms to adopt new technologies that can stimulate economic growth. Poorly integrated markets thereby choke off the prospective gains from technological change. Markets also play a fundamental role in managing risk associated with demand and supply shocks in that well-integrated markets facilitate adjustment in net export flows across space, thereby reducing price variability faced by consumers and producers. Finally, the spatial extent of markets has profound implications for anti-trust policy (Stigler and Sherwin, 1985).

The micro-level realities of markets in much of the world, however, involve poor communications and transport infrastructure, limited rule of law, and restricted access to commercial finance, all of which can sharply limit the degree to which markets function as effectively as textbook models typically assume. A long-standing empirical literature documents considerable commodity price variability across space, especially in developing countries, with various empirical tests of market integration suggesting significant and puzzling forgone arbitrage opportunities (Fackler and Goodwin, 2001). The international trade literature similarly finds substantial and sometimes persistent deviations from the law of one price and from purchasing power parity, even among advanced market economies (Froot and Rogoff, 1995; Anderson and van Wincoop, 2004). These results raise important questions about the nature of spatial market integration in actual economies.

The concept of spatial market integration

Although contemporary economics rests fundamentally upon the concept of markets, the discipline struggles with the important and practical challenges of clearly defining a market empirically and of establishing whether markets are efficient in allocating scarce goods and services (Barrett, 2001). Much of the problem revolves around the concept of 'market integration' one employs and the empirical evidence thereby needed to demonstrate that condition. In macroeconomics and international economics, a common conceptualization of market integration focuses on 'tradability', the notion that a good is traded between two economies or that market intermediaries are indifferent between exporting from one nation to another and not doing so. Tradability signals the transfer of excess demand from one market to another, as captured in actual or potential physical flows. Positive trade flows are sufficient to demonstrate spatial market integration under the tradability standard. But prices need not be equilibrated across markets. Spatial market integration conceptualized as tradability is therefore consistent with Pareto-inefficient distributions.

For this reason, the primary approach one finds in the spatial market integration literature focuses instead on the notion of competitive equilibrium and Pareto efficiency manifest in zero marginal profits to arbitrage. At the heart of most analyses of market integration lies the Enke-Samuleson-Takayama-Judge (ESTJ) spatial equilibrium model (Enke, 1951; Samuelson, 1952; Takayama and Judge, 1971), in which the dispersion of prices in two locations for an otherwise identical good is bounded from above by the cost of arbitrage between the markets when trade volumes are unrestricted and bounded from below when trade volumes reach some ceiling value (for example, associated with a trade quota). More precisely, in ESTJ spatial equilibrium

$$
\begin{aligned}
p^0 \quad & = p^1 + \tau^{10} \text{ if } q^{10} \in (0, q^{10}*) \\
& \leq p^1 + \tau^{10} \text{ if } q^{10} = 0 \\
& \geq p^1 + \tau^{10} \text{ if } q^{10} = q^{10}*
\end{aligned}
$$

where p^0 and p^1 are the prices in two spatially distinct markets, 0 and 1, respectively, τ^{10} is the cost of moving the good from market 1 to market 0, q^{10} is the physical volume of trade between the two markets and $q^{10}*$ is a maximal permitted trade volume between the two markets (for example, due to a trade quota). These equilibrium conditions imply both firm-level profit maximization and long-run competitive equilibrium at market level. The strict equality reflects the form of competitive equilibrium assumed under the law of one price. If trade occurs and is unrestricted, the marginal trader earns zero profits and prices in the two markets co-move perfectly. The theory, however, implies multiple competitive equilibria. The first weak inequality reflects a segmented equilibrium in which no trade occurs. Prices can be uncorrelated within the price band created by the costs of inter-market arbitrage. The latter weak inequality reflects binding trade quotas that may yield positive marginal quasi-rents to arbitrage.

Note that trade is neither necessary nor sufficient for the attainment of ESTJ competitive equilibria. Hence the difference between tradability-based and efficiency-based conceptualizations of market integration. In the prevailing view, spatial market integration occurs when the ESTJ equilibrium condition holds, irrespective of whether trade occurs.

Empirical estimation methods

The empirical challenge of measuring spatial market integration arises because the ESTJ equilibrium condition involves four variables – prices, transactions costs, trade volumes and trade volume quotas – yet few studies employ more than price data. Spatial price analysis studies typically test for co-movement in time series of prices measured simultaneously at different places. But even with proper controls for autocorrelation or non-stationarity, such studies inevitably impose great structure on the nature of market relationships: for example, linear pricing, continuous unidirectional tradability, and stationary transactions costs series. Tests of the hypothesis of market efficiency thereby become indistinguishable from tests of the veracity of the assumptions that underpin model specification. Simple linear time series tests of market integration-cum-equilibrium using co-integration, error correction or Granger causality models have therefore drawn considerable criticism (Barrett, 1996; Baulch, 1997; Fackler and Goodwin, 2001).

More recent innovations use mixture distribution estimation methods in an attempt to integrate price data with transactions costs, trade volume data, or both, while relaxing some of the strong assumptions that underpin conventional time series methods of testing for market integration. Baulch's (1997) parity bounds model (PBM) that integrates price and transactions costs series is perhaps the best known of these methods. Barrett and Li (2002) extended the PBM to incorporate trade data. These methods have their shortcomings too, however. They rely on inherently arbitrary distributional assumptions in estimation and typically ignore the time series properties of the data, not permitting analysis of the dynamics of inter-temporal adjustment to short-run deviations from long-run equilibrium and potentially important distinctions between short-run and long-run integration (Ravallion, 1986).

A fragile empirical foundation for guiding policy

Even satisfaction of the ESTJ spatial equilibrium condition does not imply welfare maximization unless the costs of commerce and the quasi-rents associated with binding trade quotas are minimized. In order for markets to fulfil the promise they offer for risk management, efficient distribution of production according to comparative advantage, clear transmission of policy signals, and maintenance of micro-level incentives to innovate, there should be neither segmented competitive equilibria nor effective trade quotas. When the costs of commerce are high or trade restrictions bind, it can be difficult to draw out clear implications for policy even from empirical analyses that take seriously the implications of ESTJ spatial equilibrium. Given limited data, in particular a paucity of data on transactions costs and trade volumes, and the intrinsic limitations of existing empirical methods, economists still have only a fragile empirical foundation for reaching clear, strong judgements about spatial market integration as a guide for corporate or government policy.

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See also agricultural markets in developing countries, law of one price, market definition, purchasing power parity, spatial competition

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