The openness–inflation puzzle revisited

WILLIAM C. GRUBEN and DARRYL MCLEOD*

Center for Latin American Economics, Federal Reserve Bank of Dallas, PO Box 655906, 2200 North Pearl Street, Dallas, TX 75201-2272, USA and Department of Economics, Fordham University, 441 East Fordham Road, NY 10458-5158, USA

Dynamic panel estimates show the negative relation between trade openness and inflation found by Romer (Quarterly Journal of Economics, (VIII, 869–903, 1993) but questioned by Terra (Quarterly Journal of Economics, (XIII, 641–48, 1998) became more robust in the 1990s, both among high income OECD and developing countries. Trade openness was also associated with less variable inflation during the 1990s and had a stronger disinflation effect in economies with floating exchange rates.

I. INTRODUCTION

Romer (1993) finds closed economies tend to have higher inflation. Central banks in economies more open to trade, Romer argues, find currency fluctuations caused by money surprises more painful and therefore exercise more restraint than their closed economy counterparts. While some question this ‘dynamic inconsistency’ story, the openness–inflation correlation itself has generated considerable interest. Temple (2002) calls it one of the modern ‘puzzles’ of international macroeconomics. But Terra (1998) challenges Romer’s empirical findings, arguing that the openness–inflation correlation is confined to severely indebted countries and, even then, is only evident during the 1980s debt crisis period. Romer (1993) himself finds no significant openness–inflation relationship among OECD economies.

This note revisits Romer and Terra’s findings in a more general dynamic panel setting using data from the 1990s. Arellano–Bover (1995) GMM panel system estimates using five-year average suggest causality runs from openness to lower inflation, as Romer (1993) argued. The disinflation effect of openness appears to be stronger in countries with floating exchange rates. These results support the view that trade openness is associated with lower inflation, particularly during the worldwide disinflation of the 1990s.

II. DATA RESULTS

The panel consists of five-year averages for inflation and import shares over the period 1971–2000, effectively encompassing Romer and Terra’s 1973–1989 cross-country averages.

Following Terra (1998) the focus here is mainly on the bivariate inflation and openness relationship, though in a more general dynamic panel framework. Table 1 addresses Terra’s hypothesis regarding the role of external debt by separating countries into severely and less indebted and reporting results for the 1980s debt crisis period and other periods separately. The four upper right entries of Table 1 tell the story. Consistent with Terra (1998), there is a
1.3 All countries

Nominal rigidities or market imperfections that cause nominal
inflation might reduce inflation have been proposed. Lane
(1997) and Guen and McCaw (2000) stress nominal
rigidities or market imperfections that cause nominal
exchange rate movements to have real effects. Similarly,
Temple (2002) and Bowdler (2003) focus on exchange
rate movements that worsen the tradeoff between money
surprises and unemployment. To see if nominal exchange
rate fluctuations play a role, Equation 2.4 (see Table 2)
splits the import-share among three classifications of
exchange rate regime (fixed, moderately flexible and float-
ing). These classifications are not perfect, due to the
five-year averages. If a country had a flexible rate regime
for four of the five years, for example it classified as flexible
for that period. The magnitude of the openness–inflation coeffi-
cient increases with the degree of exchange rate flexibility.
The difference between the pure floating and the near fixed
exchange rate regime coefficient is significant at the 5.1%
level.

Terra (1998) argues that highly indebted countries use
seigniorage to pay off debt, a strategy that is less inflation-
ary in more open economies. To test this proposition,
Equation 2.3 (see Table 2) splits the import share variable
into three country groups defined by levels of external
indebtedness. The coefficient for severely indebted coun-
tries is higher than that for the less indebted countries,
but differences among the coefficients are not significant
even at the 10% confidence level.

The openness–inflation correlation appears to strengthen
in the 1990s. The time-varying coefficients reported in
Table 3 suggest that countries most open to trade saw the
greatest reduction in their inflation rates during the 1990s.5
Additional evidence for the 1990s is provided by Equation
2.5 (see Table 2) where the dependent variable is now the
exchange rate movements.1

---

**Table 1. Inflation and openness to trade: 1971–2000 5-year averages**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Not severely indebted countries</td>
<td>−0.09 (0.022)**</td>
<td>−0.064 (0.033)∗</td>
<td>−0.10 (0.028)**</td>
</tr>
<tr>
<td>Number of observations</td>
<td>472</td>
<td>165</td>
<td>307</td>
</tr>
<tr>
<td>1.2 Severely indebted countries</td>
<td>−0.61 (0.23)**</td>
<td>−1.14 (0.47)**</td>
<td>−0.30 (0.23)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>193</td>
<td>70</td>
<td>123</td>
</tr>
<tr>
<td>1.3 All countries</td>
<td>−0.23 (0.05)**</td>
<td>−0.35 (0.11)**</td>
<td>−0.17 (0.058)**</td>
</tr>
<tr>
<td>Number of observations</td>
<td>665</td>
<td>235</td>
<td>430</td>
</tr>
</tbody>
</table>


4 Similar results are obtained for fixed and random effects panel estimates. Bivariate pooled OLS are reported here to be as consistent as possible with the methods of Romer (1993) and Terra (1998).

---

4 Using the World Bank WDI 2002 imports of goods and services over its PPP GDP estimates yields similar results, but the World Bank WDI only includes PPP GDP estimates from 1975 on, so using the PWT 6.1 openness measures provides a larger sample.

5 Between the late 1980s and the late 1990s, the weighted average import share for the 118 countries in the sample rose from 19% to 24% of GDP while the weighted average inflation rate fell from 70% to 5%.
The openness–inflation puzzle revisited

Table 2. Panel regressions: five-year averages 1971–2000

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Estimation method</th>
<th>2.1 Log import share</th>
<th>2.2 Inflationa log(1 + π)</th>
<th>2.3 Inflationa log(1 + π)</th>
<th>2.4 Inflationa log(1 + π)</th>
<th>2.5 Coefficient of Variationf</th>
<th>2.6 Inflationa log(1 + π)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade openness Lagged: previous 5-yr period</td>
<td>GMM-SYSa</td>
<td>0.41 (0.20)</td>
<td>–0.17 (0.05)</td>
<td>–</td>
<td>–</td>
<td>–5.0 (1.23)</td>
<td>–0.12 (0.03)</td>
</tr>
<tr>
<td>Lagged inflation (previous 5-year period)</td>
<td></td>
<td>–0.04 (0.05)</td>
<td>–0.45 (0.14)</td>
<td>–</td>
<td>–</td>
<td>–0.21 (0.65)</td>
<td>–</td>
</tr>
<tr>
<td>Import share – LICsb</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–0.21 (0.046)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>(less indebted countries and OECD)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–0.25 (0.063)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Import share – SICsc</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–0.21 (0.05)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>(Severely Indebted.Ctys)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–0.3 (0.07)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Openness: fixed rate regimesc</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>(import share for fixed regimes)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–0.046 (0.03)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Openness: floating fx regimesc</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–0.05 (0.02)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>(import share for flex rate regimes)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>1.84 (0.68)</td>
<td>0.67 (0.19)</td>
<td>0.25 (0.03)</td>
<td>0.27 (0.04)</td>
<td>5.85 (1.91)</td>
<td>0.25 (0.03)</td>
</tr>
<tr>
<td>Number of observations</td>
<td></td>
<td>657</td>
<td>659</td>
<td>660</td>
<td>535</td>
<td>328</td>
<td>616</td>
</tr>
<tr>
<td>Sargan test (p-value)</td>
<td></td>
<td>0.08</td>
<td>0.34</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1st order serial-correlation (p-value)</td>
<td></td>
<td>0.09</td>
<td>0.06</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Coefficient differenced (Wald test)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>0.04 (0.05)</td>
<td>0.09 (0.048)</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Notes: 

a To cope with deflation episodes, inflation is measured as the natural log of one plus the average annual change in the GDP deflator.
b Less, severely and moderately indebted country classifications are those of Terra (1998). Equation 2.3 includes a moderately indebted group coefficient of –0.20 (0.07) but the difference is less significant statistically than that between less and severely indebted countries.
c Classification of countries into fixed, floating and semi-fixed regimes uses LaFluer’s (2002) 8-level classification to classify countries into three groups: fixed, flexible and semi-fixed. For Equation 2.4 the openness coefficient for the semi-fixed group was –0.28 (0.08). As La Fluer’s regime index is only available 1975–2000, the sample is reduced to five 5-year intervals.
d The Wald test null hypothesis is equal coefficients for the two import share variables reported above. The difference and standard error are reported here. The significance levels for the Equations 2.3 and 2.4 tests are 36% and 5.1% respectively.

e This Arrellano and Bover (1995) system-GMM estimator regresses levels and changes in inflation/import shares on lags of the same variables, using lagged levels as instruments for changes and vice versa. The Sargan tests validate this instrument set, but this was not the case before the log of the import share was taken and added a time period dummy. The 1971–1975 and 1996–2000 time period dummies were significant with coefficients of –0.037 (0.017) and –0.05 (0.02) respectively.
f The coefficient of variation is standard deviation over the mean inflation for each five-year interval. The sample period for this equation 1986–2000 – prior to 1986 this relationship disappears, due in large part to the extreme variations Latin American inflation.
g The openness variable in this equation is the Penn World Tables v. 6.1 ‘openness’ variable: imports plus exports over USSPPP GDP.

Table 3. Openness–Inflation over time

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(3.1) No severely indebted countries</td>
<td>(497 observations)</td>
<td>0.17 (0.16)</td>
<td>–0.09 (0.65)</td>
<td>–0.07 (0.05)</td>
<td>–0.14 (0.052)</td>
<td>–0.14 (0.051)</td>
<td>–0.19 (0.051)</td>
</tr>
<tr>
<td>(3.2) All countries</td>
<td>(665 observations)</td>
<td>0.26 (0.025)</td>
<td>–0.28 (0.11)</td>
<td>–0.22 (0.084)</td>
<td>–0.19 (0.084)</td>
<td>–0.17 (0.083)</td>
<td>–0.32 (0.084)</td>
</tr>
<tr>
<td>(3.3) Severely indebted countries</td>
<td>(178 observations)</td>
<td>0.5 (0.09)</td>
<td>–1.03 (0.45)</td>
<td>–0.8 (0.35)</td>
<td>–0.3 (0.35)</td>
<td>–0.16 (0.31)</td>
<td>–0.74 (0.31)</td>
</tr>
<tr>
<td>(3.4) 27 OECD countries</td>
<td>(160 observations)</td>
<td>0.13 (0.16)</td>
<td>–0.05 (0.07)</td>
<td>–0.07 (0.61)</td>
<td>–0.13 (0.06)</td>
<td>–0.18 (0.065)</td>
<td>–0.21 (0.066)</td>
</tr>
</tbody>
</table>

Notes:
a Standard errors are in parentheses. These are OLS estimates for six 5-year intervals, 1971–2000.
coefficient of variation for inflation. After 1985, economies more open to trade also had less variable inflation.

To summarize, the inflation–trade openness correlation appears to have strengthened during the 1990s and is more robust than earlier research suggested – extending even to the OECD countries. Yet the origin of this relationship remains something of a puzzle. David Romer (2000, p. 492) now seems less convinced this correlation emanates from the ‘inconsistency of optimal [central bank] plant’. Other explanations are being explored. Bowdler (2003) finds openness makes the short-term Phillips curve steeper in OECD countries. Temple (2002) argues that it generally does not. Gruben and McLeod (2001) argue openness raises the interest rate elasticity of money demand, reducing the optimal inflation tax. Another possible explanation is disinflation contagion: with US and OECD inflation falling during the 1990s, the disciplining effect of import competition may have enabled more open economies to lower inflation faster. Whatever its cause, that greater openness to trade is associated with lower inflation should provide some comfort to those who fear globalization and flexible exchange rates increase macroeconomic instability.

REFERENCES


---