On The Determinants Of Currency Unions

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ABSTRACT

This paper studies the determinants of currency union membership. Geographical distance, colonial heritage, language, sizes and bilateral trade between two countries as predictors of their propensity to adopt a common currency are accounted for. To deal with endogeneity, two-step probit estimation method is performed. The estimation results show that geography, colonial heritage, size, and speaking the same language predict monetary unions quite well. However, bilateral trade does not enter significantly in the second-stage estimation, thus revealing that bilateral transactions between two countries are not a useful indicator of their membership in a common currency area.

INTRODUCTION

"Countries with close international trade links would benefit from a common currency and are more likely to be members of an optimum currency area (OCA). Thus the nature and extent of international trade is one criterium for EMU entry, or, more generally, membership in an OCA." [6]

As emphasized in literature at least since [9], a main advantage of joining a OCA is the reduction of transaction costs of trade (see also [1]). Countries that trade more with each other are more likely to constitute a currency union. The greater is the level of trade the higher are the savings in conversion costs and risks associated with different currencies.

Frankel, J. A. and Rose, A.[6] claimed that trade intensity and other OCA criteria, such as business cycles correlation, are jointly endogenuous. They empirically show that there is a positive correlation between bilateral trade and cross country correlation of business cycle activity. In analyzing the determinants of currency unions, [16] investigated the role of geography, cultural similarity, size, political integration, colonial origins, and synchronization of economic shocks. She does not take into account, however, for bilateral trade and other possible economic determinants of monetary unions such as GDP and per capita income. [4] estimated the probability that a "client" country adopts the currency of a main "anchor" country and used this likelihood as an instrument for currency areas in the "gravity" equation model. In their work, [1] find that both past inflation and economic shocks correlation are crucial for OCA membership. A country is more willing to give up its own money the higher is the inflation rate it experienced in the past and the greater is the business cycle correlation with the anchor.

Several studies since the seminal work of [11] (see also [5], [7], [12]) have investigated the effect of currency unions on trade. Almost always, these studies use a simple OLS methodology to estimate the effect of currency union on trade. OLS estimate, however, is biased if unmeasured characteristics, such as compatibility of legal and political system, cultural links, institution quality and total bilateral transfers can affect the propensity to adopt a common currency as well as increase bilateral trade between countries. In addition, countries that share a common currency might promote policies that foster integration and facilitate trade.

Both these unmeasured characteristics and the self-selection problem between trade and currency unions are clear cut signs that endogeneity may be present. [14] support this view. Using a panel data set spanning from 1920s to 1930s, they find that trade among future currency area member states was already high in 1920s, and that trade patterns in 1920s are good predictors of monetary union membership in 1930s.

What are the determinants of monetary unions? This paper seeks to address this question using a IV methodology. Geography, colonial heritage, language, cultural and political similarities, and bilateral trade between countries are investigated as determinants of monetary unions. The reduced form equation of trade is estimated using

the well known "gravity" equation model. The predicted values of trade from the first-stage regression are then used in the probit second-stage equation. The results show that, quite surprisingly, bilateral trade does not enter significantly in the probit model. This means that bilateral transactions between two countries are not useful predictors of their membership in a currency union.

The remainder of the paper is organized as follows. Section 2 describes the content of the dataset. Section 3 discusses both the currency union model and the econometric methodology. The empirical results are discussed in section 4. The summary ends the paper.

A LOOK AT THE DATASET

The [7]'s dataset has been exploited to study the determinants of currency unions within a cross-sectional fashion. The analysis is performed on ten multiple of 5-year subsamples (between 1950 and 1996) extracted from the original dataset. The variables of interest are described below.

$ltrade_{ijt}$ is a continuous variable which measures the (log) average value of real bilateral trade between country *i* and country *j* in year *t*;
$lrgdp_{it}$ is a continuous variable denoting the (log) real GDP of country *i* in year *t*;
$lrgdppc_{it}$ is a continuous variable denoting the (log) real per-capita GDP of country *i* in year *t*;
$ldist_{ij}$ is a continuous variable which denotes the (log) great-circle distance between the capitals of country *i* and country *j*;
$comlang_{ij}$ is a binary variable indicating whether country *i* and country *j* have a common language;
$border_{ij}$ is a binary variable which measures whether nation *i* and nation *j* share a border (either by land or sovereign waters, as recognized by international low);
$regional_{ijt}$ is a binary variable that indicates whether country *i* and country *j* belong to the same regional trade agreement at time *t*;
$landl_{ij}$ is a dichotomous variable indicating the number of landlocked nations in the country-pair (0, 1 or 2);
$island_{ij}$ is a dichotomous variable measuring the number of island nations between country *i* and country *j* (0, 1 and 2);
$larea_i$ is a continuous variable denoting the (log) land surface of country *i*;
$comcol_{ij}$ is a binary variable that measures whether country *i* and country *j* have ever been colonized (after 1945) by the same colonizer;
$curcol_{ijt}$ is a binary variable indicating whether nation *i* and nation *j* are colonies in year *t*;
$colony_{ij}$ is a binary variable that measures whether country *i* has ever been colonized by country *j* or vice versa;
$comnat_{ij}$ is a binary variable that indicates whether country *i* and country *j* have remained part of the same nation during the sample period;
$custrict_{ijt}$ is a binary variable that records whether nation *i* and nation *j* belong to the same currency union in year *t*.

A MODEL OF CURRENCY UNIONS

Endogeneity of OCA criteria can be a problem when assessing the role of trade intensity as a determinant of monetary union. As mentioned above, unmeasured characteristics such as compatibility of legal and political systems, cultural similarities, better institutions, and tied bilateral transfers can affect the propensity to adopt a common currency as well as increase bilateral trade between two countries. In addition, members of a currency area might promote policies that foster integration and facilitate trade. Another source of endogeneity is the reverse causality problem. Namely, large level of bilateral trade may be the consequence rather than the cause of monetary union membership. The elimination of conversion costs and risk associated to different currencies encourages bilateral transactions between member states. Bilateral trade between two countries may be high ex-post, even though the level of trade was very low ex-ante the adoption of a common currency.

Endogeneity in classical OLS and Probit models leads to inconsistent estimates. One way to consistently estimate the effect of trade on currency union is by using a Two Stage Probit methodology (see, among others, [8] and [17] for further details). The model can be written as follows

$$custrict_{ij}^{*}=\mathbf{Z}_1\boldsymbol{\delta}_1+\alpha_1 ltrade_{ij}+u_1 \quad (1)$$

$$ltrade_{ij}=\mathbf{Z}_1\boldsymbol{\delta}_{21}+\mathbf{Z}_2\boldsymbol{\delta}_{22}+v_2=\mathbf{Z}\boldsymbol{\delta}_2+v_2 \quad (2)$$

$$custrict_{ij}=\begin{cases}1 & \text{if } custrict_{ij}^{*}>0,\\ 0 & \text{otherwise,}\end{cases} \quad (3)$$

where $\mathbf{Z}_1$ is the matrix of exogenous variables (such as geographic distance, size, common languages, colonial heritage) in the probit model (1). The (log) level of bilateral trade between countries *i* and *j*, $ltrade_{ij}$, is the continuous endogenous variable and the disturbance term (u_1, v_2) has a zero mean bivariate normal distribution and is independent of the matrix of all exogenous variables, $\mathbf{Z}$. The greeks δ and α are parameters. (1) and (3) are the structural equations one wishes to estimate while (2) is the reduced-form equation for (log) level of trade. Subscripts *i* and *j* are omitted thereafter for ease of exposition.

Before implementing the two step procedure, the [15] test for endogeneity is performed (an alternative test is provided by [10]). Instruments of *ltrade* are needed to run the Smith-Blundell test and, eventually, the two step estimation. To identify them, the following standard procedure is followed. First, the reduced form expressions of both *ltrade* and *custrict* are estimated by OLS and probit, respectively. Second, those variables that enter significantly in the OLS equation, but not into the probit equation, are eligible instruments of *ltrade*.

EMPIRICAL RESULTS

The Smith-Blundell procedure to test exogeneity of *ltrade* has been implemented for each subsample year, from 1950 to 1997. The null hypothesis of exogeneity of *ltrade* is rejected 47 times out of 48. Only in 1953 there is not enough evidence against the null (see Tables 1 and 2). This means that bilateral trade is possibly endogenous in (1), and two step methodology with instruments should be implemented to consistently estimate the endogenous variable coefficient.

Table 1: Smith-Blundell Test For Exogeneity (1950-65)

Year	Instruments	Statistic	P-value
Pooled	lrgdppc	14.36	1.5e-04
1950	island	1.91	.17
1951	lrgdppc, island	.95	.33
1952	landl	.59	.44
1953	island	.28	.6
1954	lrgdppc	.65	.42
1955	lrgdppc	.95	.33
1956	lrgdppc, curcol	3.17	.05
1957	lrgdppc, curcol	2.89	.09
1958	lrgdppc	.59	.44
1959	lrgdppc, island	1.82	.18
1960	lrgdppc, lrgdp	12.73	3.6e-04
1961	lrgdppc, lrgdp	13.98	1.8e-04
1962	lrgdppc, lrgdp	14.56	1.4e-04
1963	lrgdppc, lrgdp, regional	26.25	3.0e-07
1964	lrgdppc, lrgdp, regional	34.68	3.9e-09
1965	lrgdppc, regional	4.15	.04

Table 2: Smith-Blundell test for exogeneity (1966-80)

Year	Instruments	Statistic	P-value
1966	lrgdppc, regional	.9	.34
1967	lrgdppc, regional	1.13	.29
1968	lrgdppc, regional	1.97	.16
1969	regional	1701.79	0
1970	regional	2243.65	0
1971	regional	2226.69	0
1972	colony	1.25	.26
1973	colony	1.69	.19
1974	lrgdppc	.8	.35
1975	regional	1.45	.23
1976	landl	1.75	.19
1977	colony	1.53	.22
1978	colony	.97	.32
1979	colony	737.54	2.0e-162
1980	colony	866.25	2.1e-190

Table 3: Smith-Blundell test for exogeneity (1981-97)

Year	Instruments	Statistic	P-value
1981	colony	1021.44	3.9e-22
1982	colony	1136.15	4.6e-25
1983	colony	1073.43	2.0e-23
1984	colony	1275.11	2.9e-279
1985	colony	1250.23	7.4e-27
1986	colony	1345.10	1.8e-294
1987	colony	1049.72	2.8e-230
1988	colony	1167.68	6.5e-256
1989	colony	1342.86	5.5e-294
1990	colony	1145.13	5.1e-251
1991	comctry	53.46	2.6e-13
1992	comctry	5.74	0.166
1993	comctry	69.61	7.2e-17
1994	comctry	52.22	5.0e-13
1995	comctry	56.77	4.9e-14
1996	comctry	111.05	5.8e-26
1997	lrgdppc	2.12	.14

Quite surprisingly, the suitable instruments for *ltrade* are time dependents. In the first subsample period, between 1950 and 1970, economic indicators such as the per-capita income and the GDP better instrument bilateral trade. Since 1970, as these variables become more correlated with currency unions, the best eligible instruments for bilateral trade are represented by colonial links such as *colony*, *curcol* and *comctry*, as reported in Tables 1, 2 and 3.

To estimate the determinants of currency unions the two stage estimation methodology has been performed. First, the reduced form equation of (2) is estimated using the well known "gravity" equation model. The predicted values of *ltrade* from the first-stage regression are then used in the probit second-stage estimation. The results are reported in Tables 5 and 6.

The main finding of the paper is that IV estimates of bilateral trade are not statistically significant in (1) for each subsample under study (see Table 4). This means that bilateral trade between countries is not a useful predictor of their membership in a currency union. This is in contrast with the OCA theory which states that countries with closer bilateral trade links would benefit more from joining a currency union.

Table 4: Effect of trade

Year	IV (*s.e.* below)
Pooled	.038 .026
1950	-2.526 2.099
1955	-.013 .463
1960	-.092 .082
1965	-.07 .234
1970	.258 .159
1975	.141 .146
1980	-.025 .153
1985	-.456 .468
1991	.374 .451
1996	.348 .540

Table 5: IV probit estimates of (1), (1950-65)

Variables	Pooled	1950	1955	1960	1965
ltrade	.038 .026	-2.526 2.099	-.013 .463	-.092 .082	-.070 .234
landl	-.202 .026	-1.460 1.104	-.631 .751	-.185 .231	-.289 .159
island	.309 .027		-.109 .48	.15 .19	.266 .192
border	-.500 .04	-.522 .711	-1.062 .652	-.214 .288	-.078 .263
comlang	.766 .029	-.356 .474	-.405 .406	.338 .174	.490 .179
comcol	1.264 .027	3.708 1.078	3.060 .587	1.651 .201	1.78 .229
comctry	.471 .184			.280 .956	.445 1.018
colony	1.367 .059	3.880 1.622	2.301 .564	1.635 .327	2.146 .418
curcol	1.573 .099	8.752 4.648	2.700 1.215	1.805 .39	1.052 .589
regional	-.359 .06				
lareap	.197 .006	-.046 .171	.081 .124	.112 .035	.104 .043
ldist	-.649 .035	-2.503 1.498	-.881 .438	-.589 .121	-.623 .211
lrgdp	-.164 .026	2.172 1.666	.232 .39		.022 .192
lrgdppc					
intercept	4.136 .679	-56.850 40.36	-9.624 9.264	-.090 1.315	-1.182 4.6

Common colonial history and geographical characteristics of two countries are strong predictors of their propensity to join a currency union. The almost always negative coefficient of *lrgdp* means that smaller countries are more likely to form a currency union.

The negative sing of *ldist* means that geographically closer states are more prone to participate in currency unions. More subtle is the negative sign on the *border* variable. This is explained by the fact that most member countries are islands. Speaking the same language increases the chances for two states of belonging the same monetary union. The *regional* variable coefficient, where significant, is negative. As argued by [16], to the extent that free trade agreements enhance trade between member states, more open countries have a lower incentive to produce surprise inflation and thus they are less prone to participate in currency unions as a commitment device.

CONCLUSIONS

This paper studied the determinants of currency unions using a two step probit estimation methodology. It is shown that, geography, colonial heritage, language, cultural and political similarities are strong predictors of monetary unions. In contrast, bilateral trade is not statistically significant. This means that the bilateral exchanges of goods and services between two countries do not help to predict their membership in a common currency area.

Table 6: IV probit estimates of (1), (1970-96)

Variables	1970	1975	1980	1985	1991	1996
ltrade	.258 .159	.141 .146	-.025 .153	-.456 .468	.374 .451	.348 .540
landl	-.170 .136	-.252 .161	-.333 .171	-.163 .171		
island	.281 .161	.570 .168	.562 .168		.104 .218	-.125 .216
border	-.641 .249	-.494 .252	-.863 .282	-.344 .39	-.626 .303	-.718 .455
comlang	.434 .174	1.024 .205	.977 .213	1.453 .343	1.274 .347	1.581 .352
comcol	1.342 .184	1.185 .184	1.220 .188	1.208 .246	.818 .215	.813 .28
comctry			7.214 .067	5.516 2.226		
colony	1.142 .357	1.209 .377			.706 .71	.817 .827
curcol	.563 .542		1.439 .118	-.384 1.68		
regional					-1.138 .654	-1.267 .597
lareap	.230 .046	.281 .044	.305 .053	.185 .082	.293 .137	.271 .065
ldist	-.426 .188	-.429 .197	-.852 .208	-1.138 .637	-.338 .58	-.351 .748
lrgdp	-.367 .167	-.333 .156	-.153 .171	.218 .458	-.724 .574	-.274 .521
lrgdppc				.425 .259		.0268 .279
intercept	9.126 4.363	6.950 4.095	2.814 4.419	-10.494 14.716	22.200 15.61	22.428 17.172

Table 7: **Countries in sample**

Afghanistan	Belgium	Cape Verde
Albania	Belize	Cayman Islands
Algeria	Benin	Central African Rep.
American Samoa	Bermuda	Chad
Angola	Bhutan	Chile
Anguilla	Bolivia	China
Antigua and Barbuda	Bosnia	Colombia
Argentina	Herzegovina	Comoros
Armenia	Botswana	Congo, Dem. Rep. of (Zaire)
Aruba	Brazil	Congo, Rep. of
Australia	Brunei Darussalam	Costa Rica
Austria	Bulgaria	Cote D'Ivorie (Ivory Coast)
Azerbaijan	Burkina Faso	Croatia
Bahamas	Burma (Myanmar)	Cuba
Bahrain	Burundi	Cyprus
Bangladesh	Cambodia	Czech Republic
Barbados	Cameroon	Czechoslovakia
Belarus	Canada	Denmark

Table 8: Countries in sample (continued)

Djibouti	Gabon	Hungary
Domenica	Gambia	Iceland
Dominican Rep.	Georgia	India
Eastern Germany	Germany	Indonesia
Ecuador	Ghana	Iran
Egypt	Gibraltar	Iraq
El Salvador	Greece	Ireland
Equatorial Guinea	Greenland	Israel
Eritrea	Grenada	Italy
Estonia	Guadeloupe	Jamaica
Ethiopia	Guam	Japan
Faeroe Islands	Guatemala	Jordan
Falkland Islands	Guinea	Kazakhstan
Fiji	Guinea-Bissau	Kenya
Finland	Guyana	Kiribati
France	Haiti	Korea, North
French Guiana	Honduras	Korea, South (R)
French Polynesia	Hong Kong	Kuwait

Table 9: **Countries in sample (continued)**

Kyrgyz Republic	Martinique	Nigeria
Lao People's Dem. Rep.	Mauritania	Norway
Latria	Mauritius	Oman
Lebanon	Mexico	Pakistan
Lesotho	Moldova	Panama
Liberia	Mongolia	Papua N.Guinea
Libya	Montserrat	Paraguay
Lithuania	Morocco	Peru
Luxembourg	Mozambique	Philippines
Macao	Namibia	Poland
Macedonia	Nauru	Portugal
Madagascar	Nepal	Qatar
Malawi	Netherlands	Reunion
Malaysia	Netherlands Antilles	Romania
Maldives	New Caledonia	Russia
Mali	New Zealand	Rwanda
Malta	Nicaragua	Samoa
Martinique	Niger	

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