THE LATIN AMERICAN RESEARCH NETWORK PROJECT

Call for Research Proposals

The Elasticity of Substitution in Demand for Non-tradable Goods in Latin America

April 1, 2003
Washington, DC
I. Justification of the Study

The elasticity of substitution in the demand for non-tradable goods relative to tradable goods plays a critical role in the analysis of several key economic phenomena that affect developing countries, including those of Latin America. The interest in understanding the behavior of the sectoral dynamics of prices and quantities in terms of the tradables and non-tradables sectors of a national economy dates back to the early writings on real exchange rate determination by Balassa (1964) and Samuelson (1964). Since then, a large literature in open-economy macroeconomics has shown that the elasticity of substitution in the demand for non-tradables is an important determinant of the short-run response of the real exchange rate to shocks hitting the economy, and that in turn the real-exchange-rate response is critical for determining the responses of macroeconomic variables to those same shocks.

Two important issues for which knowledge of the elasticity of substitution in demand for non-tradables is crucial are the response of the trade balance and the current account to terms-of-trade shocks (the so-called Harberger-Laursen-Metzler effect) and the analysis of deviations from real interest rate parity. Existing research shows that the direction and magnitude of the response of the external accounts, consumption, saving and investment to terms-of-trade shocks depends on the elasticity of substitution between non-tradables and tradables and on the implications that this has for the responses of the relative price of non-tradables and the real exchange rate (see Ostry and Reinhart, 1992, Mendoza, 1995, and Engel and Kletzer, 1989). Similarly, the classic paper by Dornbusch (1983) studies the implications of the elasticity of demand for non-tradables for the dynamics of the real exchange rate and domestic real interest rates via the effect of the rate of change in the relative price of non-tradables on the “consumer-based” real interest rate.

More recently, the elasticity of substitution in demand for non-tradables has been identified as a key element in the analysis of a variety of important macroeconomic phenomena. These include (1) the business cycle dynamics of emerging economies facing devaluation risk (Calvo and Vegh, 1993, and Mendoza and Uribe, 2000) (2) Sudden Stops of capital inflows into emerging markets driven by borrowing constraints and liability dollarization (Aghion, Baccheta and Banerjee, 2002, and Mendoza, 2002), (3) the effects of Sudden Stops on the real exchange rate and fiscal sustainability (Calvo, Izquierdo and Talvi, 2002), (4) the long-run real effects of economic reform (Fernandez de Cordoba and Kehoe, 2000), and (5) the home bias in investment portfolios of the residents of industrial nations (Baxter, Jermann and King, 1998).
II. Objectives of the Study

Despite the central role that the elasticity of substitution for demand of non-tradables plays in many areas of international macroeconomics, there is little empirical work showing estimates on the value of this elasticity for the majority of industrial and developing countries. Hence, the goal of this project is to produce rigorous empirical studies that provide estimates of the elasticity of substitution in the demand for non-tradables for Latin American countries. We describe in Section III three standard approaches that have been proposed for breaking down macroeconomic and price data into tradables and non-tradables, and provide guidelines for a basic estimation procedure to produce estimates of the elasticity of substitution. Using this information, the research groups funded under this proposal must gather the necessary data and conduct the estimation experiments.

The tasks that the research teams need to complete are:
Gather sectoral quantity and price time-series data from National Income Accounts, expenditure surveys, and the consumer price index.
Use the data to create measures of private consumer expenditure in tradables and non-tradables and of the relative price of non-tradables in units of tradables.
Use the tradables-non-tradables data to estimate the elasticity of substitution in demand for non-tradables, conducting a series of controlled experiments to study the robustness of the estimated elasticities.
Organize the original and generated data in Excel spreadsheets to be submitted to the Research Department of the IADB along with supporting documentation detailing sources and procedures.

III. Research Strategy and Methodology

The construction of the time-series dataset of tradables and non-tradables expenditures and prices is expected to be an intensive data-gathering effort. If data allows, research teams should produce three different measures of these variables following each of the procedures described below:

III.a National Accounts Procedure

This procedure requires gathering from National Income Accounts data the sectoral decomposition of the components of aggregate demand and supply in terms of the nine major sectors of economic activity: Agriculture (A), Mining (M), Construction (C), Manufacturing (MF), Utilities (U), Commercial Services (CS), Transportation Services (TS), Financial Services (FS), and Personal Services (PS). Data for the following items are needed...
both at current prices \((N)\) and at constant prices \((R)\), for each sector \(i\) (where \(i = A,M,C,MF,U,CS,TS,FS,PS\)):

Gross production \((NY_i\text{ and } RY_i)\)
Exports \((NX_i\text{ and } RX_i)\)
Imports \((NIM_i\text{ and } RIM_i)\)
Private consumption of domestically-produced goods \((NCD_i\text{ and } RCD_i)\)
Private consumption of imported goods \((NCMi\text{ and } RCM_i)\)

Once the data are gathered, the data will be used to determine which sectors represent non-tradable goods and which sectors represent tradable goods. To do this, exports and imports data at current prices are added up to measure total trade in each sector: \(NTTi=NX_i+NIM_i\). Total trade and gross production data at current prices are then used to compute sectoral ratios of total trade to gross output: \(TTY_i=NTTi/NY_i\). Select three threshold values \(z\) for this ratio, \(z = 0.01, 0.05,\) or \(0.1\). A sector \(i\) is then classified as forming part of the tradable goods industry (according to threshold \(z\)) if \(TTY_i \geq z\), otherwise the sector is classified as pertaining to the non-tradable goods industry. Classifications obtained using each of the three values of \(z\) should be compared.

After the nine major industrial sectors have been allocated into tradables and non-tradables using the data on gross production, imports and exports, the rest of the data will be used to create measures of consumption expenditures in tradables and non-tradables and the corresponding prices. These expenditures and price data are created in a manner that is consistent with the above procedure for classifying industries into tradables and non-tradables sector by making use of the data on private consumption of imported and domestically-produced goods of the nine industrial sectors at current and constant prices. Use first data at current prices to define “nominal” consumption of tradables \(NCT\) (non-tradables \(NCN\)) as the sum of \(NCD_i\) and \(NCMi\) for the sectors classified as tradables (non-tradables) according to a threshold value \(z\). Proceed in the same manner with the data at constant prices to define “real” consumption of tradables and non-tradables, \(RCT\) and \(RCN\) respectively, using \(RCD_i\) and \(RCMi\). Finally, combine the nominal and real data to construct implicit deflators that represent the price indices of tradables and non-tradables as \(PT=NCT/RCT\) and \(PN=NCN/RCN\). These indices have the same base year as the data at constant prices gathered from the National Accounts.
III.b  Simplified National Accounts or Expenditure Survey Procedure

This simplified approach is useful in cases in which sufficient sectoral National Accounts data to apply the previous procedure are unavailable or deemed unreliable. The simplified procedure requires current and constant prices data from either National Accounts or an Expenditure Survey for these variables:

Private consumption of non-durable goods (NCNDUR and RCNDUR)  
Private consumption of services (NCSER and RCSER)  
Private consumption of durable goods (NCDUR and RCDUR)

The procedure requires the time series on services consumption and at least one of durables or non-durables consumption. The procedure is based on the ad-hoc assumption that consumption of services is identical to the total consumption of non-tradables and that consumption of nondurables and/or durables represents the total consumption of tradables. That is, the procedure adopts three alternative definitions of tradables consumption at current prices: \( NCT_1 \equiv NCNDUR, NCT_2 \equiv NCDUR \) or \( NCT_3 \equiv (NCNDUR+NCDUR) \), and one definition of non-tradables consumption at current prices: \( NCN \equiv NCSER \). Accordingly, there are three alternative definitions of real tradables consumption \( RCT_1 \equiv RCNDUR, RCT_2 \equiv RCDUR \) or \( RCT_3 \equiv (RCNDUR+RCDUR) \) and one definition of real non-tradables consumption \( RCN \equiv RCSER \). As before, these generated time series can be used to construct implicit deflators that represent prices of tradables and non-tradables. The price of non-tradables is \( PN=NCN/RCN \) and there are three alternative definitions of the price of tradables \( PT_1=NCT1/RCT1, PT_2=NCT2/RCT2, PT_3=NCT3/RCT3). \)

III.c CPI Procedure

The CPI procedure takes advantage of the direct, final consumer price data collected in the process of computing the consumer price index and it follows the approach commonly used in empirical studies of the variance decomposition of real exchange rate movements (see Engel (1999) and the example applied to Mexico in Mendoza (2000)).

Time-series data for two of the price indexes usually reported by the agency in charge of computing the CPI need to be retrieved: the CPI for durables (PD) and the CPI for services (PS). The procedure adopts similar ad-hoc definitions as the previous procedure, so the price of durables is treated as the price of tradables and the price of services is treated as the price of non-tradables. Hence, \( PN=PS \) and \( PT=PD \). The robustness of this assumption (as well as the corresponding assumptions of previous procedure) needs to
be evaluated by examining the total trade ratios computed in the first stage of the procedure described in 3.1.

The drawback of the CPI procedure is that corresponding data for consumption expenditures is generally not available. The weights of the CPI are derived and revised using infrequent expenditure surveys, but the recurrent surveys on which CPI data are based are price surveys, not expenditure surveys. Hence, the data on consumption of services and durables gathered for the procedure in 3.2 will be used as proxies.

**III.d Estimation**

Research teams should make use of advanced econometric methods in the estimation exercise. These should be clearly described in the documentation accompanying their results. While this proposal does not require a particular estimation technique, it does require that certain main guidelines are followed. In particular, the estimation needs to follow a structural approach that can yield well-identified and testable estimates of the elasticity of substitution in the private consumer demand for non-tradable goods relative to tradable goods. To this the end, the estimation exercise must adopt the structural relationships described below.

Consider an open economy with constant-elasticity-of-substitution preferences with respect to consumption of tradables and non-tradables: \( U(C_T, C_N) \) where \( U(.) \) could be the standard constant-relative-risk-aversion utility function in terms of the composite good \( C(.) \), and \( C(.) \) is a CES aggregator of \( C_T \) and \( C_N \) of the form:

\[
C(C_T^i, C_N^i) = \left[ \omega(C_T^i)^{-\eta} + (1 - \omega)(C_N^i)^{-\eta} \right]^{1/\eta}
\]

The parameter \( \eta \) determines the elasticity of substitution between consumption of tradable goods and consumption of non-tradable goods, which is given by \( \nu = 1/(1+\eta) \), and \( \omega \) is the standard CES weighing factor.

In this environment, utility maximization by households subject to a standard budget constraint yields the following optimality condition for the allocation of consumption across \( C_T \) and \( C_N \):

\[
p_{i} = \left( \frac{1 - \omega}{\omega} \right) \left[ \frac{C_T^i}{C_N^i} \right]^{1+\eta}
\]
where $p$ is the relative price of non-tradable goods in units of tradables (i.e., $p=PN/PT$). This optimality condition can be re-written as:

$$
\left[ \frac{C^T_t}{C^N_t} \right] = \left[ \left( \frac{\omega}{1 - \omega} \right) p_t \right]^\nu
$$

This is the key relationship that must be used to produce the estimates of $\nu$. The relationship may seem ad-hoc in as much as it has been derived without a full characterization of the model into which the utility function with this CES aggregator is entered. Note, however, that the same optimality condition is a feature of a large class of neoclassical and neokeynesian inter-temporal equilibrium models for open economies.

Using logarithms and the variables defined in 3.1-3.3, the above condition reduces to the following log-linear testable relationship:

$$\ln \left( \frac{RCN_t}{RCT_t} \right) = \alpha_0 + \alpha_1 \ln(p_t)$$

where

$$\alpha_0 = -\nu \ln \left( \frac{\omega}{1 - \omega} \right) \quad \text{and} \quad \alpha_1 = -\nu$$

There is also an alternative specification that can be estimated using the ratio of tradables to non-tradables consumption measured with data at current prices:

$$\ln \left( \frac{NCN_t}{NCT_t} \right) = \beta_0 + \beta_1 \ln(p_t)$$

where

$$\beta_0 = -\nu \ln \left( \frac{\omega}{1 - \omega} \right) \quad \text{and} \quad \beta_1 = 1 - \nu$$

Research teams should examine the statistical properties of basic OLS regressions of the above two specifications estimated using the data generated by the three approaches described earlier. Alternative specifications dealing with the standard problems than emerge when using OLS with time-series data should also be reported, as well as robustness checks aiming to control for potential problems of endogeneity, missing regressors, and model misspecification.
IV. Contents of the Research Proposals

To participate in this project, research institutions should submit a proposal detailing:

1) Description of the Data to be used in the study [maximum 3 pages]. Demonstrating access to national accounts and price data is a necessary condition to obtain funding for this project. The proposals should specify:
   a) Coverage
   b) Frequency and number of periods available.
   c) Definition and summary statistics of available variables.

2) Demonstrate data availability for different methodologies (see section III) [maximum 2 pages]

3) Describe in detail the proposed empirical methodology [4-5 pages].

4) Previous studies available in the country on similar topics [1 page]

5) Submit CV of the research team, emphasizing previous relevant experience [maximum 2 pages per researcher].

6) A budget (on a separate annex) indicating the time and resources that will be used within the context of a research work plan must be included. The budget proposed by the institution should desegregate items financed by the IDB contribution and those financed by the Institution. The budget should distinguish among amounts assigned to professional honoraria, “overhead,” and other major categories of research expenditures.

Note: ALL proposals should be submitted in English.

V. Responsibilities and schedule

This project will be coordinated by Enrique Mendoza (University of Maryland), Arturo Galindo (Research Department, IADB) and Alejandro Izquierdo (Research Department, IADB).

Institutions should express their interest in submitting proposals by April 25, 2003 (email: red@iadb.org).

The deadline for submitting proposals is May 16, 2003. Complete documentation includes “Registration Form” with all information requested. Send documentation to: red@iadb.org.

The IDB will announce the winning proposals by June 16, 2003
On **June 30 and July 1, 2003** the director of each project will hold a video conference with the coordinating committee for the purposes of presenting and discussing the data, a preliminary version of required statistics, and the methodology to be used in the study.

First drafts of papers are due by **September 15, 2003**.

On **October 7-8, 2003** a discussion seminar will be held in Puebla, Mexico (Lacea 2003 will take place on October 9-11). The purpose of this seminar is to discuss and present the first round of results included in the first draft.

Final versions of papers including comments of the coordinating team are due by **November 14, 2003**.

Studies that are considered of good quality will be published as working papers.

**VI. Financing**

The objective of the second Regional Research Center project of the IDB is to strengthen policy research capabilities in Latin America and the Caribbean.

The Bank will provide **US$15,000** as a contribution to the total budget of the study. Funds will be disbursed in the following manner:

- 20% within 30 days of signing the formal agreement between the IDB and the respective research center.
- 40% within 30 days of presenting and approval by the Bank of the first draft.
- 40% within 30 days of presenting and approval by the Bank of the final research paper.

**Note:** Fees for unjustified delays in any stage of the project will be charged in the form of a reduction in the corresponding payment of **$200 per day** of delay. Failure to comply with any of the terms of the contract will imply a partial devolution of the funds paid up to the stage in which the failure occurs.
VII. References


