APPENDIX I

The Trade Flow Model: Linnemann Approach

Factors contributing to trade flow between any pair of countries say, the exports from country A to country B may be classified in three categories. For example,

1. Factors that indicate total potential supply of country A, the exporting country on the world market:

2. Factors that indicate total potential demand of country B, the importing country on the world market.

3. Factors that represent the “resistance” to a trade flow from potential supplier to potential buyer B.

The “resistance” factors are cost of transportation, tariff wall, quota, etc.

The potential supply of any country to the world market is linked systematically to

(i) The size of country’s national or domestic product (simply as a scale factor), and

(ii) The size of a country’s population.

The level of a country’s per capita income may also be considered as a third factor though its influence will be very limited, at most. If the third factor indeed had no effect at all, then the factors (i) and (ii) would obviously be completely independent of each other as explanatory variables, on theoretical grounds. On the other hand, if the each other as explanatory variables, on theoretical grounds. On the other hand, if the third factor did have an effect, then the three explanatory factors would not be independent of each other, as a change in one of the three would necessarily be associated with a change in at
least one of the other two variables. For statistical exercises this has important implications because it would imply certain problems of identification.

**The Price Level**

Potential supply and potential demand, in the equilibrium situation, on the world market have to be equal. For this, a prerequisite must be that the exchange rate has been fixed at a level corresponding with the relative scarcity of the country’s currency on the world market. Equality of supply and demand on the world market also implies that every country has a moderate price level in the long run. If the price level is too high or too low, there would be a permanent disequilibrium of the balance of payments. Adjustment through a change in the exchange rate will necessarily take place. Therefore, the general price level will not influence a country’s potential foreign supply and demand except in the short-run.

A Formula for the Flow of Trade Between Two Countries

Let $E^p_i$ = Total Potential supply  

$M^p_j$ = Total potential demand  

$R$ = Resistance

Apparently the trade flow from country I to country j will depend on $E^p_i$ and $M^p_j$. We assume a constant elasticity of the size of the trade flow in respect of potential supply and potential demand. Indicating the trade flow from country I to country j by $X_{ij}$, the trade flow equation would then combine the three determining factors in the following way:

$$X_{ij} = \beta \frac{(E^p_i)^{\alpha_1}(M^p_j)^{\alpha_2}}{(R^o)^{\alpha_3}}$$  

(1)

In its simplest form, all exponents equal to 1.
The above three explanatory factors in (1) should now be replaced by the variables determining them. Therefore we now introduce the following notations.

\[ Y = \text{Gross national product} \]
\[ N = \text{Population size} \]
\[ Y = \text{Per capita national income (or product)} \]
\[ D = \text{Geographical distance} \]
\[ P = \text{Preferential trade factor} \]

\[ E^p \] is a function of \( Y \) and \( N \), and possibly of \( y \). Thus we may write

\[ E^p = \gamma_0 Y^\gamma_1 N^\gamma_2 \quad (2) \]

In which \( \gamma_1 = 1 \) and \( \gamma_2 \) is negative. If we include per capita income, in spite of its limited significance, as one of the explanatory variables, we have

\[ E^p = \gamma_0 Y^\gamma_1 N^\gamma_2 Y^\gamma_3 \quad (3) \]

However, as \( y = Y/N \), the coefficients of this equation would be dependent. So per capita income will not be introduced as an individual variable. If its effect is at all significant, that would be incorporated “automatically” in the exponents of the two other variables.

\[ E^p = \gamma_0 Y^\gamma_1 N^\gamma_2 \quad (4) \]

The same is true for the potential supply, \( M^p \), which is determined by identical forces.

\[ M^p = \gamma_4 Y^\gamma_5 N^\gamma_6 \]

We have argued that potential supply and potential demand are, in principle, equal to each other. Therefore, \( \gamma_0' = \gamma_4' \), \( \gamma_1' = \gamma_5' \), and \( \gamma_2' = \gamma_6' \). This obviously has to be realized in an equilibrium situation.
The trade resistance factor R can be replaced by two variables D with a negative exponent and P with a positive exponent. For the later variable several other variables may be substituted if we want to distinguish between various types of preferential trading areas. Here we disregard this complication for the sake of simplicity of the model. The trade flow equation, then, would run as follows:

\[ X_{ij} = \delta_0 \frac{y_i^{\delta_1} y_j^{\delta_2} d_{ij}^{\delta_6}}{n_i^{\delta_3} n_j^{\delta_4} d_{ij}^{\delta_5}} \]  

(5)

Or

\[ X_{ij} = \delta_0 y_i^{\delta_1} n_i^{\delta_2} n_j^{\delta_4} d_{ij}^{\delta_5} p_{ij}^{\delta_6} \]  

(6)
A Theoretical Foundation of the Model: Anderson’s Approach

Generally the gravity equation is specified as

\[ M_{ijk} = \alpha Y_i^{\beta_1 k} Y_j^{\beta_2 k} N_i^{\beta_3 k} d_{ij}^{\beta_5 k} U_{ijk} \]

Where \( M_{ijk} \) is the dollar flow of good or factor \( k \) from country or region \( i \) to country or region \( j \), \( Y_i \) and \( Y_j \) are incomes in \( i \) and \( j \), \( N_i \) and \( N_j \) are population in \( i \) and \( j \), and \( d_{ij} \) is the distance between countries (regions) \( i \) and \( j \). The \( U_{ij} \) is a log normally distributed error term with \( E(\ln U_{ijk}) = 0 \). Most often the flows are aggregated across goods. Ordinarily the equation is run on cross section data and sometimes on pooled data. Typical estimates observe income elasticity not significantly different from one and significantly different from zero and population elasticity around 4 usually significantly different from zero.

**Assumptions:** (1) identical homothetic preferences across regions, (2) products are differentiated by place of origin, (3) pure expenditure system by specifying that the share of national expenditure accounted for by spending on tradable is a stable unidentified reduced from function of income and population.

I. The Pure Expenditure System Model

Suppose, each country is completely specialized in the production of its own good. So there is one good for each country. There are no tariffs or transport costs. The fraction of income spent on the production of country \( i \) is denoted by \( b_i \) and is the same in all countries. This implies identical Cobb-Douglas preferences everywhere. Prices are constant at equilibrium values and units are chosen such that they are all unity with cross section analysis. Consumption of good (in value and quantity terms) in country \( j \) (imports of good I by country \( j \)) is thus.
(2) \( M_{ij} = b_i Y_j \)

Where \( Y_j \) is income in country \( j \).

The requirements that income must equal sales implies that

(3) \( Y_i = b_i (\sum Y_j) \)

Solving (3) for \( b_i \) and substituting into (2), we get

(4) \( M_{ij} = \frac{Y_i Y_j}{\sum Y_j} \)

This is the simplest form of “gravity” model. If error structure is disregarded, a generalization of equation (4) can be estimated by OLS, with exponents on \( Y_i, Y_j \) unrestricted. In a pure cross section, the denominator is an irrelevant scale term. The income elasticity produced should not differ significantly from unity.

II. The Trade-Share-Expenditure System Model

This section adds to the Cobb-Douglas expenditure system for traded goods a differing traded – non traded goods split and produces an unrestricted (non-unit income elasticity) gravity equation.

Traded goods shares of total expenditure differ widely across regions and countries. Per capital income is considered as exogenous demand side factor, and population (country size) is considered a supply – side factor. Trade share “should” increase with per capita income and decrease with size. Taking the trade – share function as stable, the expenditure system model combines with it to produce the gravity equation.

Suppose, all countries produce a traded and a non-trade good. The overall preference function assumed in this formulation is weakly separable with respect to the partition between traded and non-traded goods; \( U = u(g(\text{traded goods}), \text{non traded goods}) \). Then given the level of expenditure on traded goods, individual traded goods demand are determined as if a
\[ g(\ ) \text{ are maximized subject to a budget constraint involving the level of expenditure with homotheticity are functions of traded goods prices. Only. To make it simple it is assumed } g(\) \text{ has the Cobb - Douglas form. Since preferences are identical, expenditure shares for any good are identical across countries within the class of traded goods. So for any consuming country } j, \theta_i \text{ is the expenditure in country i’s tradable good divided by total expenditure in } j \text{ on tradable; i.e., } \theta_i \text{ is an exponent of } g(\). Let } \phi_j \text{ be the share of expenditure in } j \text{ on tradable; i.e. } \theta_i \text{ is an exponent of } g(\). Let } \phi_j \text{ be the share of expenditure on all traded goods in total expenditure of country } j \text{ and } \phi_j=F(Y_jN_j). \]

Demand for I’s tradable good in country } j \text{ (j’s imports of i’s good) is}

\[ (5) \quad M_{ij} = \theta_i \phi_j Y_j \]

The balance of trade relation for country } i \text{ implies}

\[ (6) \quad Y_i \phi_i = (\sum Y_j \phi_j) \theta_i \]

The left – hand side of equation (6) implies the value of imports of } i \text{ plus domestic spending on domestic tradeables. The right0hand of equation (6) implies the value of exports of } i \text{ plus domestic spending on domestic tradeables.}

Solving (6) for } \theta_i \text{ an substituting into (5), we have}

\[ (7) \quad M_{ij} = \frac{\phi_i Y_{ij} j}{\sum \phi_j Y_j} - \frac{\phi_i \phi Y_j}{\sum \sum M_{ij}} \]

With } F(Y_i, N_i) \text{ taking on a log – linear form, equation (7) is the deterministic form of the gravity equation (1) with the distance term suppressed and a scale term added. In fact, if trade imbalance due to long term capital account transactions is a function of } (Y_i, N_i), \text{ and substitute into (6) an (7).} \]
This yields:

$$M_{ij} = \frac{m_i \phi_i Y_i \phi_j Y_j}{\sum \sum M_{ij}}$$

With log-linear forms for m and F, (8) is again essentially the deterministic gravity equation.

III. Estimation Efficiency

The trade-share model of section II provides some legitimacy to the gravity model. Ultimately many tradeables will be allowed for each country, with tariffs and transport costs present, but initially, as before, assume only one tradeable in each and no barriers to trade. The system to be estimate is.

(5’) $M_{ij} = \theta_i \phi_j Y_j U_{ij}$

(6’) $m_i \phi_i Y_i = \theta_i \Sigma \phi_j Y_j$

Where $U_{ij}$ is a log – normal disturbance with $E(ln U_{ij}) = 0$. Note that (6’) states that planned expenditures (reduced or increased by the capital account factor) = planned sales, and has no error term. For efficient estimation we need that the information in (6’) be utilized. Since the constraint is highly non-linear in the $Y$‘s, the most equivalent way to do this is to substitute out $\theta_i$ and estimate the gravity equation.

$$M_{ij} = \frac{m(Y_i, N_i)F(Y_i, N_i)Y_i F(Y_j, N_j)Y_j}{\sum F(Y_i, N_i)Y_j} U_{ij}$$

With the log-linear form for $m(\ )$ and $F(\ )$,

$M(Y_i, N_i) = K_m Y_i^{mY} N_i^{mN}$

And $F(Y_j, N_n)=K_f H_j^{fY} N_i^{fN}$

And the denominator made a constant term we have

(8’) $M_{ij} = \frac{(K_m Y_i^{mY} N_i^{mN})(K_f Y_i^{fY} N_i^{fY})(K_f Y_j^{fY} N_j^{fY})Y_j U_{ij}}{K^k}$

$$(K_m K_f^2) Y_i^{mY+fY+1} N_i^{mN+fN} Y_i^{fY+1} N_i^{fN} U_{ij}$$
This is the aggregate form of equation (1) with the distance term omitted. Ordinarily it can be fitted on a subset of countries in the world. Exports to the rest of the world are exogenous and imports from it excluded from the fitting. If this is done, the denominator is still the sum of world trade expenditures, and (6’) implies that (8) and (8’) assume that $\theta_i$ is the same in the excluded countries as in the included countries.

At last, form the set of estimated values for traded – goods expenditures.

\[ \phi_j Y_j = K_{ij} Y_j^{\phi_j + 1} N_j^{\phi_i} \]

the individual traded – goods shares $\theta_i$ can be estimated using the instruments $\phi_j Y_j$ (which are asymptotically uncorrelated with $U_{ij}$):

\[ M_{ij} = \theta_i \phi_j Y_j U_{ij} \]

Which is estimated across countries for country i’s exports (including the rest of the world’s exports to included countries), with the restriction that $\sum \theta_i = 1$. 

\[ \Sigma^\theta_i = 1. \]
Figure: 1 Export Potential

UK
Figure: 2 Export Potential
France

ACTUAL
POTENTIAL
Figure: 3 Export Potential

Germany

ACTUAL

POTENTIAL
Figure: 1 Export Potential

Italy
Figure: 1 Export Potential
Netherlands
Government of Karnataka

Department of Backward Classes:

Student Application cum Verification for Post-Matric/Food & Accommodation/Fee Concession

1. Application No: 2013 0019 2190
2. Application Date: 15-10-2013

4. Student Name: GOWDA MANJUNATHARAVI

6(a). Father Name: RAVI
6(b). Mother Name: PAI

7. Address & Mobile No: KIKKERI HOUBLI, Krishnarajapet, Yelahallikote, MANDYA & 98806

8. SSLC HT No: 20080420515

11. Family Annual Income (in Rs.): 9000
12. Ration Card: KRP12

13. College Details (college Nature): MYSORE UNIVERSITY PG COURSE COLLEGE MMY: (Residential), Mysore University, Mysore

14. Course Name / Course Year / Duration of Course: MCOM / I Yr / 2Yrs
15. College Admission No / Admission Date (of this year): 72 / 19-08-2013

17. Scholarship Type: Day Scholar


I. Declaration

I hereby certify that the above information furnished is true. I have not availed any shall abide by the terms and conditions of the sanction of the scholarship. If any disciplinary actions are taken, I am liable for action by the Department.

Date:

II. Verification Report of College: 
This is to certify that the information furnished above is verified with the records an college studying in MCOM / I Yr (Course & Course Year) during 2013-14.

Date:

III. Verification Report of Verification

I have verified the contents of scholarship Fresh application with reference to the identified the student verified the following certificates:

<table>
<thead>
<tr>
<th>Caste: Yes</th>
<th>No</th>
<th>Income: Yes</th>
<th>No</th>
<th>SSLC: Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Other Details/Certificates if any:

I recommend for sanction of:
- Post-Matric/Food & Accomodation/Fee Concession

I do not recommend the sanction of scholarship for the following reasons. (Please spec

I have physically verified the SSLC Certificate in person

Date:

November 8, 2013 02:21:37 PM