

## **Lecture 3: Terms of Trade and the Measurement of Real GDP**

### **Review from Lectures 1 and 2:**

Broda and Weinstein (2006) – import variety into US using TSUSA 8-digit/  
HS 10-digit (10,000 goods) / and SITC when necessary

Feenstra and Kee (2006) – export variety into the US using TSUSA/HS 10-digit

### **What about when we want to variety for other countries?**

Hummels and Klenow (*AER*, 2005) – measure export variety across many pairs  
of countries using HS 6-digit *import* data for 1995 (5,000 goods)

HS data only available after 1989. Before that there is SITC data, 5-digit (rev. 2  
after 1984 and rev. 1 before that). These have <1,000 goods. Example of  
South Korean export variety from Kei-mu Yi used SITC rev. 1, 5-digit data.

## Hummels and Klenow (*AER*, 2005):

They measure export variety from each country  $h$  to its partner country  $j$ , using the world in 1995 as the comparison. That is, the “*extensive margin*” of exports from country  $h$  to  $j$  is:

$$EM_{t,\text{exp}}^{hj} = \frac{\sum_{i \in I_t^{hj}} p_{it}^{Fj} q_{it}^{Fj}}{\sum_{i \in I_t^{Fj}} p_{it}^{Fj} q_{it}^{Fj}}$$

where  $F$  is the world and  $j$  denotes the destination country. This is similar to Feenstra-Kee (2006), but *does not* take the intersection/average over years.

Hummels and Klenow define the *intensive margin* of exports as:

$$IM_{t,\exp}^{hj} = \frac{\sum_{i \in I_t^{hj}} p_{it}^{hj} q_{it}^{hj}}{\sum_{i \in I_t^{hj}} p_{it}^{Fj} q_{it}^{Fj}}$$

It follows that the product of the extensive and intensive margins are:

$$EM_{t,\exp}^{hj} \times IM_{t,\exp}^{hj} = \frac{\sum_{i \in I_t^{hj}} p_{it}^{hj} q_{it}^{hj}}{\sum_{i \in I_t^{Fj}} p_{it}^{Fj} q_{it}^{Fj}} = \frac{\text{Country } h \text{ exports to } j}{\text{Total imports by } j}$$

In order to form the extensive margin of exports from *country h to all destination countries*, Hummels and Klenow take the geometric mean of the extensive margin from h to j, over all j, using Sato-Vartia weights.

*Note:* This approach treats exports to different countries are different varieties!

Likewise, we can define the *extensive and intensive margin of imports*:

$$EM_{t,imp}^{hj} = \frac{\sum_{i \in I_t^{hj}} p_{it}^{hF} q_{it}^{hF}}{\sum_{i \in I_t^{hF}} p_{it}^{hF} q_{it}^{hF}}$$

Notice that this measure requires *export data* for country h.

$$IM_{t,imp}^{hj} = \frac{\sum_{i \in I_t^{hj}} p_{it}^{hj} q_{it}^{hj}}{\sum_{i \in I_t^{hj}} p_{it}^{hF} q_{it}^{hF}} \quad , \text{ and,}$$

$$EM_{t,imp}^{hj} \times IM_{t,imp}^{hj} = \frac{\sum_{i \in I_t^{hj}} p_{it}^{hj} q_{it}^{hj}}{\sum_{i \in I_t^{hF}} p_{it}^{hF} q_{it}^{hF}} = \frac{\text{Country h exports to j}}{\text{Total exports by h}} \quad .$$

## To summarize extensive margin of exports, run regressions for 1995:

| Independent Variable --><br>Dependent Variable |         | Y/L                   | L                     | Adj. R <sup>2</sup> | Y                     | Adj. R <sup>2</sup> | Num of Countries |
|------------------------------------------------|---------|-----------------------|-----------------------|---------------------|-----------------------|---------------------|------------------|
| Overall Exports                                | H&K     | 1.29<br>(0.07)        | 0.89<br>(0.04)        | 0.86                | 1.00<br>(0.04)        | 0.83                | 126              |
|                                                | Revised | 1.48<br>(0.07)        | 1.01<br>(0.04)        | 0.89                | 1.13<br>(0.04)        | 0.85                | 126              |
| Intensive Margin                               | H&K     | 0.44<br>(0.05)<br>34% | 0.36<br>(0.03)<br>41% | 0.6                 | 0.38<br>(0.03)<br>38% | 0.6                 | 126              |
|                                                | Revised | 0.43<br>(0.05)<br>29% | 0.38<br>0.03<br>38%   | 0.63                | 0.39<br>(0.03)<br>35% | 0.64                | 126              |
| Extensive Margin                               | H&K     | 0.85<br>(0.05)<br>66% | 0.53<br>(0.03)<br>59% | 0.79                | 0.61<br>(0.03)<br>62% | 0.74                | 126              |
|                                                | Revised | 1.05<br>(0.05)<br>71% | 0.63<br>(0.03)<br>62% | 0.86                | 0.74<br>(0.03)<br>65% | 0.8                 | 126              |

**Also check some other years, using revised PWT 6.2 data:**

| Independent Variable --><br>Dependent Variable |                  | Y/L                   | L                     | Adj. R <sup>2</sup> | Y                     | Adj.<br>R <sup>2</sup> | Countries Numbers |
|------------------------------------------------|------------------|-----------------------|-----------------------|---------------------|-----------------------|------------------------|-------------------|
| 1993                                           | Overall Exports  | 1.76<br>(0.08)        | 0.97<br>(0.05)        | 0.84                | 1.18<br>(0.05)        | 0.75                   | 159               |
|                                                | Intensive Margin | 0.70<br>(0.05)<br>40% | 0.47<br>(0.03)<br>49% | 0.70                | 0.53<br>(0.03)<br>45% | 0.66                   |                   |
|                                                | Extensive Margin | 1.06<br>(0.05)<br>60% | 0.50<br>(0.03)<br>51% | 0.79                | 0.65<br>(0.03)<br>55% | 0.67                   |                   |
| 1995                                           | Overall Exports  | 1.71<br>(0.07)        | 1.01<br>(0.05)        | 0.86                | 1.21<br>(0.05)        | 0.79                   | 163               |
|                                                | Intensive Margin | 0.68<br>(0.05)<br>40% | 0.49<br>(0.03)<br>49% | 0.73                | 0.55<br>(0.03)<br>46% | 0.71                   |                   |
|                                                | Extensive Margin | 1.03<br>(0.05)<br>60% | 0.52<br>(0.03)<br>51% | 0.82                | 0.66<br>(0.03)<br>54% | 0.71                   |                   |

|      |                  |                |                |      |                |      |     |
|------|------------------|----------------|----------------|------|----------------|------|-----|
| 1997 | Overall Exports  | 1.69<br>(0.06) | 1.02<br>(0.04) | 0.90 | 1.21<br>(0.04) | 0.83 | 162 |
|      | Intensive Margin | 0.68<br>(0.04) | 0.50<br>(0.03) | 0.75 | 0.55<br>(0.03) | 0.73 |     |
|      |                  | 40%            | 49%            |      | 45%            |      |     |
|      | Extensive Margin | 1.01<br>(0.04) | 0.52<br>(0.03) | 0.84 | 0.66<br>(0.03) | 0.73 |     |
|      |                  | 60%            | 51%            |      | 55%            |      |     |
| 1999 | Overall Exports  | 1.76<br>(0.06) | 1.04<br>(0.04) | 0.89 | 1.25<br>(0.05) | 0.81 | 163 |
|      | Intensive Margin | 0.76<br>(0.05) | 0.54<br>(0.03) | 0.75 | 0.61<br>(0.03) | 0.73 |     |
|      |                  | 43%            | 52%            |      | 49%            |      |     |
|      | Extensive Margin | 0.99<br>(0.04) | 0.50<br>(0.03) | 0.83 | 0.64<br>(0.03) | 0.71 |     |
|      |                  | 57%            | 48%            |      | 51%            |      |     |
| 2001 | Overall Exports  | 1.79<br>(0.06) | 1.05<br>(0.05) | 0.89 | 1.28<br>(0.05) | 0.81 | 164 |
|      | Intensive Margin | 0.78<br>(0.05) | 0.56<br>(0.03) | 0.75 | 0.63<br>(0.03) | 0.72 |     |
|      |                  | 44%            | 53%            |      | 49%            |      |     |
|      | Extensive Margin | 1.01<br>(0.05) | 0.49<br>(0.03) | 0.83 | 0.65<br>(0.03) | 0.70 |     |
|      |                  | 56%            | 47%            |      | 51%            |      |     |

## Compare with the extensive margin of Imports, revised PWT 6.2 data:

| Independent Variable --><br>Dependent Variable |                  | Y/L                          | L                            | Adj. R <sup>2</sup> | Y                            | Adj.<br>R <sup>2</sup> | Countries Numbers |
|------------------------------------------------|------------------|------------------------------|------------------------------|---------------------|------------------------------|------------------------|-------------------|
| 1993                                           | Overall Imports  | 1.44<br>(0.07)               | 0.81<br>(0.04)               | 0.82                | 0.98<br>(0.05)               | 0.74                   | 159               |
|                                                | Intensive Margin | 0.98<br>(0.05)<br><b>68%</b> | 0.60<br>(0.03)<br><b>75%</b> | 0.80                | 0.70<br>(0.03)<br><b>71%</b> | 0.75                   |                   |
|                                                | Extensive Margin | 0.46<br>(0.03)<br><b>32%</b> | 0.21<br>(0.02)<br><b>25%</b> | 0.67                | 0.28<br>(0.02)<br><b>29%</b> | 0.56                   |                   |
| 1995                                           | Overall Imports  | 1.40<br>(0.06)               | 0.83<br>(0.04)               | 0.85                | 0.99<br>(0.04)               | 0.78                   | 163               |
|                                                | Intensive Margin | 0.96<br>(0.05)<br><b>69%</b> | 0.61<br>(0.03)<br><b>73%</b> | 0.82                | 0.71<br>(0.03)<br><b>72%</b> | 0.77                   |                   |
|                                                | Extensive Margin | 0.44<br>(0.02)<br><b>31%</b> | 0.22<br>(0.02)<br><b>27%</b> | 0.74                | 0.28<br>(0.02)<br><b>28%</b> | 0.65                   |                   |

|      |                  |                |                |      |                |      |     |
|------|------------------|----------------|----------------|------|----------------|------|-----|
| 1997 | Overall Imports  | 1.48<br>(0.05) | 0.84<br>(0.03) | 0.90 | 1.02<br>(0.04) | 0.81 | 162 |
|      | Intensive Margin | 1.02<br>(0.04) | 0.63<br>(0.03) | 0.88 | 0.74<br>(0.03) | 0.82 |     |
|      | Extensive Margin | 0.46<br>(0.02) | 0.22<br>(0.02) | 0.75 | 0.28<br>(0.02) | 0.64 |     |
|      |                  | 69%            | 75%            |      | 73%            |      |     |
|      |                  | 31%            | 25%            |      | 27%            |      |     |
| 1999 | Overall Imports  | 1.49<br>(0.05) | 0.84<br>(0.03) | 0.88 | 1.02<br>(0.04) | 0.79 | 163 |
|      | Intensive Margin | 1.04<br>(0.04) | 0.63<br>(0.03) | 0.86 | 0.74<br>(0.03) | 0.79 |     |
|      | Extensive Margin | 0.45<br>(0.04) | 0.21<br>(0.03) | 0.75 | 0.28<br>(0.02) | 0.63 |     |
|      |                  | 70%            | 75%            |      | 73%            |      |     |
|      |                  | 30%            | 25%            |      | 27%            |      |     |
| 2001 | Overall Imports  | 1.46<br>(0.06) | 0.88<br>(0.04) | 0.86 | 1.06<br>(0.04) | 0.79 | 164 |
|      | Intensive Margin | 1.03<br>(0.04) | 0.66<br>(0.03) | 0.85 | 0.77<br>(0.03) | 0.79 |     |
|      | Extensive Margin | 0.43<br>(0.02) | 0.22<br>(0.02) | 0.72 | 0.29<br>(0.02) | 0.63 |     |
|      |                  | 71%            | 75%            |      | 73%            |      |     |
|      |                  | 29%            | 25%            |      | 27%            |      |     |

## Conclude:

The extensive margin of exports explains about 60% of the variation in total exports across countries, but the extensive margin of imports explains only 30% of the variation in total imports.

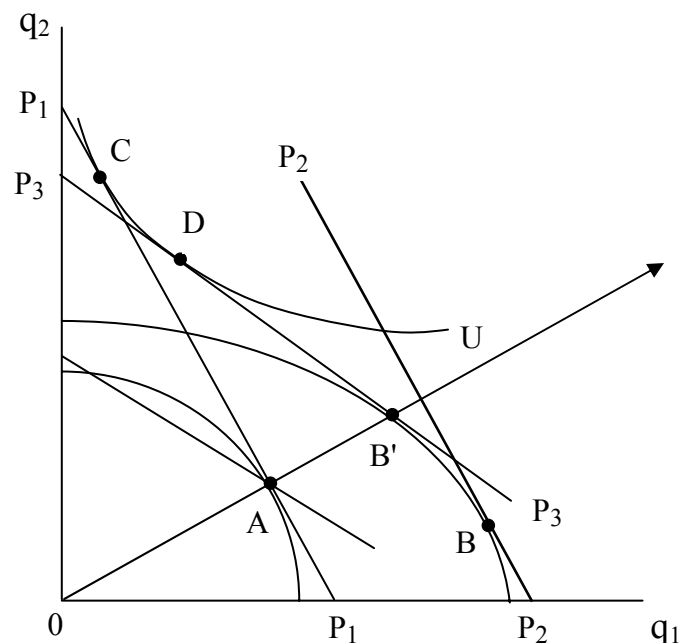
*Interpretation:* larger countries export a greater range of products (to more countries), and to a lesser degree, also import a greater range of products.

**Question:** Why does this matter?

**Answer:** We can convert the extensive margins of imports and exports into welfare/productivity measures, using the exponents  $-1/(1-\sigma_i)$  and  $(\sigma_i-1)/\sigma_i\theta_i$ , respectively. Then the extensive margins become part of the true “terms of trade” of countries, and should affect real GDP!

## Feenstra, Heston, Timmer and Deng (2006)

How do the terms of trade affect real GDP? Depends how GDP is measured:



Real GDI = (Nominal GDP)/(Final expenditures price index) = Real **GDP<sup>e</sup>** ← **PWT**

Real GDP = (Nominal GDP)/(GDP price index). = Real **GDP<sup>o</sup>**

## Measurement of real GDP on the Expenditure side

- Suppose there are  $i = 1, \dots, M$  **final goods** (or intermediate)
- Another  $i = M+1, \dots, M+K$  goods that are exclusively **intermediate inputs**.

Demand = Supply is:  $q_{ij} + x_{ij} + z_{ij} = y_{ij} + m_{ij}$ ,  $i = 1, \dots, M+K$ .

(all non-negative)

Use  $p_{ij}$  to denote prices for goods, and

$$X_j = \sum_{i=1}^{M+K} p_{ij}^x x_{ij}, \quad M_j = \sum_{i=1}^{M+K} p_{ij}^m m_{ij}$$

denote value of exports and imports at *duty-free border prices*.

$$\text{Nominal GDP}_j^e \equiv \sum_{i=1}^M p_{ij} q_{ij} + (X_j - M_j) =$$

$$\sum_{i=1}^{M+K} p_{ij} (y_{ij} - z_{ij}) + \sum_{i=M_0+1}^{M+K} [(p_{ij} - p_{ij}^m) m_{ij} - (p_{ij} - p_{ij}^x) x_{ij}] \equiv \text{Nominal GDP}_j^o$$

PWT computes “**reference prices**”  $\pi_i$  for final goods and the purchasing power parities  $PPP_j$  for each country from the simultaneous equations:

$$\pi_i^e = \sum_{j=1}^N (p_{ij} / PPP_j^e) q_{ij} / \sum_{j=1}^N q_{ij} \quad , \quad i=1, \dots, M,$$

and,

$$PPP_j^e = \sum_{i=1}^M p_{ij} q_{ij} / \sum_{i=1}^M \pi_i^e q_{ij} \quad , \quad j=1, \dots, N.$$

**Real GDP<sup>e</sup> in the PWT:**

$$\text{Real GDP}_j^e \equiv \sum_{i=1}^M \pi_i^e q_{ij} + (X_j - M_j) / PPP_j^e$$

**Normalization:**

$$\sum_{i=1}^M \sum_{j=1}^N [p_{ij} q_{ij} + (X_j - M_j)] / PPP_j^e = \sum_{i=1}^M \sum_{j=1}^N [p_{ij} q_{ij} + (X_j - M_j)] / E_j$$

## Measurement of Real GDP on the Output Side

Define reference prices for exports and imports, as well as their PPP's:

$$\pi_i^o = \sum_{j=1}^N (p_{ij} / \text{PPP}_j^o) q_{ij} \bigg/ \sum_{j=1}^N q_{ij} \quad , \quad i=1, \dots, M,$$

$$\pi_i^x = \sum_{j=1}^N (p_{ij}^x / \text{PPP}_j^o) x_{ij} \bigg/ \sum_{j=1}^N x_{ij} \quad , \quad i=M_0+1, \dots, M+K.$$

$$\pi_i^m = \sum_{j=1}^N (p_{ij}^m / \text{PPP}_j^o) m_{ij} \bigg/ \sum_{j=1}^N m_{ij} \quad , \quad i=M_0+1, \dots, M+K.$$

$$\text{PPP}_j^o = \frac{\text{Nominal GDP}_i^o}{\sum_{i=1}^{M+K} \pi_i^o (y_{ij} - z_{ij}) + \sum_{i=M_0+1}^{M+K} [(\pi_i^o - \pi_i^m) m_{ij} - (\pi_i^o - \pi_i^x) x_{ij}]} \quad .$$

**Problem:** What about  $\pi_i^o$  for  $i=M+1, \dots, M+K$  (intermediate inputs)?

**Answer:** Do not need these prices! Re-write real **GDP<sup>o</sup>** as:

$$\begin{aligned} \text{Real GDP}_j^o &= \sum_{i=1}^{M+K} \pi_i^o (y_{ij} - z_{ij}) + \sum_{i=M_0+1}^{M+K} [(\pi_i^o - \pi_i^m) m_{ij} - (\pi_i^o - \pi_i^x) x_{ij}] \\ &= \sum_{i=1}^M \pi_i^o q_{ij} + \sum_{i=M_0+1}^{M+K} (\pi_i^x x_{ij} - \pi_i^m m_{ij}) , \end{aligned}$$

Re-write real **PPP<sup>o</sup>** as:

$$\text{PPP}_j^o = \frac{\text{Nominal GDP}_j^o}{\sum_{i=1}^M \pi_i^o q_{ij} + \sum_{i=M_0+1}^{M+K} (\pi_i^x x_{ij} - \pi_i^m m_{ij})}, \quad j=1, \dots, N.$$

Use the same **normalization** as before:

$$\sum_{i=1}^M \sum_{j=1}^N [p_{ij} q_{ij} + (X_j - M_j)] / \text{PPP}_j^o = \sum_{i=1}^M \sum_{j=1}^N [p_{ij} q_{ij} + (X_j - M_j)] / E_j .$$

**Problem:** Can we ensure the price and real GDP<sup>0</sup> remain positive?

### Assumption 1

$q_{ij}, x_{ij}, m_{ij} \geq 0$ , with  $\sum_{i=1}^M q_{ij} > 0$ ,  $\sum_{i=M_0+1}^{M+N} x_{ij} > 0$ ,  $\sum_{i=M_0+1}^{M+N} m_{ij} > 0$ .

Define the *budget shares* for each final, export and import goods as:

$$\theta_{ij}^v \equiv p_{ij}^v v_{ij} / \text{Nominal GDP}_j \geq 0, \quad v = q, x, m,$$

Define the *market shares* for each good as:

$$\mu_{ij}^v \equiv v_{ij} / \sum_{k=1}^C v_{ik} \geq 0, \quad v = q, x, m,$$

### Assumption 2

For all countries  $j, k = 1, \dots, C$ , we have:  $w_{jk} \equiv \theta_j^q \mu_k^q + \theta_j^x \mu_k^x - \theta_j^m \mu_k^m > 0$ .

This assumption states that the shares of imports are not too large.

### Theorem (Feenstra, Heston, Timmer, Deng, 2006)

Under Assumptions 1 and 2, the system to compute  $\pi_i^o$ ,  $\pi_i^x$ ,  $\pi_i^m$ , real  $\text{GDP}_j^o$  and  $\text{PPP}_j^o$  has a strictly positive solution.

Then the difference between real **GDP<sup>e</sup>** and real **GDP<sup>o</sup>** is:

$$\begin{aligned} & \text{Real GDP}_j^e - \text{Real GDP}_j^o \\ &= \left( \frac{\text{PPP}_j^q}{\text{PPP}_j^e} - 1 \right) \left( \frac{\sum_{i=1}^N p_{ij} q_{ij}}{\text{PPP}_j^q} \right) + \left( \frac{\text{PPP}_j^x}{\text{PPP}_j^e} - 1 \right) \left( \frac{X_j}{\text{PPP}_j^x} \right) - \left( \frac{\text{PPP}_j^m}{\text{PPP}_j^e} - 1 \right) \left( \frac{M_j}{\text{PPP}_j^m} \right). \end{aligned}$$

where:

$$\text{PPP}_j^q = \left( \frac{\sum_{i=1}^M p_{ij} q_{ij}}{\sum_{i=1}^M \pi_i^o q_{ij}} \right), \quad \text{PPP}_j^x = \left( \frac{\sum_{i=M_0+1}^M p_{ij}^x x_{ij}}{\sum_{i=M_0+1}^M \pi_i^x x_{ij}} \right), \quad \text{PPP}_j^m = \left( \frac{\sum_{i=M_0+1}^M p_{ij}^m m_{ij}}{\sum_{i=M_0+1}^M \pi_i^m m_{ij}} \right).$$

## Application for 1996:

1. First compute real GDP<sup>e</sup>, similar to that in PWT.
2. Then compute real GDP<sup>o</sup>, including data on prices/unit-values in trade.

Those unit-values are at the SITC, 4-digit level.

3. The re-compute real GDP<sup>o</sup>, using data on prices/unit-values in trade *adjusted for product variety*. In this calculation, we use:

$$\tilde{p}_{ij}^x = p_{ij}^x (EM_{ij}^x)^{\frac{(\sigma_i-1)}{\sigma_i\theta_i}}, \quad \text{and} \quad \tilde{p}_{ij}^m = p_{ij}^m (EM_{ij}^m)^{\frac{-1}{(\sigma_i-1)}}$$

where  $EM_{ij}^x$  and  $EM_{ij}^m$  are the extensive margin in exports and imports, respectively, for country  $j$  computed for each 4-digit SITC sector  $i$ .

**Question:** where do we get the elasticities?

1. Estimates of  $\sigma_i$  are available from Broda and Weinstein (2006), by

HS/SITC. We will use the *median* estimate within each SITC 4-digit. ←

2. Estimates of  $\rho_i = \frac{(\sigma_i - 1)}{\sigma_i \theta_i}$  are available from Feenstra and Kee (2006), but only for 7 broad sectors.

3. Disaggregate estimates of  $\frac{(\sigma_i - 1)}{\sigma_i \theta_i}$  can be obtained using  $\sigma_i$  from

Broda and Weinstein, combined with an assumption like:  $\theta_i = \sigma_i$ . ←

4. Alternative estimates of  $\frac{1}{1 + \omega_i} = \frac{(\sigma_i - 1)}{\sigma_i \theta_i}$  can be obtained using  $\omega_i$  from

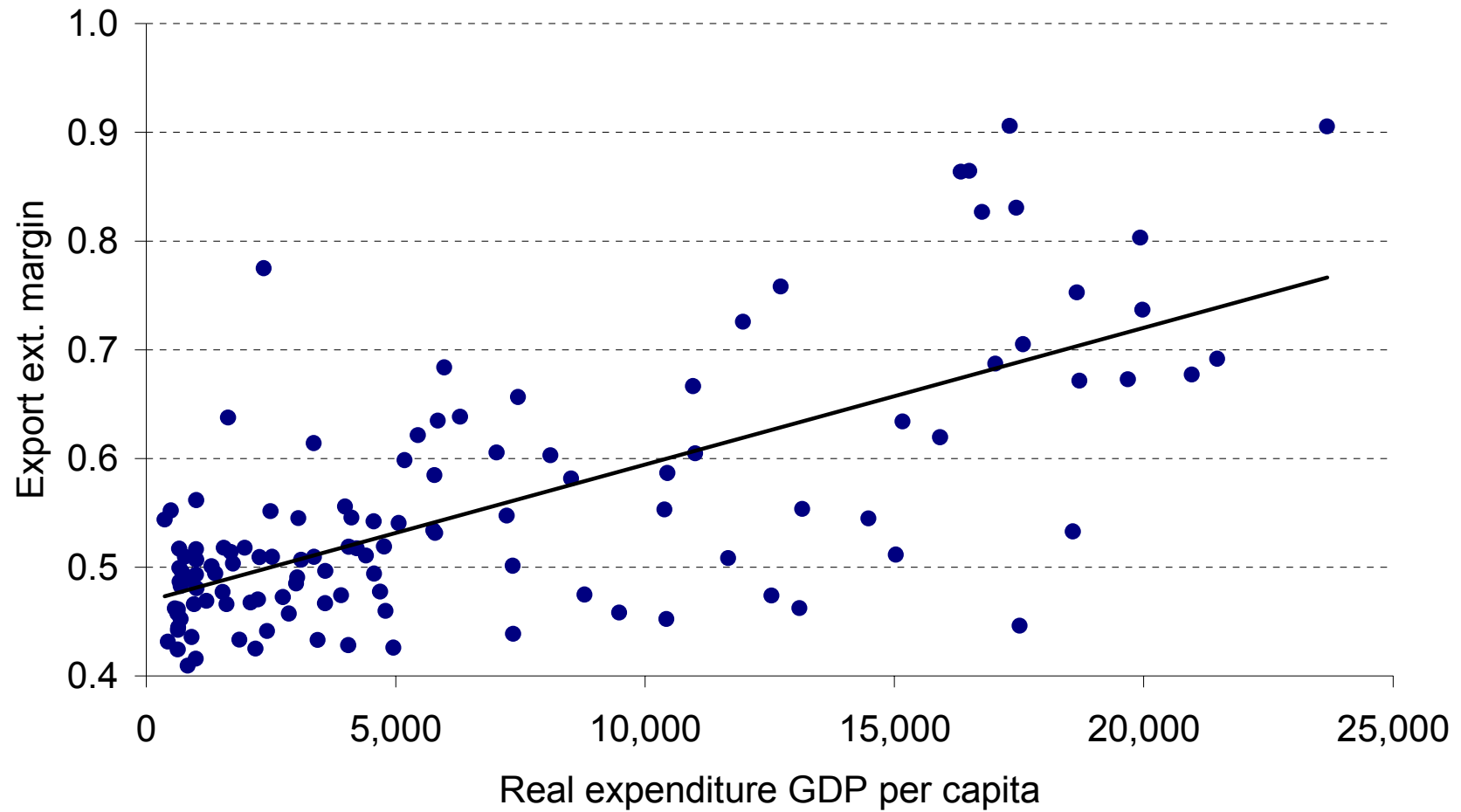
Broda, Limao and Weinstein (2006, “Optimal Tariffs: The Evidence”)

### Frequency distributions:

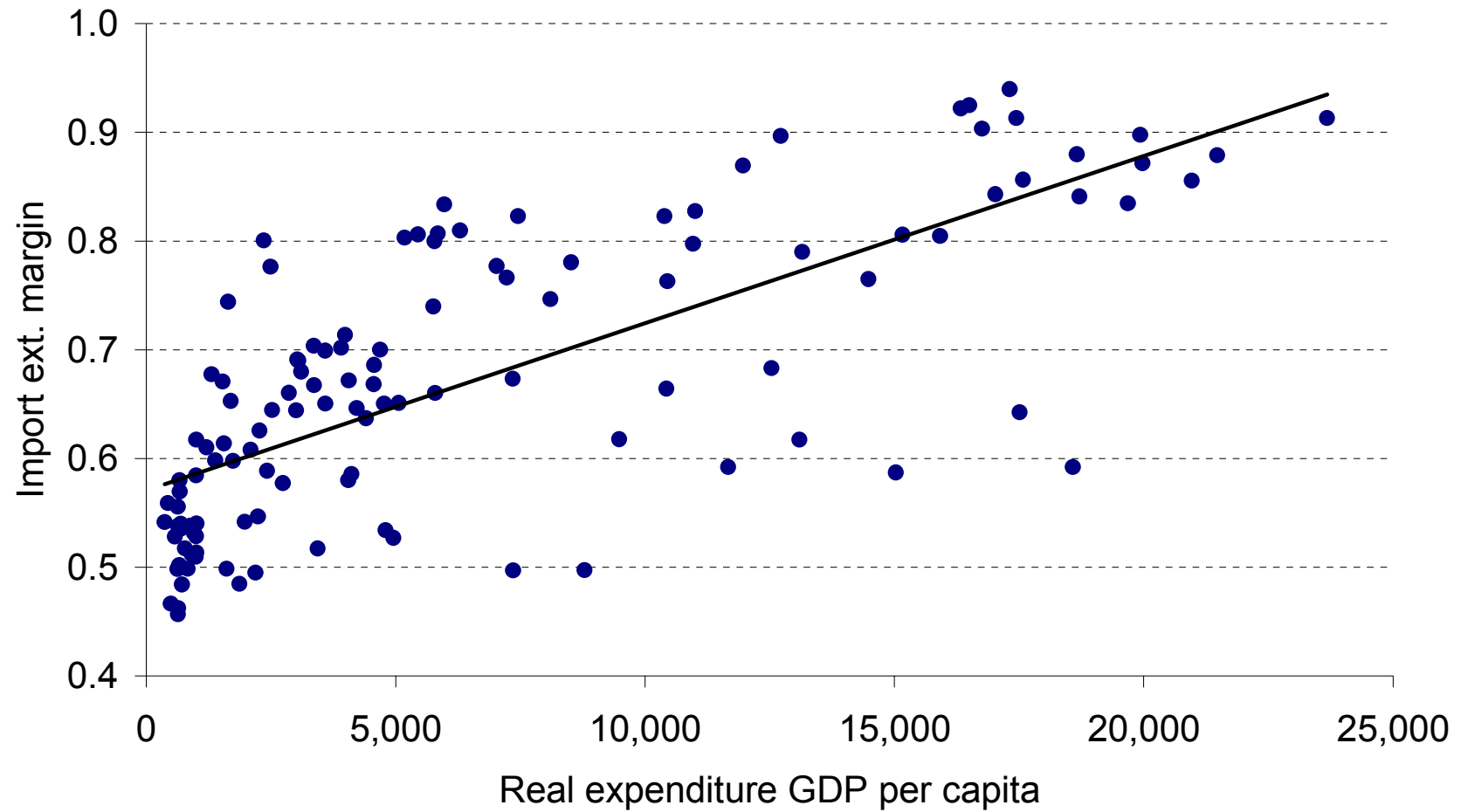
|                | $\sigma_i$ | $\frac{-1}{(\sigma_i - 1)}$ | $\frac{(\sigma_i - 1)}{\sigma_i \theta_i}$ |
|----------------|------------|-----------------------------|--------------------------------------------|
| 5th percentile | 1.55       | -1.82                       | 0.23                                       |
| 25 percentile  | 2.25       | -0.80                       | 0.25                                       |
| 50 percentile  | 3.07       | -0.48                       | 0.22                                       |
| 75 percentile  | 4.51       | -0.28                       | 0.17                                       |
| 95 percentile  | 16.1       | -0.07                       | 0.06                                       |

Exponent on the export extensive margin is smaller, which will lessen the importance of the export margin in affecting the terms of trade

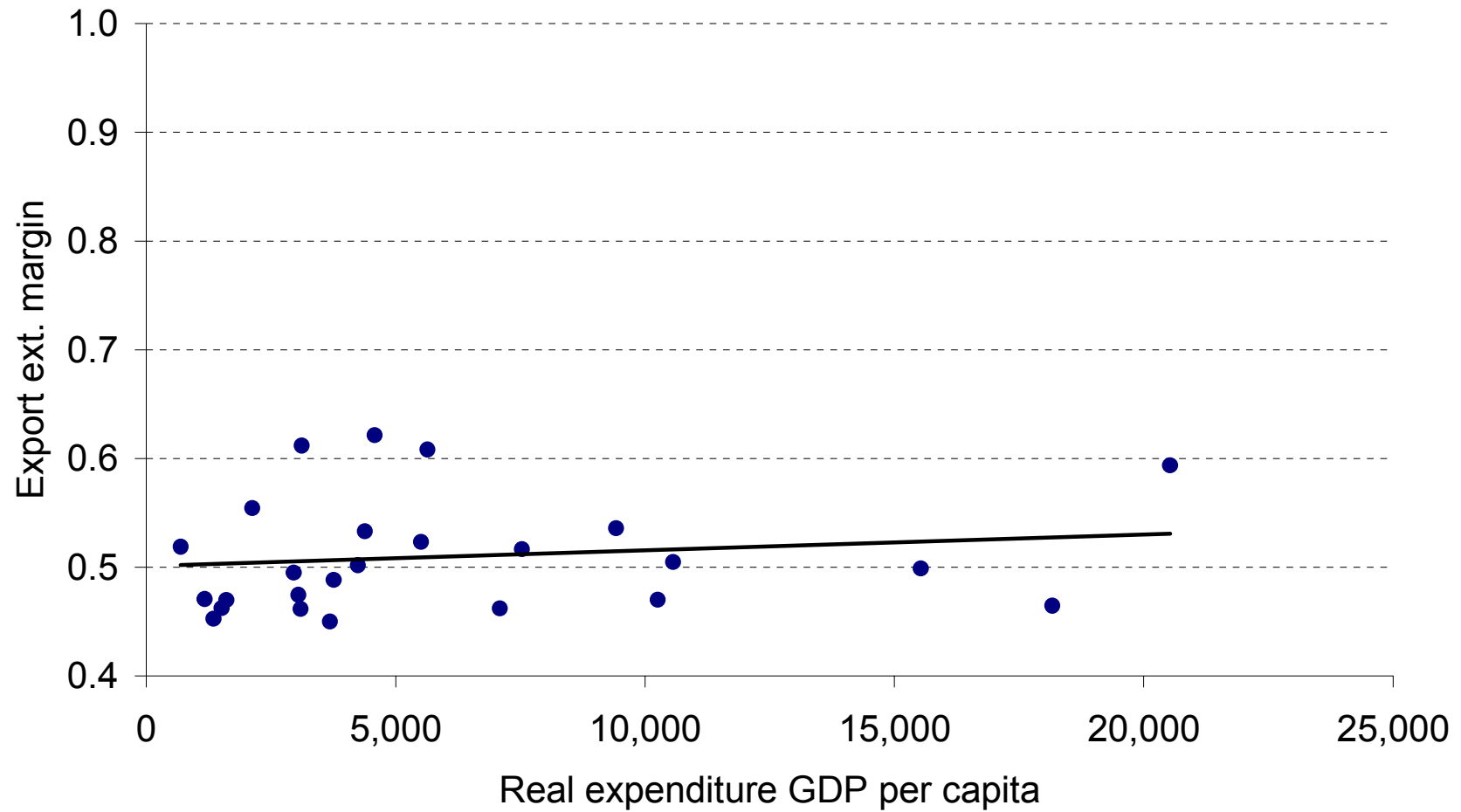
## Export Extensive Margin for Non-oil exporters:



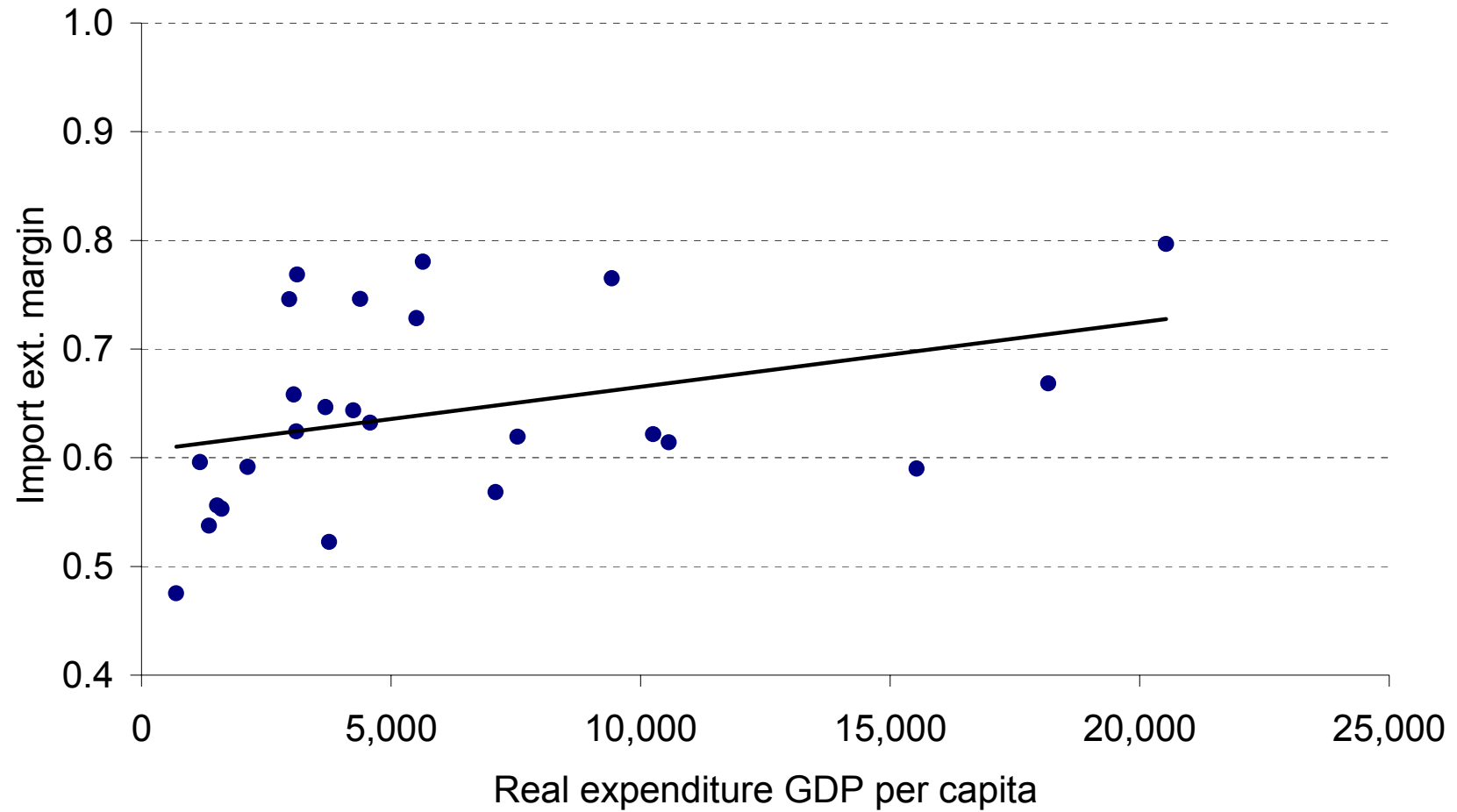
## Import Extensive Margin for Non-oil exporters:



## Export Extensive Margin for Oil exporters:



## Import Extensive Margin for Oil exporters:



## Results:

For  $PPP_j$  we use *price levels* for each country:

$$PL_j^e \equiv PPP_j^e / E_j = \sum_{i=1}^M (p_{ij} / E_j) q_{ij} / \sum_{i=1}^M \pi_i^e q_{ij} ,$$

*Price levels* for final goods, exports and imports, and the terms of trade:

$$TOT_j \equiv PL_j^x / PL_j^m = \text{Terms of Trade}$$

The difference between real  $GDP_j^e$  and real  $GDP_j^0$  is interpreted as a measure of the gains from trade from having export or import prices that *differ* from reference prices  $\pi_i^x$  and  $\pi_i^m$ .

Countries with high exports prices or low import prices will gain in the sense that real  $GDP_j^e$  exceeds real  $GDP_j^0$ , and conversely.

**Table 1: Price Levels and Real GDP, 1996**  
**(Countries with GDP<sup>e</sup> greater than GDP<sup>o</sup>)**

| Country            | Expenditure<br>price<br>level<br>(1) | Output-side price levels     |                       |                          |                |                | Real GDPe and GDPo per<br>capita |                     |                 |
|--------------------|--------------------------------------|------------------------------|-----------------------|--------------------------|----------------|----------------|----------------------------------|---------------------|-----------------|
|                    |                                      | Output<br>price level<br>(2) | Final<br>goods<br>(3) | Terms of<br>Trade<br>(4) | Exports<br>(5) | Imports<br>(6) | Real<br>GDPe<br>(7)              | Real<br>GDPo<br>(8) | Diff (%)<br>(9) |
|                    |                                      |                              |                       |                          |                |                |                                  |                     |                 |
| Austria            | 163.4                                | 182.0                        | 163.3                 | 122.4                    | 143.4          | 117.1          | 17,576                           | 15,776              | 11.4            |
| Barbados           | 64.6                                 | 76.3                         | 64.7                  | 137.0                    | 120.6          | 88.1           | 11,667                           | 9,885               | 18.0            |
| Belgium            | 157.2                                | 175.3                        | 157.2                 | 113.0                    | 118.6          | 104.9          | 16,903                           | 15,165              | 11.5            |
| Belize             | 59.1                                 | 61.6                         | 59.1                  | 110.5                    | 73.6           | 66.6           | 4,799                            | 4,603               | 4.3             |
| Bermuda            | 178.1                                | 370.3                        | 178.2                 | 196.8                    | 157.1          | 79.9           | 15,033                           | 7,229               | 108.0           |
| Bolivia            | 46.6                                 | 47.1                         | 46.7                  | 114.4                    | 73.4           | 64.2           | 2,091                            | 2,070               | 1.0             |
| Brazil             | 88.1                                 | 88.5                         | 88.1                  | 101.0                    | 79.3           | 78.5           | 5,448                            | 5,421               | 0.5             |
| Canada             | 109.5                                | 117.6                        | 109.4                 | 120.1                    | 115.3          | 96.0           | 18,656                           | 17,361              | 7.5             |
| Congo, Dem.Rp.     | 30.2                                 | 33.0                         | 30.2                  | 151.2                    | 76.4           | 50.5           | 245                              | 224                 | 9.3             |
| Cyprus             | 95.6                                 | 97.5                         | 95.6                  | 100.9                    | 79.9           | 79.2           | 12,535                           | 12,283              | 2.0             |
| Denmark            | 176.8                                | 185.6                        | 176.8                 | 115.1                    | 131.6          | 114.3          | 19,682                           | 18,757              | 4.9             |
| Djibouti           | 49.1                                 | 50.2                         | 49.2                  | 116.7                    | 69.8           | 59.8           | 1,613                            | 1,580               | 2.1             |
| Eq. Guinea         | 57.0                                 | 69.9                         | 57.0                  | 142.5                    | 85.0           | 59.7           | 1,105                            | 902                 | 22.5            |
| Finland            | 156.4                                | 160.4                        | 156.4                 | 110.6                    | 132.4          | 119.6          | 15,915                           | 15,511              | 2.6             |
| France             | 158.2                                | 167.0                        | 158.2                 | 121.4                    | 133.6          | 110.0          | 16,500                           | 15,630              | 5.6             |
| Gabon              | 72.5                                 | 73.8                         | 72.5                  | 95.7                     | 82.4           | 86.1           | 7,092                            | 6,966               | 1.8             |
| Gambia             | 41.2                                 | 41.6                         | 41.2                  | 102.6                    | 43.4           | 42.3           | 830                              | 823                 | 0.9             |
| Germany            | 168.1                                | 177.3                        | 168.1                 | 118.3                    | 142.4          | 120.3          | 17,310                           | 16,411              | 5.5             |
| Greece             | 114.3                                | 117.8                        | 114.3                 | 97.8                     | 78.1           | 79.9           | 10,388                           | 10,075              | 3.1             |
| Guyana             | 37.2                                 | 42.0                         | 37.2                  | 129.4                    | 78.5           | 60.6           | 2,241                            | 1,989               | 12.7            |
| Hungary            | 63.1                                 | 64.1                         | 63.1                  | 106.1                    | 88.6           | 83.5           | 7,025                            | 6,915               | 1.6             |
| Ireland            | 133.0                                | 175.4                        | 133.0                 | 140.0                    | 157.9          | 112.8          | 15,166                           | 11,501              | 31.9            |
| Israel             | 127.8                                | 182.1                        | 127.7                 | 170.4                    | 134.7          | 79.1           | 13,152                           | 9,229               | 42.5            |
| Italy              | 128.2                                | 129.8                        | 128.2                 | 107.1                    | 114.9          | 107.2          | 16,760                           | 16,550              | 1.3             |
| Jamaica            | 71.8                                 | 82.8                         | 71.8                  | 123.8                    | 81.4           | 65.7           | 3,009                            | 2,609               | 15.3            |
| Japan              | 187.2                                | 188.4                        | 187.1                 | 105.7                    | 135.0          | 127.6          | 19,931                           | 19,806              | 0.6             |
| Malaysia           | 64.2                                 | 76.4                         | 64.2                  | 120.1                    | 73.1           | 60.9           | 7,456                            | 6,271               | 18.9            |
| Malta              | 85.7                                 | 113.8                        | 85.7                  | 148.0                    | 138.5          | 93.6           | 10,431                           | 7,849               | 32.9            |
| Mauritius          | 40.0                                 | 40.8                         | 40.0                  | 106.9                    | 79.8           | 74.6           | 9,482                            | 9,287               | 2.1             |
| Mexico             | 60.1                                 | 73.7                         | 60.2                  | 173.8                    | 74.9           | 43.1           | 5,978                            | 4,879               | 22.5            |
| Netherlands        | 152.0                                | 163.1                        | 152.0                 | 112.4                    | 118.6          | 105.5          | 17,445                           | 16,261              | 7.3             |
| New Zealand        | 123.8                                | 130.7                        | 123.8                 | 115.6                    | 102.9          | 89.0           | 14,481                           | 13,719              | 5.6             |
| Niger              | 33.5                                 | 34.6                         | 33.6                  | 153.9                    | 69.1           | 44.9           | 626                              | 607                 | 3.1             |
| Philippines        | 46.2                                 | 46.9                         | 46.2                  | 117.4                    | 79.4           | 67.6           | 2,495                            | 2,457               | 1.5             |
| Portugal           | 102.9                                | 104.4                        | 102.9                 | 104.2                    | 105.3          | 101.1          | 11,010                           | 10,849              | 1.5             |
| Singapore          | 119.3                                | 155.5                        | 119.1                 | 114.1                    | 103.1          | 90.3           | 20,960                           | 16,077              | 30.4            |
| South Africa       | 62.0                                 | 62.5                         | 62.0                  | 101.9                    | 73.4           | 72.0           | 5,780                            | 5,733               | 0.8             |
| Spain              | 122.1                                | 125.9                        | 122.1                 | 111.5                    | 110.7          | 99.2           | 12,718                           | 12,329              | 3.2             |
| St. Lucia          | 78.0                                 | 84.1                         | 78.0                  | 113.3                    | 91.9           | 81.2           | 4,956                            | 4,595               | 7.8             |
| St.Kitts and Nevis | 68.4                                 | 69.1                         | 68.4                  | 113.3                    | 91.9           | 81.2           | 8,786                            | 8,701               | 1.0             |
| Sweden             | 174.0                                | 194.7                        | 174.0                 | 131.2                    | 156.7          | 119.4          | 17,024                           | 15,215              | 11.9            |
| Switzerland        | 209.5                                | 247.3                        | 209.5                 | 151.1                    | 229.4          | 151.9          | 19,974                           | 16,922              | 18.0            |
| Syria              | 129.9                                | 139.7                        | 130.0                 | 99.1                     | 60.4           | 60.9           | 3,097                            | 2,881               | 7.5             |
| Tajikistan         | 20.2                                 | 20.4                         | 20.2                  | 104.8                    | 51.9           | 49.6           | 776                              | 770                 | 0.8             |
| Togo               | 50.2                                 | 50.6                         | 50.2                  | 99.7                     | 46.0           | 46.2           | 695                              | 690                 | 0.8             |
| Trinidad & Tbg     | 59.3                                 | 62.0                         | 59.3                  | 103.4                    | 81.4           | 78.6           | 7,534                            | 7,203               | 4.6             |
| Turkmenistan       | 13.6                                 | 13.9                         | 13.6                  | 65.6                     | 44.7           | 68.1           | 3,762                            | 3,687               | 2.0             |
| UK                 | 123.8                                | 129.5                        | 123.8                 | 114.5                    | 125.8          | 109.8          | 16,331                           | 15,611              | 4.6             |
| USA                | 123.3                                | 124.1                        | 123.3                 | 101.4                    | 101.2          | 99.8           | 23,673                           | 23,530              | 0.6             |
| Venezuela          | 57.2                                 | 57.7                         | 57.3                  | 95.5                     | 63.1           | 66.0           | 5,511                            | 5,468               | 0.8             |
| Zambia             | 53.6                                 | 54.3                         | 53.6                  | 108.0                    | 69.8           | 64.7           | 667                              | 658                 | 1.3             |

**Table 2: Price Levels and Real GDP, 1996**  
**(Countries with GDP<sup>e</sup> less than GDP<sup>o</sup>)**

| Country       | Expenditure price level<br>(1) | Output-side price levels  |                    |                       |                |                | Real GDPe and GDPo per capita |                  |                 |
|---------------|--------------------------------|---------------------------|--------------------|-----------------------|----------------|----------------|-------------------------------|------------------|-----------------|
|               |                                | Output price level<br>(2) | Final goods<br>(3) | Terms of Trade<br>(4) | Exports<br>(5) | Imports<br>(6) | Real GDPe<br>(7)              | Real GDPo<br>(8) | Diff (%)<br>(9) |
| Albania       | 34.0                           | 30.1                      | 34.0               | 76.8                  | 43.7           | 56.9           | 2,423                         | 2,742            | -11.6           |
| Algeria       | 44.4                           | 44.2                      | 44.4               | 86.7                  | 60.4           | 69.6           | 3,685                         | 3,702            | -0.5            |
| Angola        | 58.4                           | 57.1                      | 58.4               | 96.7                  | 69.4           | 71.8           | 1,001                         | 1,022            | -2.1            |
| Argentina     | 90.9                           | 88.7                      | 90.9               | 80.2                  | 71.3           | 88.8           | 8,520                         | 8,727            | -2.4            |
| Armenia       | 22.6                           | 19.3                      | 22.7               | 105.8                 | 53.1           | 50.2           | 1,869                         | 2,188            | -14.6           |
| Australia     | 121.0                          | 119.0                     | 121.0              | 94.0                  | 84.7           | 90.0           | 18,713                        | 19,022           | -1.6            |
| Azerbaijan    | 25.5                           | 21.4                      | 25.5               | 90.8                  | 56.1           | 61.8           | 1,606                         | 1,911            | -16.0           |
| Bahamas       | 94.0                           | 76.1                      | 94.1               | 64.2                  | 46.2           | 72.0           | 13,094                        | 16,175           | -19.0           |
| Bahrain       | 94.6                           | 85.8                      | 94.6               | 92.9                  | 83.7           | 90.1           | 10,254                        | 11,306           | -9.3            |
| Bangladesh    | 26.8                           | 25.2                      | 26.8               | 66.2                  | 37.4           | 56.5           | 1,209                         | 1,288            | -6.1            |
| Belarus       | 26.2                           | 23.7                      | 26.2               | 66.8                  | 49.4           | 74.0           | 4,410                         | 4,887            | -9.8            |
| Benin         | 44.4                           | 44.1                      | 44.4               | 98.9                  | 47.6           | 48.1           | 884                           | 890              | -0.7            |
| Bulgaria      | 25.7                           | 24.1                      | 25.8               | 71.9                  | 51.3           | 71.4           | 4,560                         | 4,871            | -6.4            |
| Burkina Faso  | 35.8                           | 33.0                      | 35.9               | 84.0                  | 53.1           | 63.2           | 693                           | 753              | -7.9            |
| Burundi       | 28.8                           | 27.3                      | 28.8               | 76.8                  | 47.5           | 61.9           | 496                           | 524              | -5.3            |
| Cambodia      | 30.2                           | 25.6                      | 30.2               | 57.0                  | 33.6           | 58.9           | 958                           | 1,132            | -15.4           |
| Cameroon      | 43.6                           | 43.1                      | 43.6               | 86.6                  | 63.5           | 73.3           | 1,514                         | 1,529            | -1.0            |
| Cent.Afr.Rep  | 44.5                           | 42.8                      | 44.6               | 78.9                  | 52.0           | 65.8           | 716                           | 745              | -3.9            |
| Chad          | 34.0                           | 30.9                      | 34.0               | 72.0                  | 44.4           | 61.7           | 694                           | 763              | -9.2            |
| Chile         | 66.3                           | 63.2                      | 66.3               | 81.2                  | 78.5           | 96.6           | 7,230                         | 7,591            | -4.8            |
| China         | 30.7                           | 30.1                      | 30.7               | 78.9                  | 41.0           | 52.0           | 2,355                         | 2,405            | -2.1            |
| Colombia      | 57.7                           | 56.4                      | 57.7               | 89.5                  | 68.9           | 77.0           | 4,382                         | 4,483            | -2.2            |
| Congo         | 71.5                           | 71.1                      | 71.6               | 98.9                  | 70.4           | 71.2           | 1,349                         | 1,356            | -0.6            |
| Costa Rica    | 66.2                           | 60.3                      | 66.2               | 81.2                  | 57.1           | 70.4           | 4,063                         | 4,460            | -8.9            |
| Cote D'Ivoire | 49.4                           | 45.7                      | 49.5               | 75.6                  | 52.5           | 69.4           | 1,556                         | 1,685            | -7.6            |
| Croatia       | 76.8                           | 72.5                      | 76.8               | 87.8                  | 79.3           | 90.4           | 5,757                         | 6,102            | -5.7            |
| Cuba          | 51.0                           | 50.8                      | 51.1               | 97.2                  | 64.8           | 66.7           | 4,050                         | 4,071            | -0.5            |
| Czech Rep     | 51.0                           | 46.5                      | 51.0               | 80.9                  | 69.9           | 86.4           | 10,963                        | 12,038           | -8.9            |
| Dominican Rp  | 53.8                           | 50.3                      | 53.8               | 79.6                  | 56.0           | 70.3           | 3,109                         | 3,324            | -6.5            |
| Ecuador       | 53.4                           | 52.4                      | 53.4               | 87.4                  | 58.4           | 66.8           | 3,052                         | 3,110            | -1.9            |
| Egypt         | 38.6                           | 37.5                      | 38.6               | 93.0                  | 60.6           | 65.2           | 2,959                         | 3,048            | -2.9            |
| El Salvador   | 53.1                           | 49.0                      | 53.1               | 74.5                  | 53.0           | 71.1           | 3,363                         | 3,643            | -7.7            |
| Estonia       | 51.2                           | 43.1                      | 51.2               | 74.3                  | 58.4           | 78.5           | 5,792                         | 6,886            | -15.9           |
| Ethiopia      | 23.7                           | 22.2                      | 23.7               | 117.8                 | 59.5           | 50.5           | 433                           | 461              | -6.1            |
| Fiji          | 66.4                           | 65.6                      | 66.4               | 97.4                  | 73.0           | 74.9           | 4,118                         | 4,166            | -1.1            |
| Georgia       | 24.3                           | 23.2                      | 24.4               | 86.7                  | 46.6           | 53.8           | 3,436                         | 3,600            | -4.5            |
| Ghana         | 39.5                           | 38.1                      | 39.5               | 97.3                  | 58.7           | 60.3           | 1,002                         | 1,037            | -3.4            |
| Guatemala     | 50.4                           | 48.4                      | 50.5               | 80.4                  | 52.2           | 64.9           | 3,054                         | 3,182            | -4.0            |
| Guinea        | 26.8                           | 26.1                      | 26.8               | 95.5                  | 52.8           | 55.2           | 2,191                         | 2,246            | -2.4            |
| GuineaBissau  | 38.4                           | 33.7                      | 38.4               | 54.4                  | 36.7           | 67.4           | 636                           | 725              | -12.2           |
| Haiti         | 29.8                           | 27.3                      | 29.9               | 80.9                  | 45.7           | 56.5           | 1,381                         | 1,509            | -8.5            |
| Honduras      | 41.3                           | 37.2                      | 41.3               | 76.6                  | 48.0           | 62.7           | 1,697                         | 1,884            | -9.9            |
| Hong Kong     | 113.4                          | 71.8                      | 113.3              | 79.1                  | 57.1           | 72.2           | 21,471                        | 33,913           | -36.7           |
| Iceland       | 154.6                          | 129.3                     | 154.6              | 72.9                  | 79.0           | 108.4          | 17,511                        | 20,925           | -16.3           |
| India         | 25.6                           | 24.5                      | 25.6               | 59.8                  | 50.2           | 83.9           | 1,642                         | 1,714            | -4.2            |
| Indonesia     | 37.0                           | 35.7                      | 37.0               | 79.3                  | 59.9           | 75.5           | 3,117                         | 3,225            | -3.3            |
| Iran          | 51.7                           | 51.4                      | 51.7               | 86.2                  | 61.7           | 71.6           | 4,245                         | 4,271            | -0.6            |
| Jordan        | 53.9                           | 52.4                      | 53.9               | 104.9                 | 70.2           | 66.9           | 2,858                         | 2,941            | -2.8            |
| Kazakhstan    | 28.9                           | 28.2                      | 28.9               | 92.1                  | 45.6           | 49.5           | 4,580                         | 4,697            | -2.5            |
| Kenya         | 32.9                           | 31.1                      | 32.9               | 80.5                  | 51.1           | 63.6           | 1,002                         | 1,062            | -5.6            |

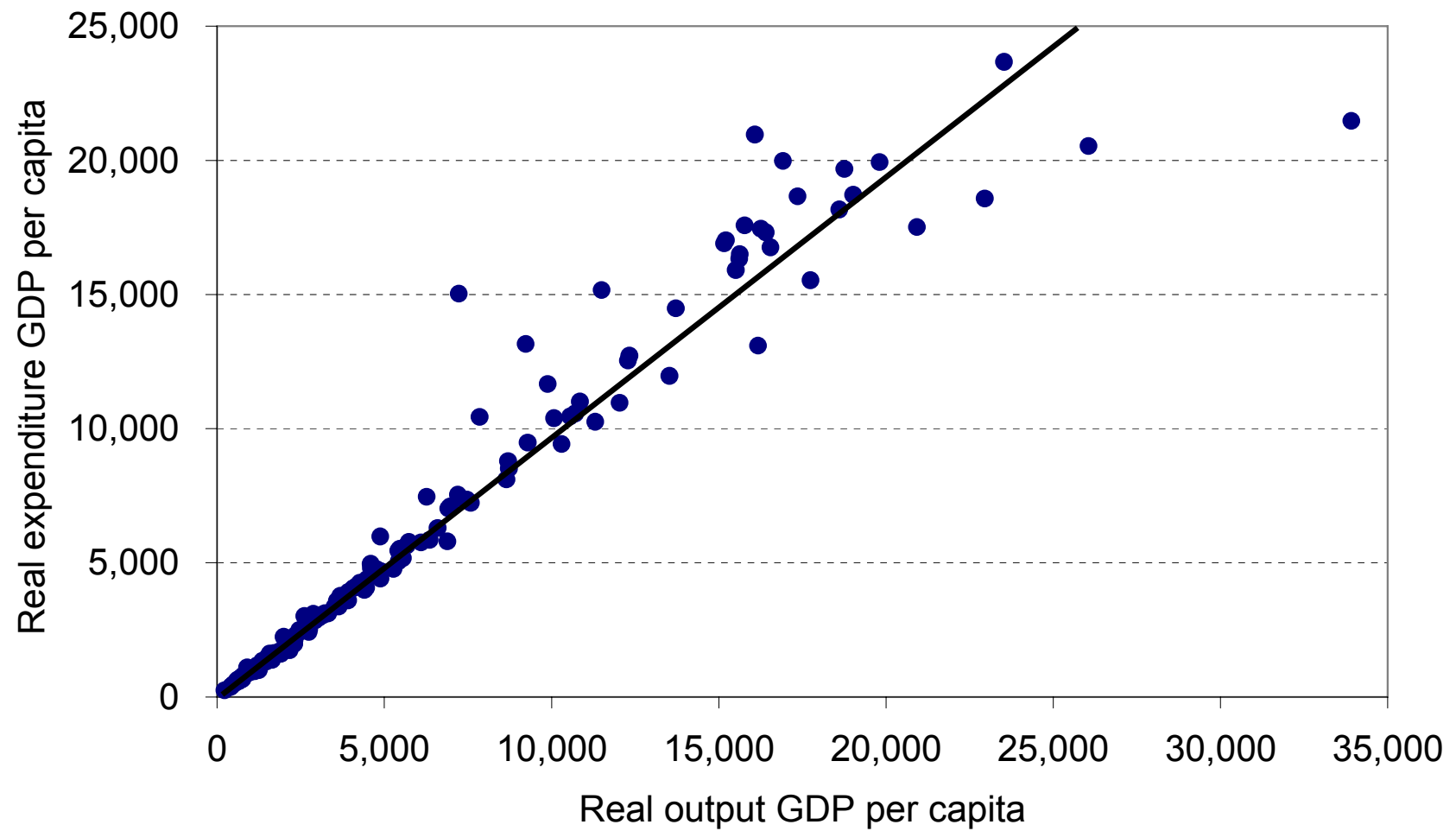
Table 2: (continued)

| Country            | Expenditure price level<br>(1) | Output-side price levels  |                    |                       |                |                | Real GDPe and GDPo per capita |                  |                 |
|--------------------|--------------------------------|---------------------------|--------------------|-----------------------|----------------|----------------|-------------------------------|------------------|-----------------|
|                    |                                | Output price level<br>(2) | Final goods<br>(3) | Terms of Trade<br>(4) | Exports<br>(5) | Imports<br>(6) | Real GDPe<br>(7)              | Real GDPo<br>(8) | Diff (%)<br>(9) |
|                    |                                |                           |                    |                       |                |                |                               |                  |                 |
| Korea, Rep. of     | 95.5                           | 84.4                      | 95.4               | 65.4                  | 79.2           | 121.0          | 11,962                        | 13,529           | -11.6           |
| Kuwait             | 99.4                           | 97.1                      | 99.5               | 100.1                 | 82.9           | 82.9           | 18,170                        | 18,606           | -2.3            |
| Kyrgyzstan         | 20.2                           | 17.3                      | 20.2               | 86.6                  | 43.9           | 50.7           | 1,973                         | 2,311            | -14.7           |
| Laos               | 37.2                           | 31.8                      | 37.2               | 58.3                  | 39.9           | 68.5           | 1,068                         | 1,249            | -14.5           |
| Latvia             | 43.3                           | 39.1                      | 43.3               | 79.9                  | 57.3           | 71.8           | 4,768                         | 5,278            | -9.7            |
| Lebanon            | 81.6                           | 81.1                      | 81.6               | 75.6                  | 58.0           | 76.7           | 3,908                         | 3,928            | -0.5            |
| Lithuania          | 42.0                           | 39.2                      | 42.1               | 89.4                  | 58.4           | 65.3           | 5,062                         | 5,434            | -6.8            |
| Macao              | 88.3                           | 71.5                      | 88.3               | 92.3                  | 57.8           | 62.7           | 18,578                        | 22,952           | -19.1           |
| Macedonia          | 62.0                           | 56.8                      | 62.0               | 75.9                  | 60.5           | 79.7           | 3,591                         | 3,917            | -8.3            |
| Madagascar         | 45.9                           | 45.8                      | 45.9               | 106.0                 | 63.9           | 60.3           | 635                           | 635              | -0.1            |
| Malawi             | 39.5                           | 35.2                      | 39.5               | 63.1                  | 47.1           | 74.6           | 573                           | 643              | -10.9           |
| Mali               | 41.7                           | 38.4                      | 41.7               | 79.8                  | 52.1           | 65.3           | 640                           | 695              | -7.8            |
| Mauritania         | 46.1                           | 41.9                      | 46.1               | 83.1                  | 53.0           | 63.8           | 994                           | 1,093            | -9.0            |
| Moldova            | 22.5                           | 18.0                      | 22.5               | 61.3                  | 34.6           | 56.5           | 1,739                         | 2,171            | -19.9           |
| Mongolia           | 42.7                           | 34.2                      | 42.7               | 54.5                  | 35.4           | 65.0           | 1,003                         | 1,254            | -20.0           |
| Morocco            | 45.0                           | 43.4                      | 45.0               | 92.3                  | 67.9           | 73.6           | 3,029                         | 3,138            | -3.5            |
| Mozambique         | 26.1                           | 23.0                      | 26.1               | 77.9                  | 50.1           | 64.3           | 673                           | 764              | -11.9           |
| Nepal              | 20.0                           | 16.9                      | 20.0               | 42.9                  | 27.5           | 64.1           | 1,008                         | 1,192            | -15.5           |
| Nicaragua          | 31.3                           | 26.3                      | 31.3               | 75.0                  | 55.0           | 73.4           | 1,387                         | 1,648            | -15.8           |
| Norway             | 175.2                          | 138.1                     | 175.2              | 72.7                  | 85.3           | 117.4          | 20,529                        | 26,057           | -21.2           |
| Oman               | 65.3                           | 64.4                      | 65.4               | 94.6                  | 66.7           | 70.5           | 10,564                        | 10,711           | -1.4            |
| Pakistan           | 31.5                           | 29.1                      | 31.6               | 63.9                  | 37.0           | 57.9           | 1,536                         | 1,663            | -7.6            |
| Panama             | 66.7                           | 66.1                      | 66.6               | 97.6                  | 71.6           | 73.3           | 4,574                         | 4,615            | -0.9            |
| Papua N.Guin       | 43.5                           | 42.5                      | 43.5               | 88.0                  | 67.7           | 77.0           | 2,739                         | 2,803            | -2.3            |
| Paraguay           | 46.1                           | 44.9                      | 46.1               | 96.6                  | 69.0           | 71.4           | 4,220                         | 4,333            | -2.6            |
| Peru               | 70.9                           | 70.8                      | 70.9               | 99.5                  | 75.2           | 75.6           | 3,585                         | 3,591            | -0.2            |
| Poland             | 59.2                           | 56.5                      | 59.2               | 79.4                  | 65.7           | 82.8           | 6,292                         | 6,592            | -4.6            |
| Qatar              | 87.2                           | 76.3                      | 87.3               | 69.9                  | 67.8           | 96.9           | 15,530                        | 17,746           | -12.5           |
| Romania            | 39.0                           | 35.3                      | 39.0               | 67.4                  | 57.3           | 84.9           | 3,987                         | 4,409            | -9.6            |
| Russian Fed        | 50.2                           | 49.9                      | 50.2               | 89.8                  | 63.9           | 71.2           | 5,639                         | 5,671            | -0.6            |
| Rwanda             | 32.6                           | 29.6                      | 32.7               | 77.1                  | 47.9           | 62.1           | 641                           | 705              | -9.1            |
| Saudi Arabia       | 77.1                           | 70.5                      | 77.2               | 82.1                  | 64.8           | 79.0           | 9,422                         | 10,301           | -8.5            |
| Senegal            | 46.3                           | 45.1                      | 46.3               | 94.9                  | 60.8           | 64.1           | 1,172                         | 1,203            | -2.6            |
| Seychelles         | 90.2                           | 89.7                      | 90.1               | 96.9                  | 76.2           | 78.6           | 7,356                         | 7,394            | -0.5            |
| Sierra Leone       | 27.6                           | 26.5                      | 27.6               | 124.8                 | 60.0           | 48.0           | 737                           | 766              | -3.9            |
| Slovakia           | 45.4                           | 42.5                      | 45.4               | 93.4                  | 70.0           | 75.0           | 8,105                         | 8,654            | -6.3            |
| Slovenia           | 90.4                           | 89.5                      | 90.4               | 98.0                  | 96.4           | 98.4           | 10,449                        | 10,555           | -1.0            |
| Sri Lanka          | 30.2                           | 27.6                      | 30.2               | 77.1                  | 51.4           | 66.7           | 2,521                         | 2,756            | -8.5            |
| St. Vincent & Grn. | 52.3                           | 52.3                      | 52.3               | 113.3                 | 91.9           | 81.2           | 4,766                         | 4,767            | 0.0             |
| Sudan              | 33.4                           | 31.3                      | 33.4               | 74.4                  | 44.4           | 59.6           | 912                           | 970              | -6.1            |
| Tanzania           | 51.5                           | 47.2                      | 51.6               | 71.7                  | 43.4           | 60.5           | 372                           | 406              | -8.4            |
| Thailand           | 51.8                           | 47.7                      | 51.8               | 78.9                  | 64.9           | 82.2           | 5,846                         | 6,352            | -8.0            |
| Tunisia            | 46.0                           | 44.0                      | 46.0               | 85.1                  | 71.4           | 83.9           | 4,690                         | 4,901            | -4.3            |
| Turkey             | 55.9                           | 52.1                      | 55.9               | 72.6                  | 62.8           | 86.5           | 5,180                         | 5,558            | -6.8            |
| Uganda             | 44.7                           | 42.1                      | 44.8               | 70.9                  | 43.7           | 61.6           | 663                           | 706              | -6.0            |
| Ukraine            | 25.9                           | 24.8                      | 26.0               | 85.3                  | 54.6           | 64.1           | 3,361                         | 3,512            | -4.3            |
| Uruguay            | 80.6                           | 79.2                      | 80.6               | 91.7                  | 72.6           | 79.2           | 7,346                         | 7,472            | -1.7            |
| Uzbekistan         | 27.6                           | 25.3                      | 27.6               | 68.2                  | 45.8           | 67.2           | 2,128                         | 2,321            | -8.3            |
| Viet Nam           | 24.0                           | 21.6                      | 24.1               | 85.0                  | 51.7           | 60.8           | 1,312                         | 1,459            | -10.1           |
| Zimbabwe           | 33.2                           | 32.4                      | 33.2               | 86.8                  | 62.5           | 72.0           | 2,273                         | 2,324            | -2.2            |

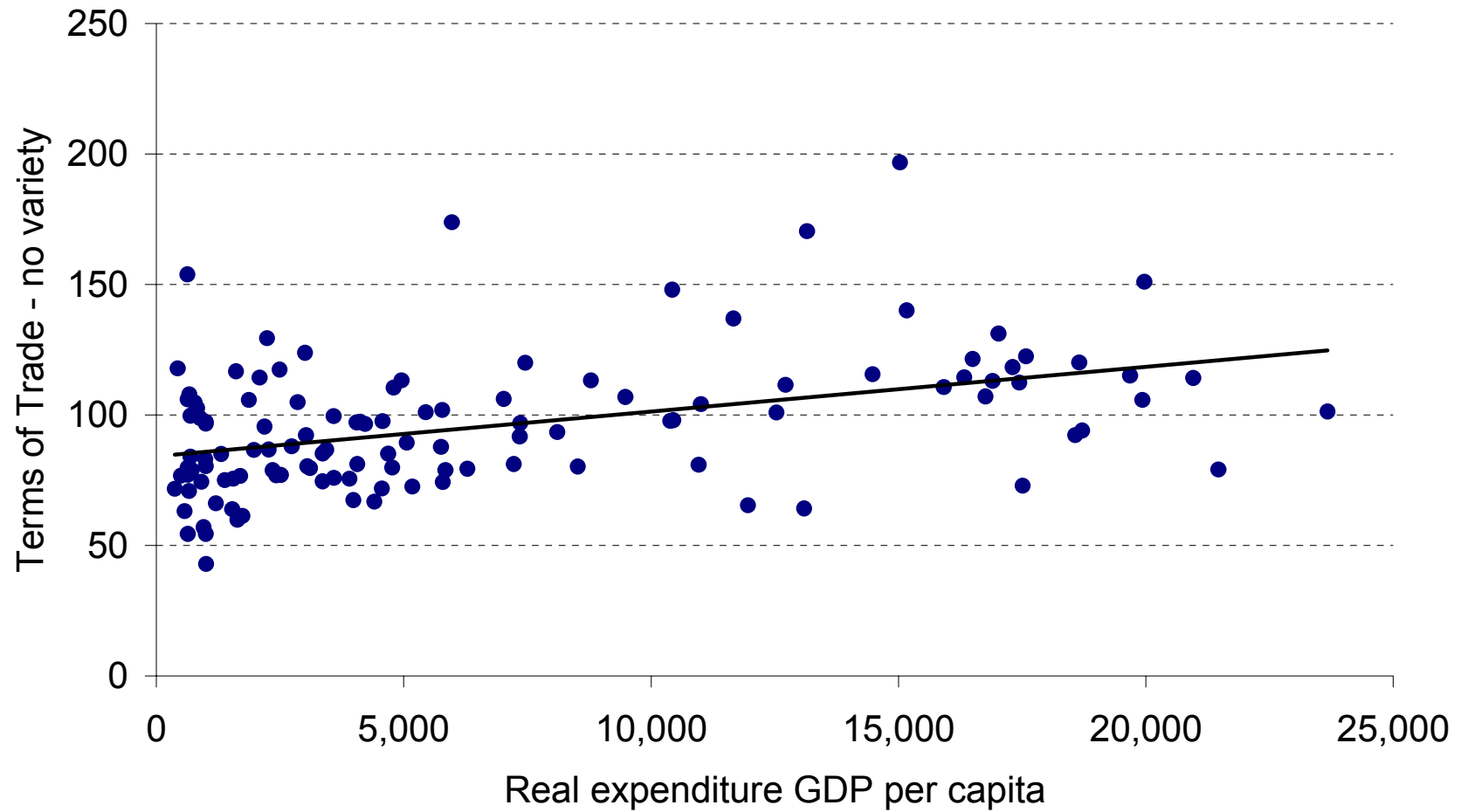
**Table 3: Summary Statistics for Price Levels and Real GDP, 1996**

| Country set                                | Expenditure price level | Output-side price levels |                 |                    |             |             | Real GDPe and GDPo per capita |               |              |
|--------------------------------------------|-------------------------|--------------------------|-----------------|--------------------|-------------|-------------|-------------------------------|---------------|--------------|
|                                            | (1)                     | Output price level (2)   | Final goods (3) | Terms of Trade (4) | Exports (5) | Imports (6) | Real GDPe (7)                 | Real GDPo (8) | Diff (%) (9) |
| <i>all available countries (151)</i>       |                         |                          |                 |                    |             |             |                               |               |              |
| mean                                       | 66.7                    | 68.3                     | 66.7            | 94.9               | 72.3        | 75.4        | 6,326                         | 6,352         | -1.3         |
| stdev                                      | 42.5                    | 52.1                     | 42.5            | 24.3               | 30.5        | 19.1        | 6,130                         | 6,329         |              |
| min                                        | 13.6                    | 13.9                     | 13.6            | 42.9               | 27.5        | 42.3        | 245                           | 224           | -36.7        |
| max                                        | 209.5                   | 370.3                    | 209.5           | 196.8              | 229.4       | 151.9       | 23,673                        | 33,913        | 108.0        |
| <i>Countries with GDPe &gt; GDPo (51)</i>  |                         |                          |                 |                    |             |             |                               |               |              |
| mean                                       | 96.2                    | 108.5                    | 96.2            | 118.7              | 99.4        | 83.8        | 9,889                         | 8,971         | 10.2         |
| stdev                                      | 50.7                    | 67.2                     | 50.7            | 22.8               | 36.1        | 25.0        | 6,853                         | 6,296         |              |
| min                                        | 13.6                    | 13.9                     | 13.6            | 65.6               | 43.4        | 42.3        | 245                           | 224           | 0.5          |
| max                                        | 209.5                   | 370.3                    | 209.5           | 196.8              | 229.4       | 151.9       | 23,673                        | 23,530        | 108.0        |
| <i>Countries with GDPe &lt; GDPo (100)</i> |                         |                          |                 |                    |             |             |                               |               |              |
| mean                                       | 51.7                    | 47.7                     | 51.7            | 82.8               | 58.5        | 71.1        | 4,509                         | 5,017         | -7.4         |
| stdev                                      | 27.6                    | 24.0                     | 27.5            | 14.0               | 13.5        | 13.6        | 4,830                         | 5,945         |              |
| min                                        | 20.0                    | 16.9                     | 20.0            | 42.9               | 27.5        | 48.0        | 372                           | 406           | -36.7        |
| max                                        | 175.2                   | 138.1                    | 175.2           | 124.8              | 96.4        | 121.0       | 21,471                        | 33,913        | 0.0          |
| <i>Oil sample (25)</i>                     |                         |                          |                 |                    |             |             |                               |               |              |
| mean                                       | 60.8                    | 57.9                     | 60.8            | 86.2               | 63.1        | 73.4        | 5,855                         | 6,267         | -4.0         |
| stdev                                      | 35.0                    | 31.3                     | 35.0            | 12.3               | 13.0        | 13.4        | 5,341                         | 6,233         |              |
| min                                        | 13.6                    | 13.9                     | 13.6            | 54.4               | 36.7        | 49.5        | 636                           | 725           | -21.2        |
| max                                        | 175.2                   | 139.7                    | 175.2           | 103.4              | 85.3        | 117.4       | 20,529                        | 26,057        | 7.5          |
| <i>Non-oil sample (126)</i>                |                         |                          |                 |                    |             |             |                               |               |              |
| mean                                       | 67.8                    | 70.2                     | 67.8            | 96.7               | 74.2        | 75.7        | 6,382                         | 6,329         | -0.8         |
| stdev                                      | 43.9                    | 55.3                     | 43.9            | 25.8               | 32.7        | 20.1        | 6,296                         | 6,374         |              |
| min                                        | 20.0                    | 16.9                     | 20.0            | 42.9               | 27.5        | 42.3        | 245                           | 224           | -36.7        |
| max                                        | 209.5                   | 370.3                    | 209.5           | 196.8              | 229.4       | 151.9       | 23,673                        | 33,913        | 108.0        |

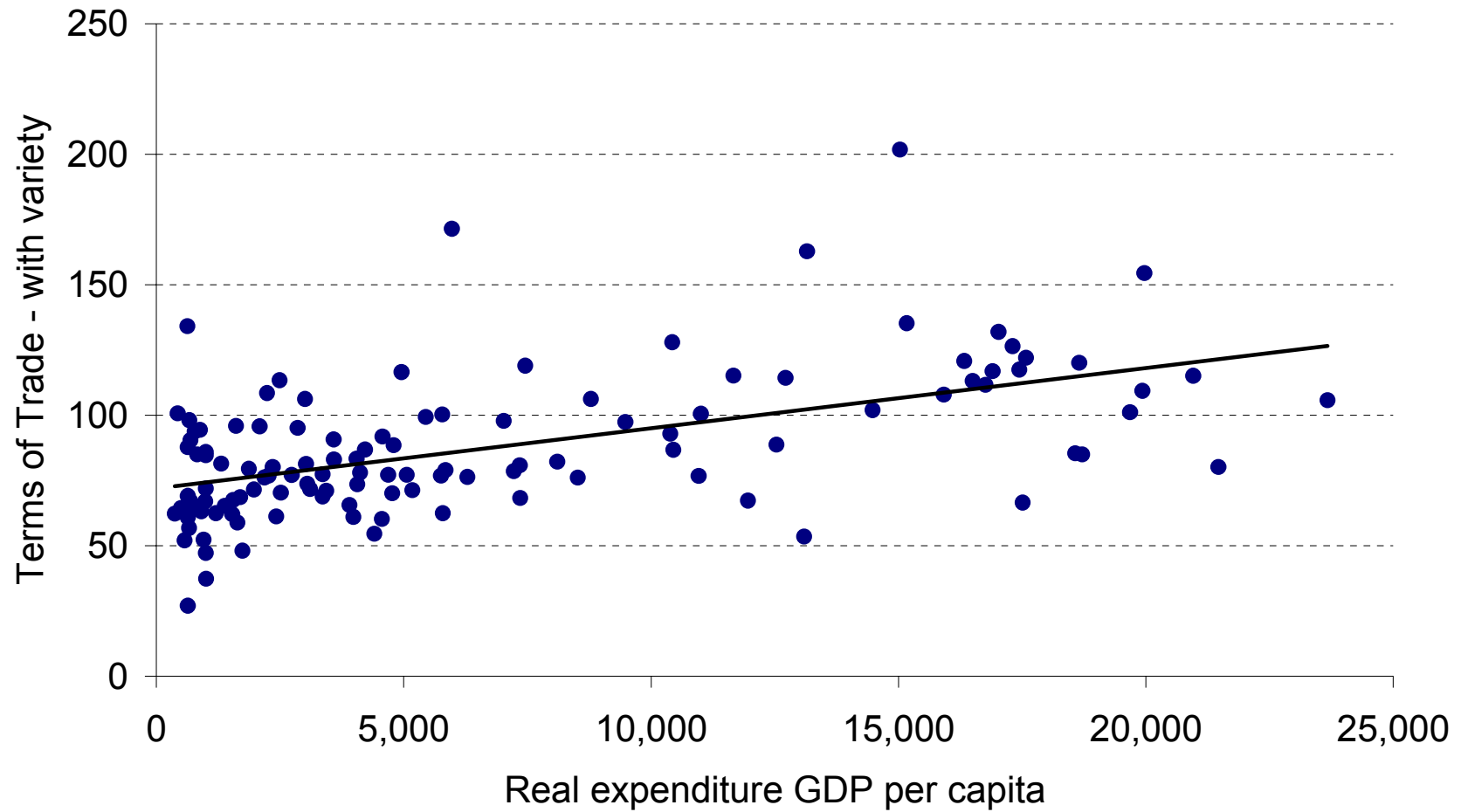
## Real GDP<sup>e</sup> versus real GDP<sup>o</sup>



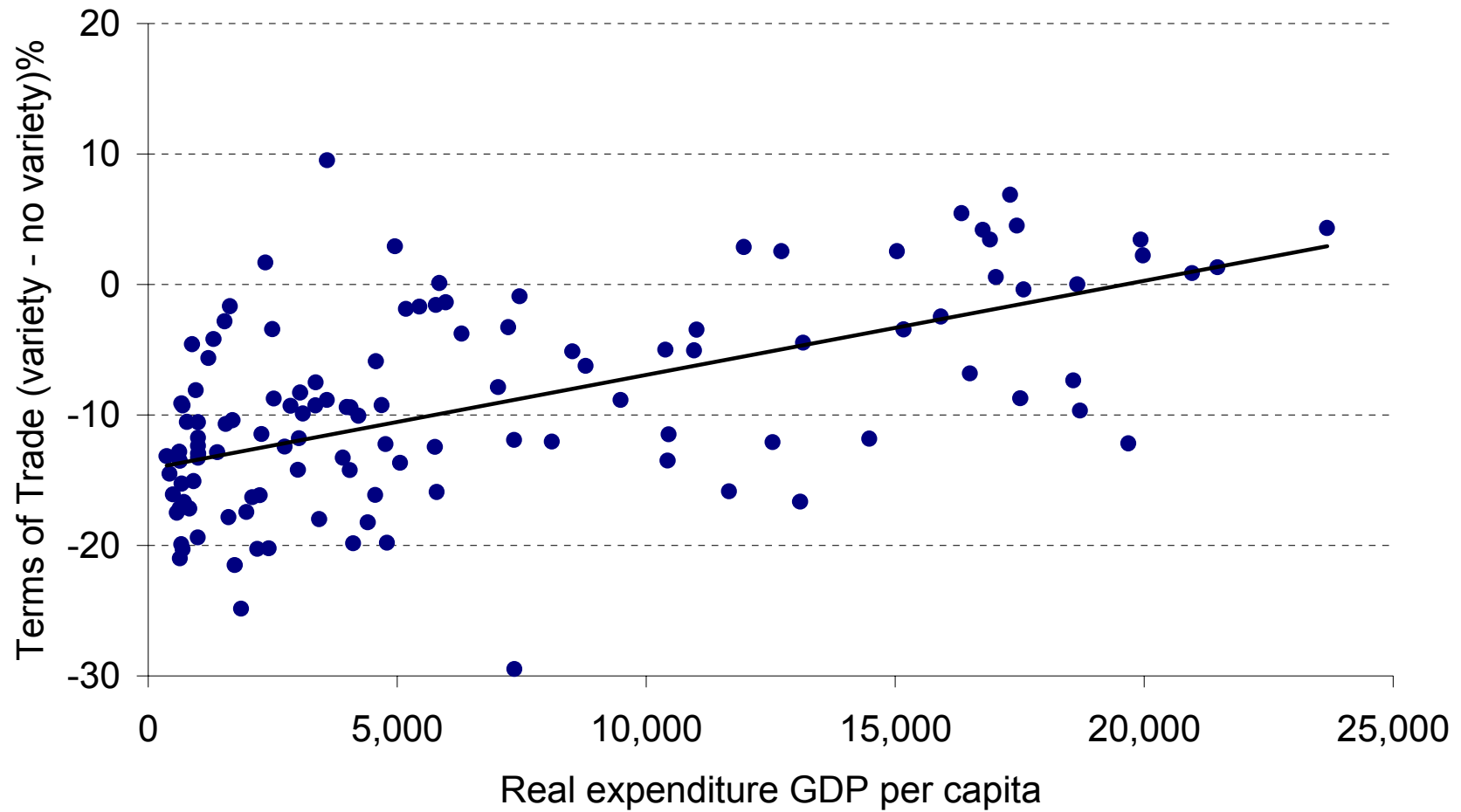
## Terms of Trade for Non-oil exporters (no variety correction):



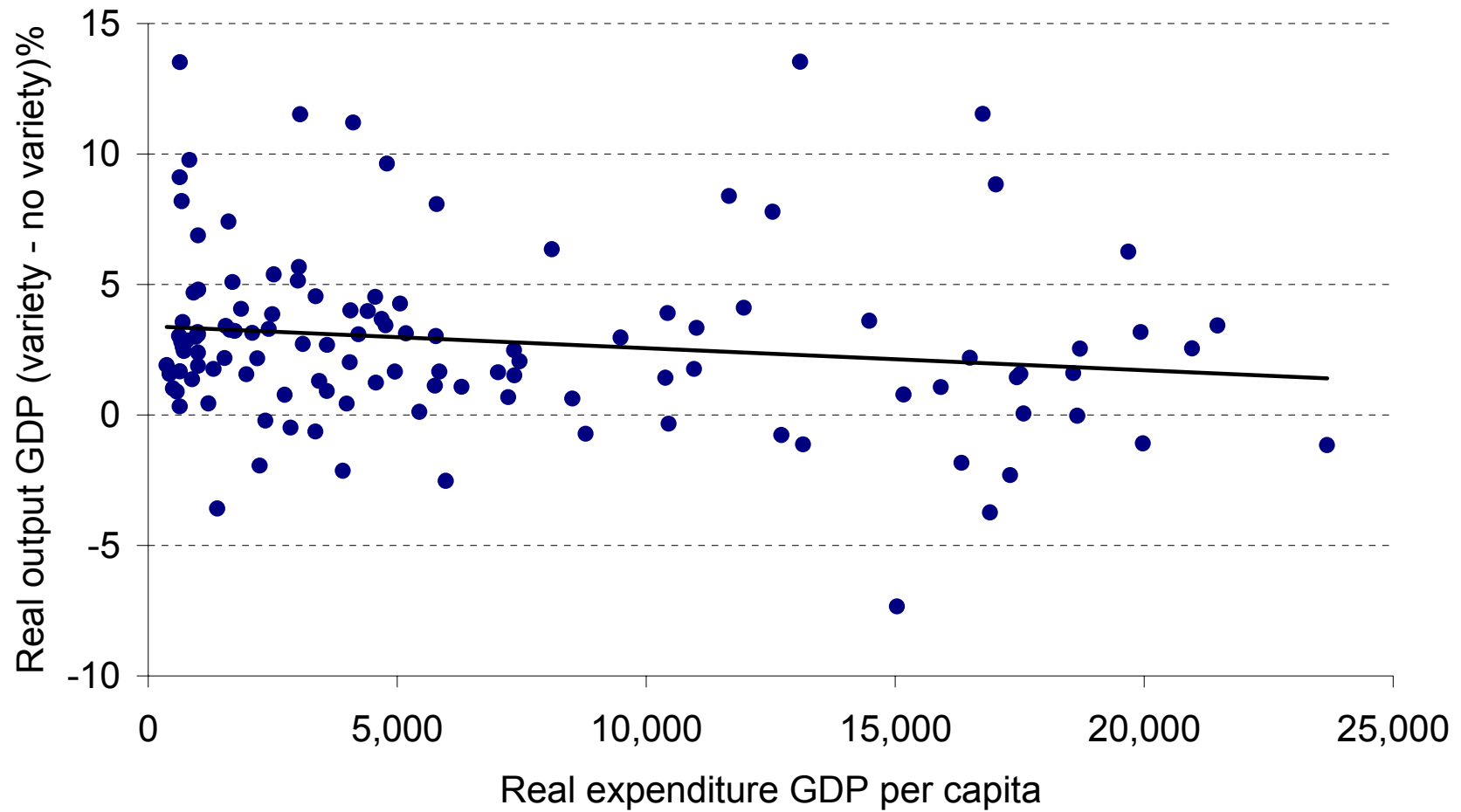
## Terms of Trade for Non-oil exporters (with variety correction):



## Terms of Trade for Non-oil exporters (variety – no variety)%



## Real output GDP for Non-oil exporters (variety – no variety)%

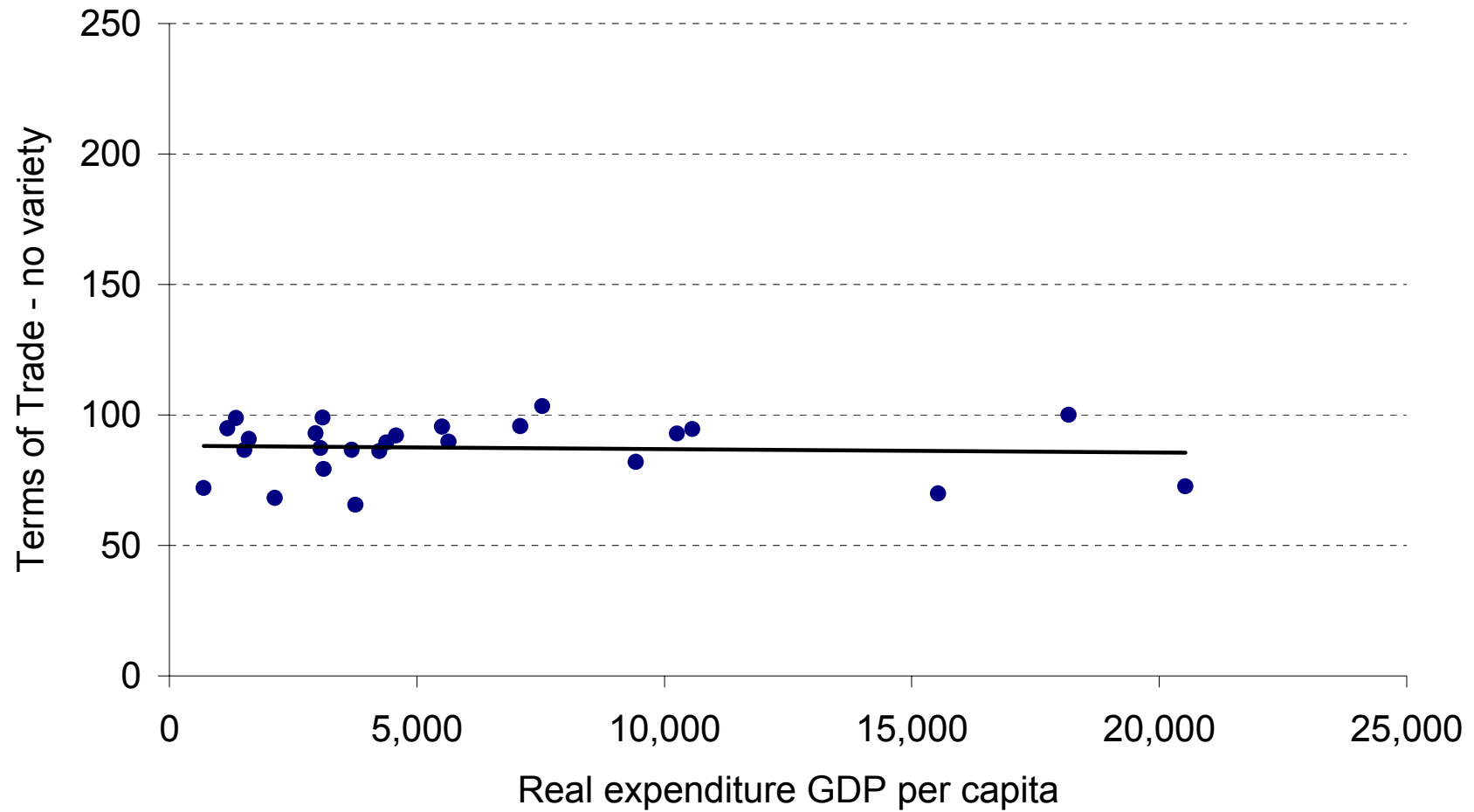


## Conclude:

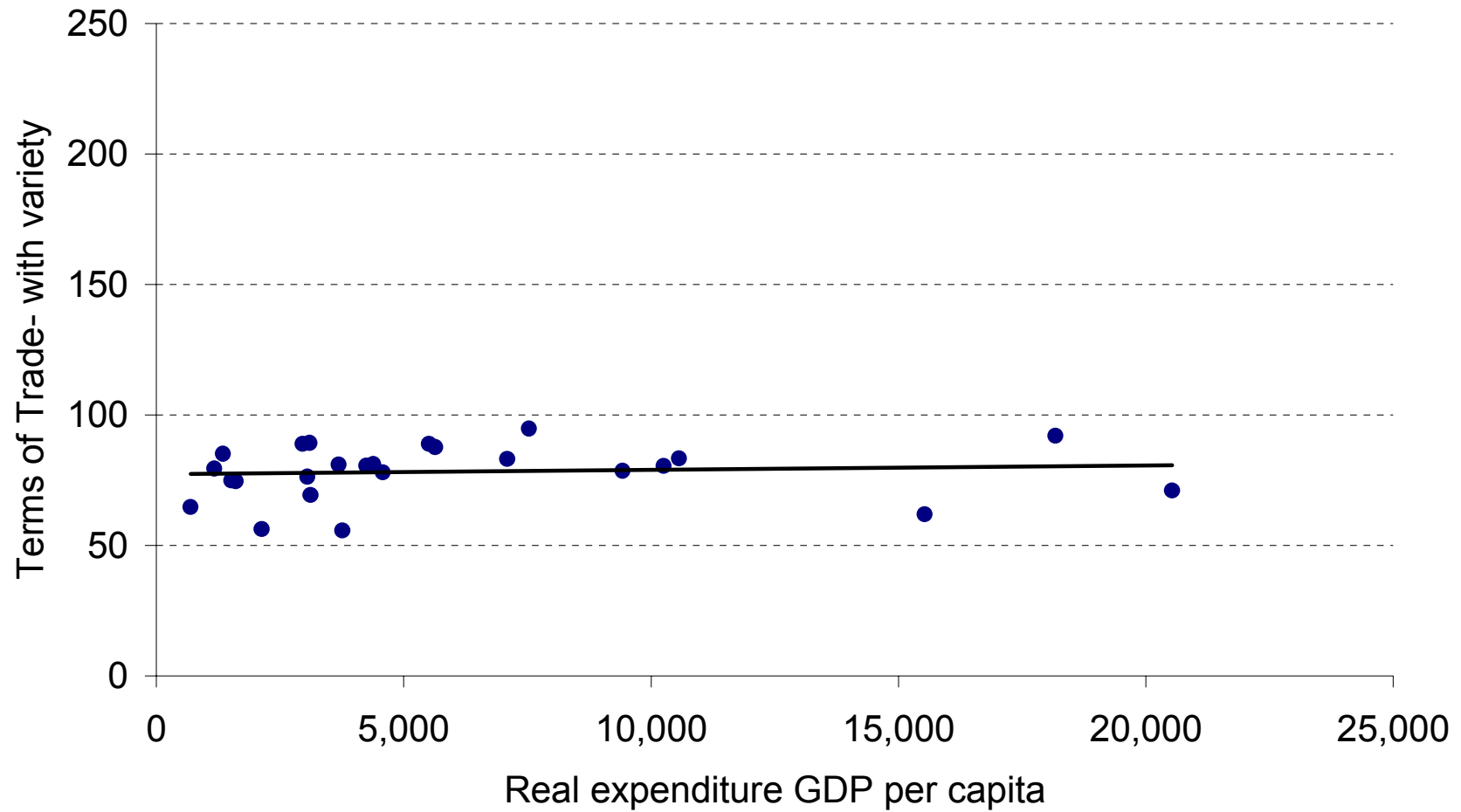
- Wealthier non-oil exporters tend to have *better terms of trade*, which is driven especially by better export prices.
- This tendency is *amplified* by the inclusion of export and import variety (both of which grow with income)
- As a result, the wealthier countries are obtaining somewhat *more* of real expenditure  $GDP^e$  from trading opportunities, *less* from productivity.
- Conversely, the poorer countries are obtaining somewhat *less* of real expenditure  $GDP^e$  from trading opportunities, *more* from productivity.

**What about for oil exporters? ( $\sigma \approx 10$  or  $100$ )**

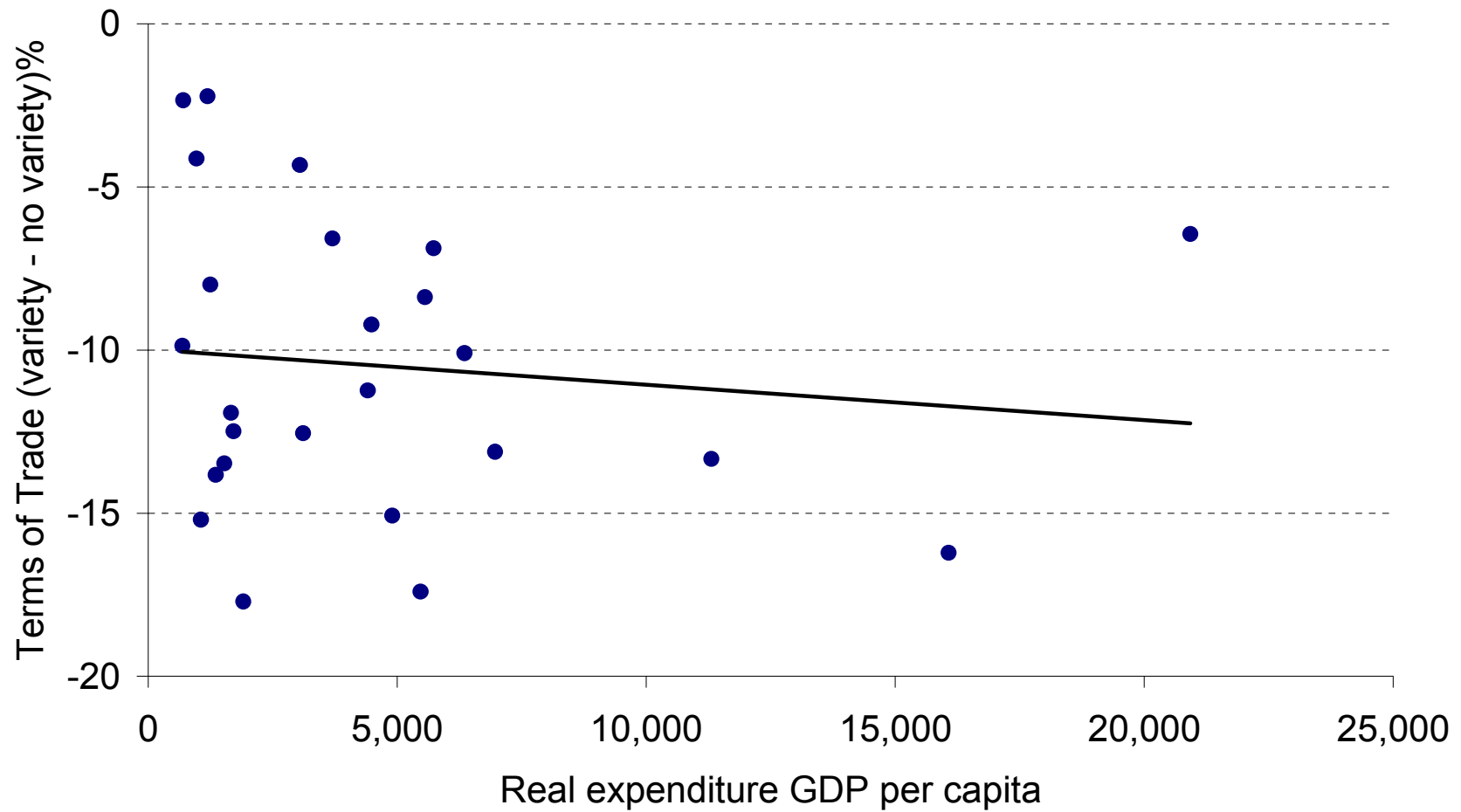
## Terms of Trade for Oil exporters (no variety correction):



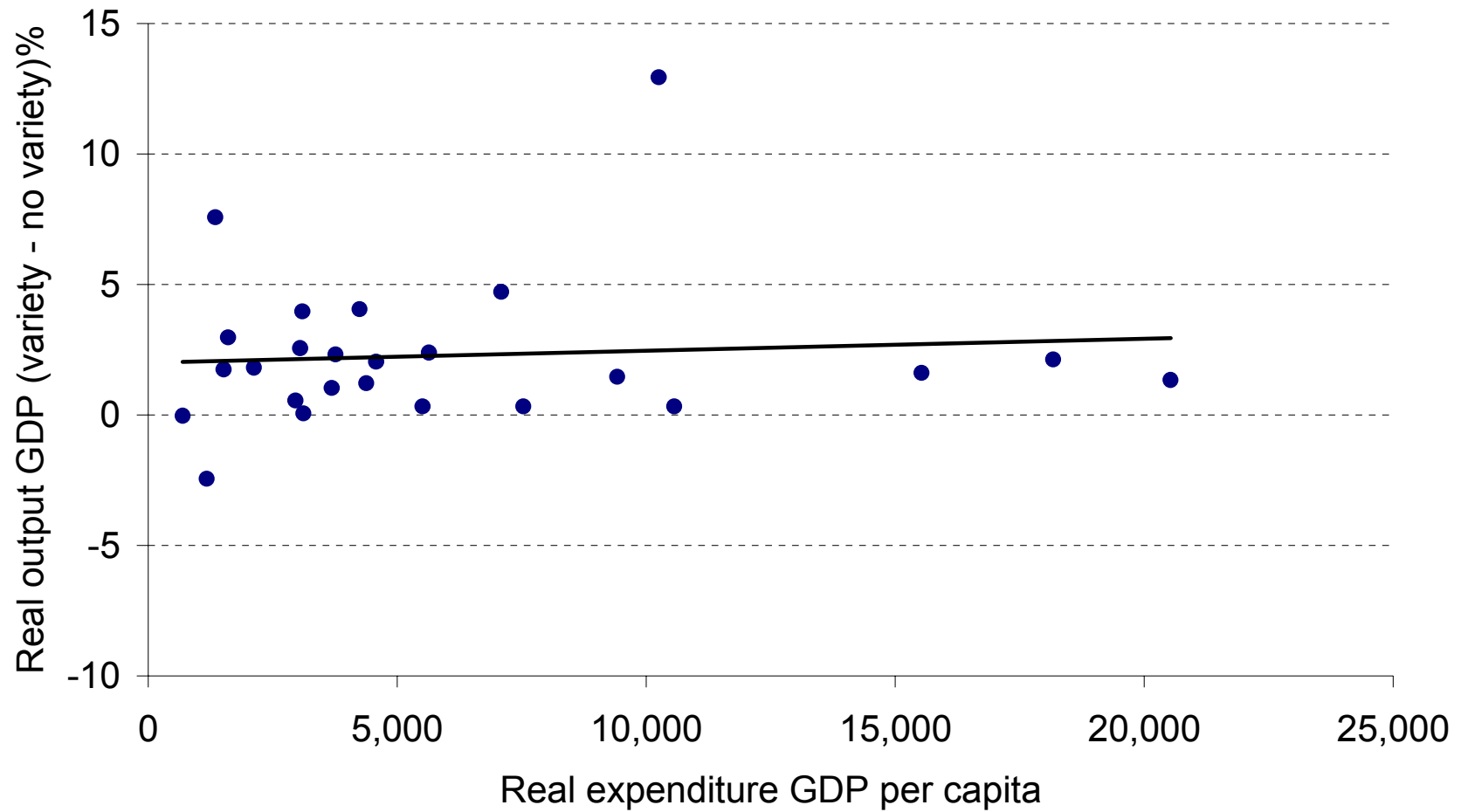
## Terms of Trade for Oil exporters (with variety correction):



## Terms of Trade for Oil exporters (variety – no variety)%



## Real output GDP<sup>0</sup> for Oil exporters (variety – no variety)%



## Conclude:

- Wealthier non-oil exporters tend to have *better terms of trade*, which is driven especially by better export prices.
- This tendency is *amplified* by the inclusion of export and import variety (both of which grow with income)
- As a result, the wealthier countries are obtaining somewhat *more* of real expenditure  $GDP^e$  from trading opportunities, *less* from productivity.
- Conversely, the poorer countries are obtaining somewhat *less* of real expenditure  $GDP^e$  from trading opportunities, *more* from productivity.
- Little impact of variety correction on oil exporters.

## Extensions

1. Obtain a true measure of the gains from trade:
  - Can use time-series growth in import and export extensive margins (like Broda and Weinstein for the United States)
  - Allow for “flexible weight” indexes, where the production and consumption quantities *respond* to the reference prices

Neary, Peter, 2004, “Rationalizing the Penn World Tables: True Multilateral Indices for International Comparisons of Real Income,” *American Economic Review*, 94(5), December, 1411-1428.

2. Reconcile differences between time-series and cross-country extensive margins (like in the South Korea example from Kei-mu Yi)
3. Correct the unit-value in trade for the *quality of products*!