Non-Technical Project Summary

'Geography and Micro Level Real Exchange Rates: A Structural Investigation'

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Outline

How geography, particularly, cross-location distance and national borders affect the dynamics in microeconomic prices and spatial price differentials, within and across countries? The answer to this question is likely to have profound implications for a number of important issues in the integration of national economies into the European Union, including international differentials in prices and inflation rates, real exchange rate dynamics, and consumer price pass-through.

Our project combines quantitative theory with store-level measurement to estimate distance and border effects in relative price dynamics. We start out with developing a discrete time, multi-region, two-country, dynamic industry equilibrium industry model of price setting. The model is a multi-region variant of the standard monopolistic competition model, appended with two basic frictions. We assume in the model that, first, buying across space is costly, and this cost is related to distance and the border (Anderson and van Wincoop (2003), Asplund and Friberg (2001), Ghosh and Wolf (1994), Obstfeld and Rogoff (2001), Obstfeld and Taylor (1997), etc.), and that, second, stores are subject to fixed cost to price adjustment, coupled with shock heterogeneity (Bils and Klenow (2004), Dhyne *et al* (2006), Golosov and Lucas (2007), Midrigan (2007), Nakamura and Steinsson (2008), etc.). The key idea in the model is that when stores set their price, they care about other stores' prices, especially about ones located close to them.

We then apply the dynamic equilibrium model to quantify structural distance and border parameters in store-level price data via an indirect inference procedure. The focus is on price levels and cross-location price deviations in a novel panel of store-level consumer price quotations of a diverse group of very narrowly defined, specific goods and services observed in two small, neighboring economies, Hungary and Slovakia. The sample covers price observations collected for calculating the CPI in the two countries of about 50 products in on average about 200 stores over a period of 60 months. The time-span is January 2002 to December 2006, the period including these countries formally joining the European Union in May 2004. We observe prices with identifiers describing time, product, store and location characteristics.

Background

In a seminal paper, Engel and Rogers (1996) ask the question: 'How wide is the border ?'; i.e. on top of travel costs related to distance, what is the extra cost of crossing the border in international transactions in goods and services? Engel and Rogers study a cross-sectional regression equation in which log distance, a binary border variable and location-specific dummies explain the time-series volatility of cross-location relative prices in sector-level CPI data for 14 categories of goods in 23 cities in Canada and the US. Confirmed in a number of subsequent studies using similar datasets, they find that the distance and border coefficients are both sizable and highly significant, and that the distance equivalent of the border is enormous. The distance equivalent of the border between Canada and the US is enourmous, 75,000 miles. Studying regional level price indices in Hungary and Slovakia Horvath *el al* (2007) find that the distance equivalent of the border evaluated at the average product-level parameter estimates is about $9*10^{18}$ kilometers, again, clearly an astronomical figure.

More recently, Broda and Weinstein (2008) identify, and then question, three related, still conceptually distinct findings in the empirical literature on international relative prices: "borders give rise to flagrant violations of the law of one price, distance matters enormously for understanding these deviations, and convergence rates back to purchasing power parity are inconsistent with the evidence of micro studies on nominal price stickiness". In related work, Gorodnichenko and Tesar (2009) cast doubt on the validity of the empirical methodology used in Engel and Rogers (1996), and argue that "the border coefficient that emerges from tests comparing within-country prices to cross-border prices tells us little about actual border effects in the absence of a fully articulated structural model or a (natural) experiment".

These are the challanges we take up in this project.

Analytical Approach

In the empirical part, the estimation procedure entails matching key dynamic and spatial moments in the data with those obtained in the calibrated structural model.

We bring four distinct micro level empirical moments potentially informative of the impact of geography on relative price dynamics, to be matched with the same moments in the model economy. The first two moments, the average frequency and size of price changes primarily capture basic microeconomic consequences, specific to individual store behavior, of fixed costs in price adjustment and heterogeneity in shocks affecting stores' pricing policies. The latter two moments for a particular product *k* are obtained as the coefficients β_1^k and β_2^k in the cross-sectional regression equation specified as in Engel and Rogers (1996), $V(q_{i,j,k,t}) = \beta_1^k \log(r_{i,j}) + \beta_2^k B_{i,j} + \sum_{m=1}^{n} \gamma_m^k D_m + u_{i,j,k}$, where $q_{i,j,k,t}$ is as defined above, with *V(q)* being its time-series standard deviation. $r_{j,k}$ is the distance between locations *i* and *j*, and *B* is a dummy variable indicating whether locations *i* and *j* are in different or same countries. D_m is a location dummy variable.

Results

Our results, first, confirm that in reduced form regressions both geographical distance and the border are highly significant, and the implied width of the border is truly giant. At the same time, the structural estimates show that while distance does matter a great deal, the national border adds little extra in explaining store-level relative price dynamics. Indeed, the border effect is negative for a few products in our sample. Overall, the structurally calibrated width of the border is a tiny fraction of the reduced form one. We argue that the structural and the reduced form approaches deliver different results, as the former one conditions explicitly on frictions both in the price setting and the commuting process, allowing one to separate the contributions of these two elements, while the estimated reduced form coefficient combines these two effects into a single figure.

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