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Hinlopen, J.; van Marrewijk, C.

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# Comparative advantage, the rank-size rule, and Zipf's law<sup>1</sup>

Jeroen Hinloopen<sup>2</sup>

*Universiteit van Amsterdam and Katholieke Universiteit Leuven*

Charles van Marrewijk<sup>3</sup>

*University Utrecht*

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## **Abstract**

Using a comprehensive international trade data set we investigate empirical regularities known as Zipf's Law or the rank-size rule for the distribution of the interaction between countries as measured by revealed comparative advantage. Using the recently developed estimator by Gabaix and Ibragimov (2007) we find strong evidence in favor of the rank-size rule along the time, country, and sector dimension for three different levels of data aggregation. The estimated Pareto exponents that characterize the distribution of revealed comparative advantage are stable over time but differ across countries and sectors. These differences are related empirically to country and sector characteristics, including population size, GDP, and factor intensities.

**Keywords:** Revealed comparative advantage, Balassa index, rank-size rule, Zipf's Law, power law, Pareto distribution

**JEL codes:** C13, C33, F11, O50, R12

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<sup>2</sup> Corresponding author. Correspondence: University of Amsterdam, FEB/ASE, Roetersstraat 11, 1018 WB Amsterdam, The Netherlands; [J.Hinloopen@uva.nl](mailto:J.Hinloopen@uva.nl); [www.fee.uva.nl/io/jhinloopen](http://www.fee.uva.nl/io/jhinloopen).

<sup>3</sup> Correspondence: Utrecht School of Economics, Utrecht University, Janskerkhof 12, 3512 BL Utrecht, The Netherlands; [J.G.M.vanMarrewijk@uu.nl](mailto:J.G.M.vanMarrewijk@uu.nl); [www.charlesvanmarrewijk.nl](http://www.charlesvanmarrewijk.nl).

“No phenomenon is a phenomenon until it is an observed phenomenon”

Niels Bohr

## 1. Introduction

It is often the revelation of empirical regularities that leads to the development of new theories. For instance, Frank Auerbach’s observation that city sizes are distributed regularly has led to the development of a body of literature that explains this observed pattern (Nitsch, 2005), the observation by Jan Tinbergen that gravity laws empirically rule international trade patterns initiated a literature that grasps the economics behind the “gravity equation” (Frankel, 1998), and Robert Engle’s observation that in many time series the variance changes over time triggered several theories that explain this observed conditional heteroskedasticity (Semmler, 1994).

In this paper a new empirical regularity is documented: the obedience of revealed comparative advantage to the rank-size rule. The notion of revealed comparative advantage was first introduced by Liesner (1958) and operationalized by Balassa (1965) with his concomitant index. The latter is defined as a country’s exports in some sector as a fraction of national exports, divided by world exports in that sector as a fraction of world exports. Whenever the Balassa index exceeds unity, a comparative advantage is ‘revealed’ for the particular country in the particular sector. On average about one third of all sectors display such a revealed comparative advantage, although this percentage varies considerably across countries (Hinloopen and van Marrewijk, 2001).

The rank-size rule holds if a log-linear relationship exists between the value of some phenomenon and its rank in the related sample. In the special case of a slope equal to one the rank-size rule is labeled “Zipf’s law”, named after the Harvard linguistic professor George Kingsley Zipf (Zipf, 1949). In this paper we carefully document the fact that the rank-size rule applies whenever a comparative advantage is revealed by the Balassa index, and that in a substantial, but minority, of cases Zipf’s law holds. Our analysis is based on a comprehensive data set that is obtained by merging two sets obtained from the Center for International Data at the University of California, Davis (see Feenstra *et al.*, 1997, and Feenstra, 2000). It consists in particular of observations on bilateral trade flows for 747 4-digit sectors, 166 countries, covering the years 1970 through 1997, yielding a total of slightly less than 18.4 million positive observations. This allows for a thorough and systematic empirical analysis of the observed phenomenon along three different dimensions: over time, across countries, and across sectors.

Although applications of the rank-size rule abound, this paper deviates from the existing empirical literature in three main respects. First, countries rather than cities are our unit of observation. In this respect we follow Rose (2005) who argues that the size distribution of

countries is similar to that for cities.<sup>4</sup> Second, the distribution of the interaction between economic centers rather than the size distribution as such is our focus of analysis. The innovation here is to use the empirical notion of revealed comparative advantage for capturing the interaction between countries rather than the commonly used gravity equation. Third, we use the estimation procedure recently introduced by Gabaix and Ibragimov (2007) for estimating the Pareto exponent in the rank-size rule equation, as this procedure eliminates the bias inherent to traditional estimators.

We find strong evidence in favor of the rank-size rule for international trade flows that reflect a comparative advantage. Although we focus on reporting the estimates of the Pareto exponents of the Balassa index distribution, some further empirical explorations suggest that these exponents are systematically related to country-specific characteristics and that they differ systematically across sectors in case these are grouped according to factor-intensities. Borrowing the words of Rose (2005, p. 11), these findings add to what amounts to be “an intriguing puzzle for future theoretical work.”

The remainder of the paper is organized as follows. Section 2 briefly reviews the rank-size rule and its application to the Balassa index. Section 3 discusses some estimation issues. Section 4 contains our empirical findings regarding the applicability of the rank-size rule (and, in particular, Zipf’s law) to revealed comparative advantage. Section 5 discusses these findings and presents some further empirical explanations. Section 6 concludes.

## 2. The rank-size rule and comparative advantage

The rank-size rule states that the frequency of occurrence of some event  $P$  as a function of the concomitant rank  $i$  that follows from this frequency is a power-law function:  $P_i \sim 1/i^\phi$ . This means that the distribution of the event is approximately Pareto. In case  $\phi$  equals one the rank-size rule is referred to as Zipf’s law. Phenomena in economics and finance abound which exhibit the implied heavy-tailedness in the data (i.e.  $\phi > 0$ ), see e.g. Mandelbrot (1963), Janssen and de Vries (1991), Gabaix (1999), Gabaix *et al.* (2003), Axtell (2001), and Nitsch (2005).

It appears that revealed comparative advantage also complies to the rank-size rule. The concept of revealed comparative advantage is widely used empirically to identify a country’s weak and strong export sectors (for recent applications see e.g. Porter (1990), Amiti (1999), Fertö and Hubbard (2003), or Svaleryd and Vlachos, 2005). In particular, let  $X_{i,t}^j$  be the value of exports from country  $i \in I$  for sector  $j \in J$  in period  $t \in T$ . Then  $X_{i,t} = \sum_j X_{i,t}^j$  is the

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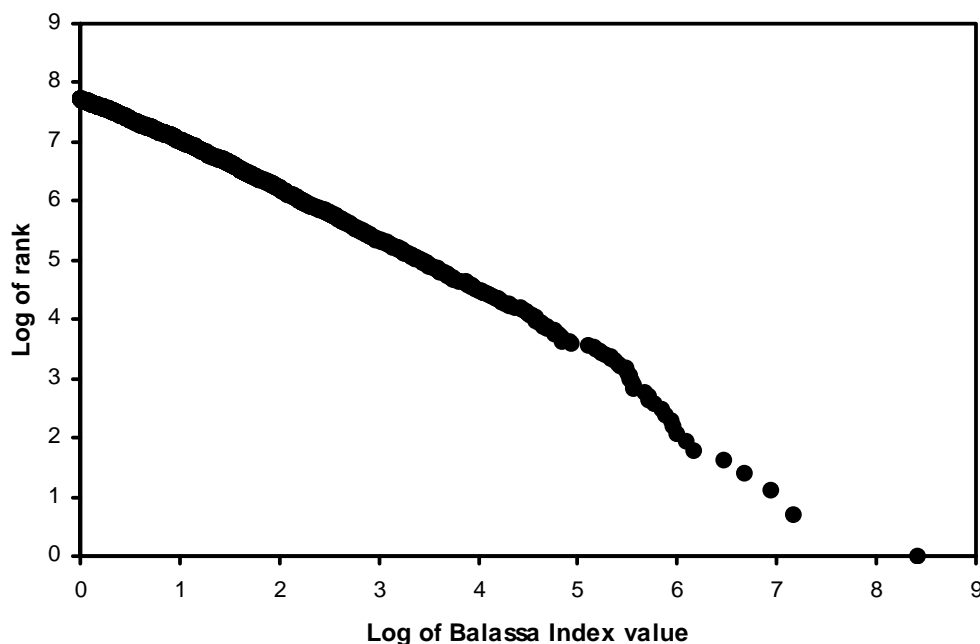
<sup>4</sup> See also Okuyama, Takayasu, and Takayasu (1999) and Axtell (2001) for similar evidence regarding firm size distributions.

value of exports from country  $i$  in period  $t$ ,  $X_t^j = \sum_i X_{i,t}^j$  is the total value of exports for sector  $j$  in period  $t$ ,  $X_t = \sum_i \sum_j X_{i,t}^j$  is the total value of exports for all countries and sectors in that period, and the Balassa index for country  $i$  and sector  $j$  in period  $t$  is defined as:

$$(1) \quad B_{i,t}^j = \frac{X_{i,t}^j / X_{i,t}}{X_t^j / X_t}, \quad i \in I, j \in J, t \in T.$$

If  $B_{i,t}^j > 1$ , country  $i$  is said to have a revealed comparative advantage in the production of commodity  $j$  in time period  $t$  as its export share for product  $j$  is larger than the concomitant export share in the group of reference countries  $I$ .<sup>5</sup>

Figure 1. Empirical relation between the Balassa index of revealed comparative advantage and the related rank. The Figure is based on 1% randomly drawn Balassa index values from the entire sample of 221,430 observations.



In Figure 1 the log of the Balassa index is plotted against the log of the concomitant rank (the figure is constructed using a random sample of 1,000 observations; appendix A contains the description of the data used throughout the paper), whereby the largest Balassa index value is given rank 1. This picture serves as a first illustration that the rank-size rule applies to the

<sup>5</sup> Hillman (1980) identifies a sufficient condition for the Balassa index to measure comparative advantage proper in that an increase in exports yields an increase in the Balassa index. Throughout the paper the analysis is restricted to those observations that meet this “Hillman condition”, which amounts to disregarding 0.25% of all observations (see Hinloopen and Van Marrewijk (2008) for further details).

upper tail of the empirical distribution of Balassa index values. Indeed, observations with a Balassa index above unity are grouped almost perfectly on a straight line. It is precisely these observations that reveal a comparative advantage.

Whether or not Zipf's law holds in particular has been of interest in the related literature on city size distributions and, recently, the size distribution of firms (Luttmer, 2005, Melitz, 2003). Meanwhile the applicability of the rank-size rule to city-size distributions is undisputed but to date there is no agreement as to the particular validity of Zipf's law. Some argue that the Pareto exponent does not assume unity quite regularly (Rosen and Resnick (1980), Brakman, Garretsen, and van Marrewijk (2001), and Soo, 2005), others stress that in most studies the hypothesis that the estimated Pareto exponent equals one cannot be rejected (Krugman (1996), Gabaix (1999), and Gabaix and Ioannides, 2004). Given the scope of our dataset we are quite confident that our findings regarding the applicability of the rank-size rule and, in particular, Zipf's law, to revealed comparative advantage, are representative for the underlying mechanisms.

### 3. Estimating a power-law coefficient

The two most commonly used methods for estimating the Pareto exponent  $\phi$  are OLS (often referred to as the *Zipf regression*) and employing the *Hill estimator* (Hill (1975), see also Gabaix and Ioannides, 2004). For large sample sizes the estimated Pareto exponent in the Zipf regression tends with probability one to the true value of  $\phi$ . For small samples, however, the estimate is biased and inefficient. Moreover, the reported standard errors grossly underestimate the true standard errors. Alternatively, under the null hypothesis of a perfect power law, the Hill estimator is the maximum likelihood estimator of  $\phi$ . But the properties of the Hill estimator in finite samples are also worrisome as the bias can be very high in small samples and the associated computed standard errors considerably underestimate the true standard errors as a result of this bias. As the rate of convergence can be arbitrary slow (Embrechts *et al.*, 1997) the estimator also requires very large samples sizes. Moreover, the choice as to the number of order statistics to be included is problematic in view of the bias – variance tradeoff (see Beirlant *et al.* (2004) and the citations therein).

Various estimators have been developed to address these issues, but these have not led to a consensus solution of the problem (see e.g. Embrechts *et al.*, 1997, Beirlant *et al.*, 1999, and Feuerverger and Hall, 1999). Recently however Gabaix and Ibragimov (2007) provide an elegant and effective solution for the estimation of Pareto exponents: an unbiased estimate is obtained when using OLS in:

$$(2) \quad \ln\left(\text{rank} - \frac{1}{2}\right) = a - b \ln(\text{size}).$$

Accordingly, all that is needed is to shift the rank by  $\frac{1}{2}$ . Gabaix and Ibragimov (2007) show further that the standard error of the so-estimated Pareto exponent is asymptotically equal to  $\sqrt{(2/n)}b$ . Also, using OLS in (2) is more robust to deviations from the exact power law formulation (in the sense of Hall, 1982) than is the Hill estimator (see also Ibragimov and Phillips (2004), and Phillips, 2007).

However, given that routine data typically carry up to 10 percent contamination (Hampel *et al.*, 1986) OLS estimates in (2) are likely to be biased. This calls for including as many observations as possible as Gabaix and Ibragimov (2007) show that this bias is inversely related with the sample size. Accordingly, we employ as low as possible a cut-off value for identifying sectors with a revealed comparative advantage. That is, include all observations with a Balassa index of at least one. By doing so we also split the sample at a theoretically meaningful point: include all observations that relate to a revealed comparative advantage.

In sum, we report only the Gabaix-Ibragimov estimates and their associated standard errors for all observations that reveal a comparative advantage.<sup>6</sup>

#### 4. Empirical results

Since the Balassa index carries three dimensions (time, country, and sector), we can empirically investigate the size of the Pareto exponent for these three dimensions. *Zipf's law* is said to apply in the particular dimension if the estimated slope coefficient of equation (2) does not differ significantly from unity; in all other cases the *rank-size rule* is said to apply given that the estimated coefficient is statistically significant. Observe that there is a sub-dimension for the Balassa index with respect to the degree of data aggregation. After eliminating erroneously classified observations, our data set effectively distinguishes 66 2-digit sectors, 225 3-digit sectors, and 419 4-digit sectors (see Appendix A).<sup>7</sup> All three identified dimensions are thus considered at three different levels of data aggregation.

##### 4.1 Dimension I: time

To examine the applicability of the rank-size rule along the time dimension of revealed comparative advantage the following equation is estimated for all Balassa index values above unity:

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<sup>6</sup> In all cases we also calculated the Zipf regression and the Hill estimator. These are available from the authors upon request.

<sup>7</sup> To be included an observation (i) has a related export value of at least 5,000 US \$, (ii) meets the Hillman condition, and (iii) is at least one. Further, regressions with 10 or fewer observations were dismissed. The smallest number of observations for any regression is 47.

$$(3) \quad \ln \left[ \text{rank}(BI_{i,t}^j) - \frac{1}{2} \right] = \alpha_{0,t} + \alpha_{1,t} \ln[B I_{i,t}^j], \quad t = 1970, \Lambda, 1997.$$

Table 1 contains the summary statistics for the several per-year estimates (details of the estimates for all individual years are listed in Table B1 in Appendix B), and the pooled regression whereby all years are taken together. The estimated Pareto exponents vary little per year and the goodness-of-fit is very high. At the 3-digit level, for example, the estimates range from 0.896 to 0.981 and the goodness-of-fit is between 98.3 and 99.4 per cent.

Table 1. Pooled Gabaix-Ibragimov regression of the slope parameter in (3) and summary statistics based on the 28 concomitant per-year estimates.

|                        | 2-digit | 3-digit | 4-digit |
|------------------------|---------|---------|---------|
| average                | 0.958   | 0.930   | 0.870   |
| median                 | 0.949   | 0.922   | 0.860   |
| stand. dev.            | 0.043   | 0.025   | 0.020   |
| min                    | 0.882   | 0.896   | 0.849   |
| max                    | 1.031   | 0.981   | 0.915   |
| average # observations | 1,911   | 5,080   | 7,908   |
| pooled                 | 0.955   | 0.928   | 0.869   |
| $\bar{R}^2$            | 0.968   | 0.991   | 0.991   |
| # observations         | 53,503  | 142,231 | 221,430 |

The distribution of the slope estimates is illustrated in Figure 2. Note that all estimated slope coefficients are highly statistically significant and that in all years the goodness-of-fit indicator is very high, especially for estimates at the 2- and 3-digit level of data aggregation.<sup>8</sup> We thus conclude:<sup>9</sup>

### Empirical result 1

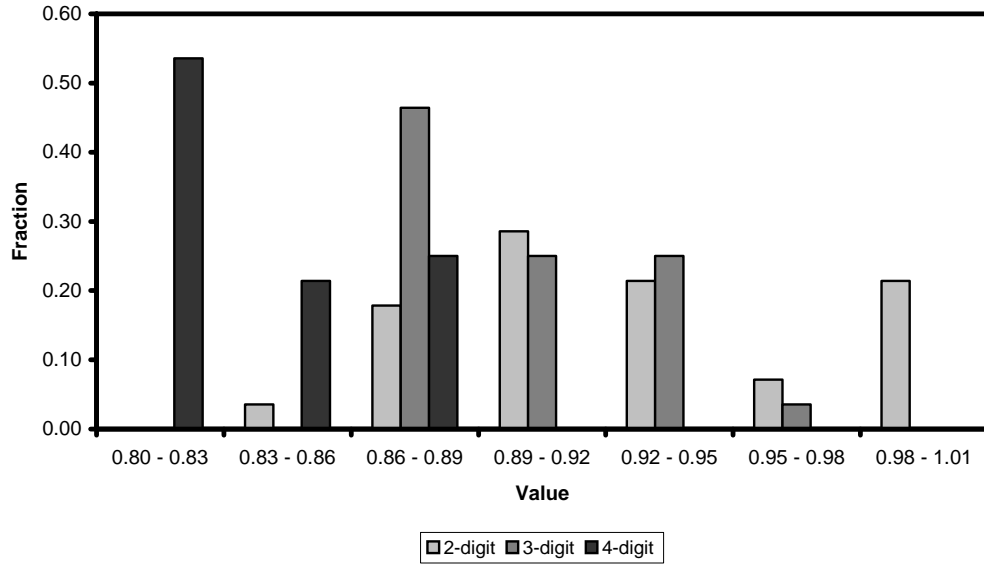
The distribution of revealed comparative advantage for the years 1970 through 1997 as measured with the Balassa index at either the 2-digit, 3-digit, or 4-digit level of data aggregation follows the rank-size rule, whereby for the respective levels of data aggregation the mean estimated power coefficient is 0.96 (0.04), 0.93 (0.03), and 0.87 (0.02).

<sup>8</sup> An obvious additional test for examining the validity of the linearity of the relationship is to include a quadratic term in (2), as in Black and Henderson (2003). However, as illustrated by Gabaix and Ioannides (2004), it is very likely that the estimated coefficient of this quadratic term will turn out to be statistically significant in situations where the underlying data are obtained from a data generating process that is known to comply perfectly to Zipf's law.

<sup>9</sup> The number in brackets are the standard deviation of the several estimates.



Figure 2. Distribution of the estimated per-year slope coefficients at the 2-digit, 3-digit, and 4-digit level of data aggregation.



To examine whether Zipf's law applies in particular a *t*-test is conducted, which leads to:

### Empirical result 2

The distribution of revealed comparative advantage for the years 1970 through 1997 as measured with the Balassa index at either the 2-digit, 3-digit, or 4-digit level of data aggregation follows Zipf's law in, respectively, 69%, 24% and 0% of all sample years.

### 4.2 Dimension II: country

The country dimension is captured by the following equation:

$$(4) \quad \ln \left[ \text{rank}(BI_{i,t}^j) - \frac{1}{2} \right] = \beta_{0,i} + \beta_{1,i} \ln [BI_{i,t}^j], \quad i = 1, \Lambda, 166.$$

Table 2 provides summary statistics of the related estimates for the different levels of aggregation whereas details of the individual estimates for the 166 countries are in Table A2 in Appendix B.

Table 2. Summary statistics of the 166 per-country Gabaix-Ibragimov estimates of the slope parameter in (4).

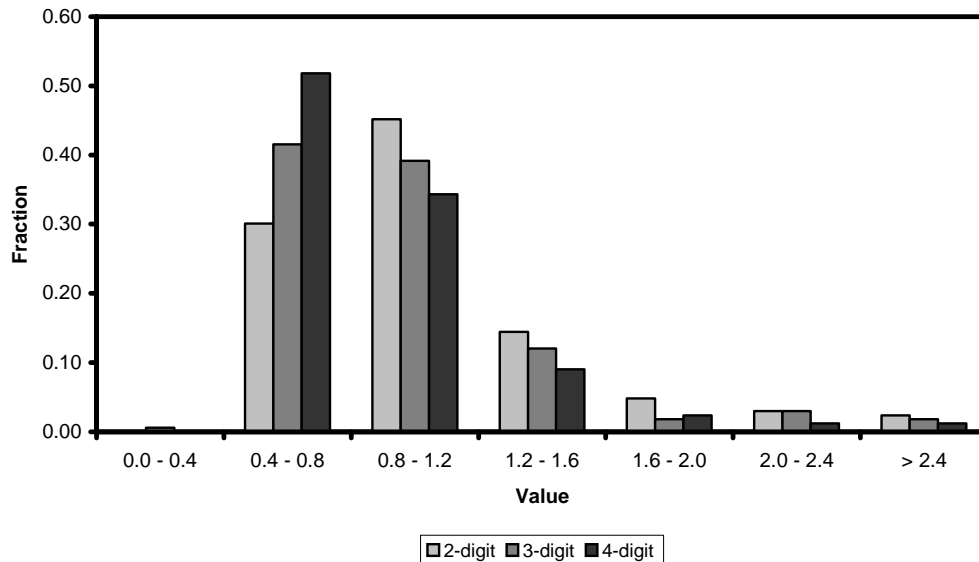
|                        | 2-digit | 3-digit | 4-digit |
|------------------------|---------|---------|---------|
| average                | 1.048   | 0.964   | 0.890   |
| median                 | 0.939   | 0.839   | 0.790   |
| stand. dev.            | 0.474   | 0.432   | 0.386   |
| min                    | 0.498   | 0.366   | 0.444   |
| max                    | 3.710   | 3.326   | 2.948   |
| average # observations | 322     | 857     | 1,334   |

All estimated slope coefficients are statistically significant, and in almost all cases the goodness-of-fit is very high (the median value of the latter is 89.5, 92.7, and 94.2 per cent at the 2-digit, 3-digit, and 4-digit level, respectively). Hence:

### Empirical result 3

The distribution of revealed comparative advantage for the 166 sample countries as measured with the Balassa index at either the 2-digit, 3-digit, or 4-digit level of data aggregation follows the rank-size rule, whereby for the respective levels of data aggregation the mean estimated power coefficient is 1.05 (0.47), 0.96 (0.43), and 0.89 (0.39).

Figure 3. Distribution of the estimated per-country slope coefficients at the 2-digit, 3-digit, and 4-digit level of data aggregation.



As is clear from Table 2 and illustrated in Figure 3, the estimated Pareto exponents vary considerably between countries. At the 3-digit level, for example, the maximum estimate of 3.326 for Germany is almost ten times as high as the minimum estimate of 0.366 for Comoros. Although the goodness-of-fit also varies more than before, in all cases the explanatory power remains high.<sup>10</sup> This suggests that an individual country exhibits its own characteristic distribution of revealed comparative advantage which might be related to country factors (an issue taken up further in Section 5 below). Finally, considering the *t*-tests for examining whether or not Zipf's law applies leads us to observe:

#### Empirical result 4

The distribution of revealed comparative advantage for the 166 sample countries as measured with the Balassa index at either the 2-digit, 3-digit, or 4-digit level of data aggregation follows Zipf's law in, respectively, 38%, 20% and 13% of all cases.

#### 4.3 Dimension III: sectors

The sector dimension is examined with the following equation:

$$(5) \quad \ln \left[ \text{rank}(BI_{i,t}^j) - \frac{1}{2} \right] = \gamma_0^j + \gamma_0^j \ln [BI_{i,t}^j], \quad j = 1, \Lambda, J,$$

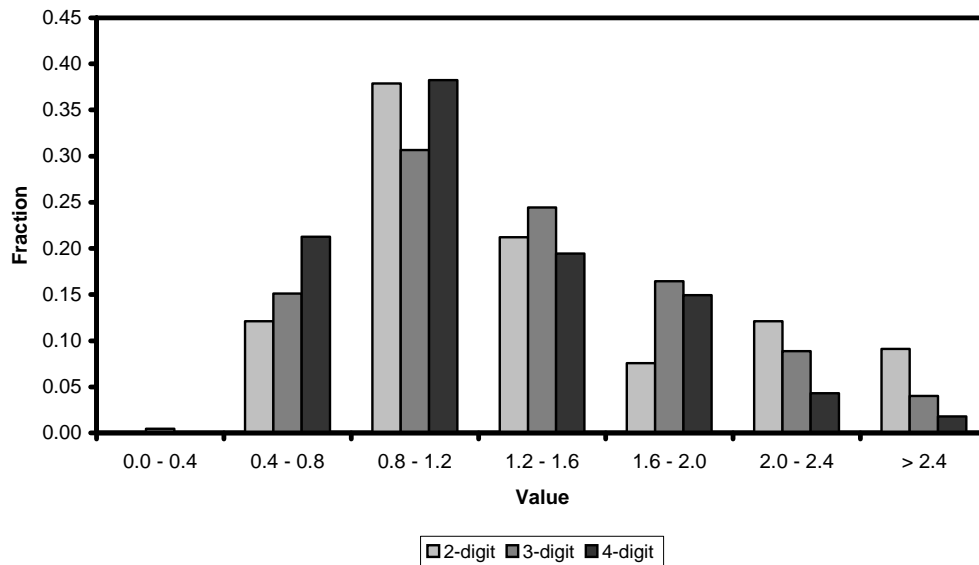
whereby *J* refers to the number of sectors for the particular level of data aggregation. At the 2-digit level there are 66 different sectors, at the 3-digit level 225 sectors are distinguished, and 419 sectors are identified at the 4-digit level. Table 3 provides the summary statistics for the sector estimates and Table B3 in Appendix B contains the details of all sector estimates separately. Figure 4 illustrates the distribution of the estimated sector exponents.

Table 3. Summary statistics of the 66 2-digit, the 225 3-digit sectors, and the 419 4-digit per-sector Gabaix-Ibragimov estimates of the slope parameter in (5).

|                        | 2-digit | 3-digit | 4-digit |
|------------------------|---------|---------|---------|
| average                | 1.411   | 1.347   | 1.198   |
| median                 | 1.225   | 1.253   | 1.101   |
| stand. dev.            | 0.618   | 0.542   | 0.469   |
| min                    | 0.646   | 0.394   | 0.415   |
| max                    | 3.113   | 3.420   | 3.282   |
| average # observations | 811     | 632     | 528     |

<sup>10</sup> This holds *a fortiori* if the number of observations is taken into account; on average a relatively low goodness-of-fit is related to a limited number of observations. For instance, the regression for Germany is based on 2,942 observations while the estimate for Comoros uses 142 observation only (Table B2).

Figure 4. Distribution of the estimated per-sector slope coefficients at the 2-digit, 3-digit, and 4-digit level of data aggregation.



We arrive at similar conclusions as for the country dimension. The estimated Pareto exponents vary considerably between sectors even for the same level of data aggregation. At the 3-digit level, for instance, the minimum estimate is 0.394 for sector 264 (“jute and other textile bast fibres, nes, raw/processed”) and the maximum estimate is 3.420 for sector 784 (“parts and accessories of 722, 781, 782, 783 [relating to motor vehicles]”). Further, the goodness-of-fit for the individual estimates remains high: the median is 94.3, 94.9, and 94.7 per cent at the 2-digit, 3-digit, and 4-digit level, respectively. We thus conclude:

### Empirical result 5

The distribution of revealed comparative advantage for the 66 2-digit sectors, the 225 3-digit sectors, and the 419 4-digit sectors as measured with the Balassa index follows the rank-size rule, whereby for the respective levels of data aggregation the mean estimated power coefficient is 1.40 (0.62), 1.34 (0.54) and 1.20 (0.47).

The considerable variation across sectors in the estimated power-law coefficients is also examined further in Section 5 below. For now we observe that for a substantial number of sectors Zipf’s law applies:

## Empirical result 6

The distribution of revealed comparative advantage for the 66 2-digit sectors, the 225 3-digit sectors, and the 419 4-digit sectors as measured with the Balassa index follows Zipf's law in, respectively, 16%, 17% and 26% of all cases.

## 5. Discussion

We thus far have seen that revealed comparative advantage always complies to the rank-size rule, and that a modest share of the estimated Pareto exponents does not differ significantly from unity. In addition, the estimated Pareto exponents do not differ from year to year, but they do vary between countries and between sectors.

### 5.1 Characteristics of estimated country exponents

The significant differences in estimated Pareto exponents between countries suggests that these estimates are related to country characteristics. To give further weight to this conjecture we relate the estimated Pareto exponents to country characteristics that can be expected to affect the value of the Balassa index, including country size (measured by GDP and number of inhabitants), export size, openness (exports as a fraction of GDP), and export breadth (measured as the number of sectors in which a comparative advantage is obtained). At the same time, the results in Section 4.1 imply that the estimated power coefficient are stable over time. This leads us to consider the following equation:

$$(6) \quad \gamma_{it} = \beta_i + \beta_t + \beta_1 \gamma_{it-1} + \beta_2 \ln(GDP_{it}) + \beta_3 \ln(POP_{it}) + \beta_4 \ln(EXP_{it}) + \beta_5 \frac{EXP_{it}}{GDP_{it}} + \beta_6 \ln(EXPS_{it}) + \varepsilon_{it},$$

whereby  $\gamma_{it}$  is the estimated value of the power-law exponent for country  $i$  in year  $t$ ,  $\beta_i$  is a country-specific fixed effect,  $\beta_t$  is a time-specific fixed effect,  $POP$  is the population size (measured in 1000 persons),  $EXP$  is the value of exports (measure in 1000 US \$),  $EXPS$  is the number of export sectors, and  $\varepsilon$  is assumed to be *iid* with zero mean and constant variance.<sup>11</sup> However, in (6) the estimated power-law exponent  $\gamma_{it-1}$  depends on  $\beta_i$  which leads to biased estimates. To solve this problem first differences are considered:

$$(7) \quad \begin{aligned} \gamma_{it} - \gamma_{it-1} = & \alpha_t + \beta_1(\gamma_{it-1} - \gamma_{it-2}) + \beta_2(\ln(GDP_{it}) - \ln(GDP_{it-1})) \\ & + \beta_3(\ln(POP_{it}) - \ln(POP_{it-1})) + \beta_4(\ln(EXP_{it}) - \ln(EXP_{it-1})) \\ & + \beta_5 \left( \frac{EXP_{it}}{GDP_{it}} - \frac{EXP_{it-1}}{GDP_{it-1}} \right) + \beta_6(\ln(EXPS_{it}) - \ln(EXPS_{it-1})) + \varepsilon_{it} - \varepsilon_{it-1}, \end{aligned}$$

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<sup>11</sup> See Appendix A for the several data sources.

where  $\alpha_t = \beta_t - \beta_{t-1}$ . This creates yet another problem as  $\gamma_{it-1}$  is correlated with  $\varepsilon_{it-1}$ . Following Anderson and Hsiao (1982) this is restored by using  $\gamma_{it-2}$  as an instrument for  $(\gamma_{it-1} - \gamma_{it-2})$ .

Table 4. Panel estimates for explaining cross country differences in estimated Pareto exponents (6); dependent variable: first differences estimated Pareto exponents.\*

|                              | 2-digit          | 3-digit         | 4-digit         |
|------------------------------|------------------|-----------------|-----------------|
| time fixed effect            | -0.00<br>(0.07)  | 0.04<br>(3.40)  | 0.04<br>(4.02)  |
| lagged power-law coefficient | 0.03<br>(1.48)   | -0.03<br>(4.10) | -0.04<br>(4.59) |
| country size (GDP)           | 0.66<br>(2.59)   | 0.29<br>(4.34)  | 0.21<br>(3.51)  |
| country size (POP)           | 0.10<br>(0.09)   | -0.60<br>(2.22) | -0.30<br>(1.20) |
| export size                  | -0.54<br>(11.09) | -0.04<br>(3.53) | -0.08<br>(8.15) |
| export breadth               | -0.56<br>(8.22)  | 0.08<br>(4.49)  | 0.05<br>(3.35)  |
| openness                     | 345.38<br>(3.57) | 65.42<br>(2.56) | 80.61<br>(3.04) |
| # observations               | 3058             | 3113            | 3100            |
| $\overline{R^2}$             | 0.05             | 0.02            | 0.03            |

\*  $t$ -values are within brackets.

The results of the panel estimates are in Table 4, where the estimated power-law coefficients are from the regressions of Section 4.2.<sup>12</sup> Considering these results prompts two observations. First, although the specification in (7) is not obtained from a formally derived first-order condition, the strong significance of most estimated coefficients does suggest that the cross-country variation of the estimated Pareto exponent is related to country-specific characteristics. Second, at the 3-digit and 4-digit level the estimated panel coefficients are quite comparable. At the 2-digit level the export breadth variable is still significant but with

<sup>12</sup> In total the panel study is based on 13,944 annually estimated Pareto exponents at the country level (namely 28 years  $\times$  166 countries  $\times$  3 levels of aggregation). Appendix B contains all these point estimates of  $\gamma$ .

an opposite sign. This is due to the related drop in the number of distinguished sectors which alienates the export breadth variable in the 2-digit case from those in which either 3-digit or 4-digit export flows are considered. We conclude:

### **Empirical result 7**

The estimated power coefficient of the rank-size rule for revealed comparative advantage as measured with the Balassa index differs significantly across countries. These differences are related to the following country-specific characteristics: country size, export size, export breadth, and openness.

### **5.2 Characteristics of estimated sector exponents**

Differences across sectors regarding the estimated Pareto exponent can be structured effectively according to the core analysis of international trade: factor intensity. To that end we use the factor intensity classification of the International Trade Center, the joint UNCTAD/WTO organization. In particular we have the following five broad factor intensity categories (within brackets the number of 3-digit sectors belonging to the particular category; note that there are 5 sectors that are not classified; see Hinloopen and van Marrewijk, 2008):<sup>13</sup>

- A. *Primary products* (83); including meat, dairy, cereals, fruit, coffee, sand, minerals, oil, natural gas, iron ore, and copper ore.
- B. *Natural-resource intensive products* (21); including leather, cork, wood, lime, precious stones, pig iron, copper, aluminum, and lead.
- C. *Unskilled-labor intensive products* (26); including various textiles and garments, clothing, glass, pottery, ships, furniture, footwear, and office supplies.
- D. *Human-capital intensive products* (43); including synthetic colors, pigments, perfumes, cosmetics, rubber and tires, tubes, pipes, various types of steel and iron, cutlery, televisions, radios, cars, watches, and jewellery.
- E. *Technology intensive products* (62); including various chemicals, medicaments, plastics, engines, generators, machines, tools, pumps, telecommunications and photo equipment, optical equipment, and aircraft.

Table 5 contains the average estimated power-law coefficients for these factor intensity categories. It appears that the estimated Pareto exponents are about equal for primary products and natural-resource intensive products. Similarly, they are about equal for technology-intensive products and human-capital intensive products. Moreover, the estimated

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<sup>13</sup> We first made some adjustments to get from the SITC Rev. 3 codes to the codes in Feenstra *et al.* (1997); see <http://people.few.eur.nl/vanmarrewijk/eta> for further details.

exponents tend to be lower for primary products than for unskilled-labor intensive products, which in turn tend to be lower than that for human-capital intensive products. Indeed, according to a two-sided  $t$ -test of mean differences the following ordering applies:

$$\gamma_{\text{primary}} = \gamma_{\text{natural-resource}} < \gamma_{\text{unskilled-labor}} < \gamma_{\text{human-capital}} = \gamma_{\text{technology}}$$

Table 5. Pair wise  $t$ -tests for equality of the mean of estimated power-law coefficients across sectors (3-digit).

|   | A     | B    | C    | D    | Mean estimate | $t$ -value for $H_0: \bar{\gamma} = 1$ |
|---|-------|------|------|------|---------------|--|
| A | *     |      |      |      | 0.94          | 2.05                                   |
| B | 0.86  | *    |      |      | 1.01          | 0.12                                   |
| C | 5.16  | 3.25 | *    |      | 1.37          | 4.73                                   |
| D | 8.59  | 5.93 | 2.73 | *    | 1.67          | 13.71                                  |
| E | 13.10 | 8.15 | 4.51 | 1.37 | 1.81          | 8.42                                   |

In addition, we have tested whether Zipf's law applies for the five different factor intensity categories. Although the mean value of the estimated power-law coefficient for natural-resource intensive products does not differ from that for primary products, it is only for the former product category that Zipf's law applies in particular (see Table 5). We thus conclude:

### Empirical result 8

The estimated power coefficient of the rank-size rule for revealed comparative advantage as measured with the Balassa index differs significantly across sectors ordered according to factor intensities. For all sectors the rank-size rule applies; for natural-resource intensive sectors Zipf's law holds in particular.

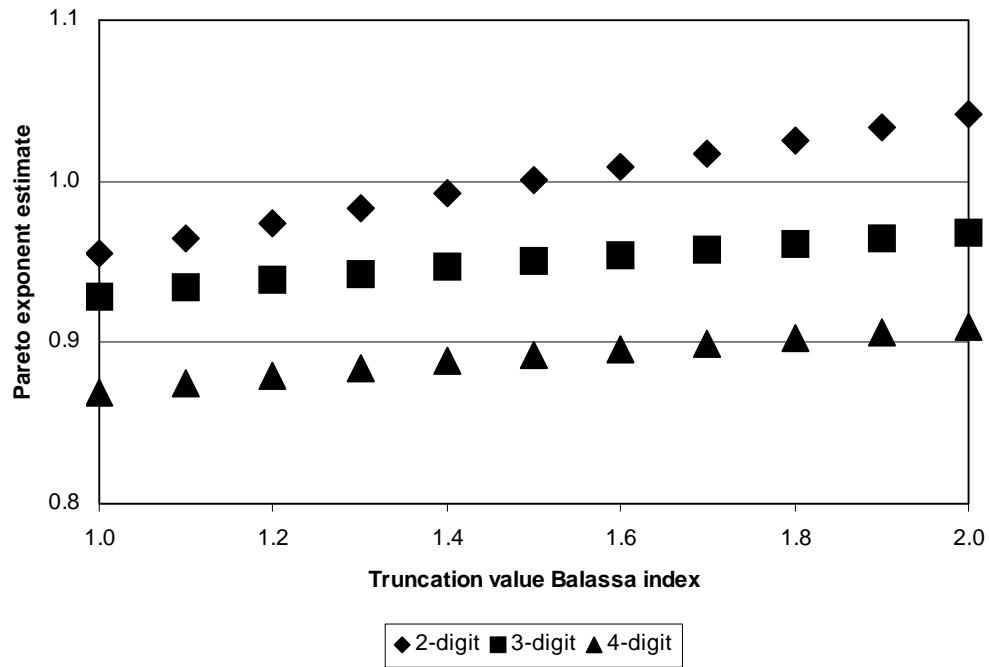
## 6. Conclusions

The analysis of the evolution of a country's apparent strong export sectors as indicated by a revealed comparative advantage using the Balassa index (or its monotonic transformations) is complicated by the lack of a characterization of the distribution of this index. Using a comprehensive international trade data set we reveal an empirical regularity of revealed comparative advantage that alleviates some of this complication: its obedience to the rank-size rule along the time, country, and sector dimension. Our results are obtained using the estimator recently developed by Gabaix and Ibragimov (2007) which yields unbiased estimates absent data contamination. As our analysis is based in total on 1,295 estimated



Pareto exponents we are quite confident that our findings are representative for the phenomenon documented here.

Figure 5. Estimated power-law coefficients for different truncation values at the 2-digit, 3-digit, and 4-digit level of data aggregation.



Eeckhout (2004) shows the estimated Pareto exponent for city size distributions to be very sensitive to the sample composition. Using a higher truncation point for cities to be included into the sample leads to higher power law estimates. As there is no natural truncation point for city sizes Eeckhout’s observation questions the applicability of the rank-size rule to city size distributions. For the Balassa index on the other hand the subsample of entries above one naturally presents itself. Thus, in Figure 5 the (absolute value of the) estimated Pareto exponent is plotted for higher truncation values.<sup>14</sup> The observation of Eeckhout (2004) also applies here although the estimated power coefficient is much less sensitive to the truncation value compared to the city size distribution. This supports the robustness of our findings.

The evidence presented in this paper calls for theoretical explorations, possibly along the lines of the recent explanations for city size distributions (Gabaix (1999), Brakman *et al.*

<sup>14</sup> Note that the fraction of industries included drops with higher truncation values. For the 2-digit, 3-digit, and 4-digit level of data aggregation going from a truncation value of one to two comes with a drop in this fraction respectively from 24.5% to 14.4%, from 24.4% to 13.9% and from 27.2% to 16.3%. Increasing the truncation value even further yields estimates that are based on a disproportionately small part of the sample.

(2001), and Eeckhout, 2004) or firms (Luttmer, 2005). The variation in estimated Pareto exponents across countries and sectors suggests that these theories should take into account country and/or sector characteristics. This is confirmed by the panel estimates that document the empirical relation between estimated Pareto exponents and country specific characteristics, including country size, openness, and export breadth. The market size variables point to theories of imperfect competition in which the home-market effect, the competition for large markets, and location effects through intra-industry trade linkages play a prominent role.<sup>15</sup>

At the sectoral level the estimated Pareto exponents differ systematically across sectors classified along factor intensity. This finding points to Heckscher-Ohlin-Samuelson type international trade theories which are rooted in factor abundance. To the extent that countries differ in technology, physical- and human capital abundance, or (un)skilled labor abundance, each of which affects the sectoral composition of revealed comparative advantage, this should also be taken into consideration when analyzing the estimated Pareto exponent at the country level. We leave that and the theoretical explorations for future research.

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<sup>15</sup> See also the related recent theories explaining the empirical success of the gravity equation in Evenett and Keller (2002) and the geographical economics theories on the endogenous determination of location in Fujita, Krugman, and Venables (1999).

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## **Appendix A Data**

Two separate data sets compiled by the Center for International Data, University of California, Davis (CID/UCD), were merged, the first covering the years 1970 through 1993 (see Feenstra, Lipsey and Bowen, 1997) and the second covering the years 1980 through 1997 (see Feenstra, 2000). For the overlapping years, the data from the latter source are used. The data set contains bilateral trade flows between 183 trading partners, including n.e.s. (not elsewhere specified) regions for trade flows that could not be classified further than within a broad geographical region (such as “Middle East”, or “North Africa”), an “Areas n.e.s.” region for trade flows that cannot be attributed to any country or to any of the used broad geographical regions but that do come from a well-defined geographical region, and an “Unknown Partner” category for trade flows that could not be attributed at all due to various reasons (see Feenstra, 2000). This leaves a sample of 165 genuine countries

The bilateral trade flows are decomposed into 1,249 sectors, comprising 747 genuine 4-digit sectors, based on SITC (Standard International Trade Classification), revision 2. The remaining 502 sectors refer to aggregates at the 1-, 2-, or 3-digit level, and a “Non-identified products” category. The 4-digit subset contains 60.39 % of all trade, the 3-digit subset covers 99.46 % of all trade, and the 2-digit subset comprises 99.67 % of all trade.

The data were first compiled by Statistics Canada and made available through the CID/UCD (see Feenstra, 2000). The former makes use of various sources (according to Statistics Canada 87% of all trade flows is based on independent sources of *both* imports and exports, while 98% is based on reports of at least one side of trade), yielding a rather complete coverage of world trade flows. The CID/UCD transforms the data such that trade flows for all years, all countries, and all industry groups are consistent and presented in a unified manner. Each observation in the raw data consists of four entries: importing country, exporting country, sector, and size of the trade flow (in 1,000 US \$). The data are thus classified according to the importing country. This is *not* to say that the data are based on import sources only, as explained above. After merging the two separate datasets a second dataset is created by “inverting” the data, in that all trade is classified according to the exporting country.

The income and population data are taken from the World Bank Development Indicators 2005 except for Taiwan. Those data are based on own calculations using the Maddison (2003) data set and complementary material taken from the website of the National Statistics Office of Taiwan (<http://eng.stat.gov.tw/mp.asp?mp=5>).

Table A1 Sample countries

| Country<br>Nr. Name                | Country<br>Nr. Name            |
|------------------------------------|--------------------------------|
| 1 South Africa                     | 91 Belize                      |
| 2 Algeria                          | 92 Falkland Isl                |
| 3 Liby Arab Jm                     | 93 French Guiana               |
| 4 Morocco                          | 94 Guyana                      |
| 5 Western Sahara                   | 95 Panama                      |
| 6 Sudan                            | 96 Surinam                     |
| 7 Tunisia                          | 98 Israel                      |
| 8 Egypt                            | 99 Japan                       |
| 10 Cameroon                        | 100 Bahrain                    |
| 11 Central Afr. Rep.               | 101 Cyprus                     |
| 12 Chad                            | 102 Iran                       |
| 13 Congo                           | 103 Iraq                       |
| 14 Gabon                           | 104 Jordan                     |
| 16 Angola                          | 105 Kuwait                     |
| 17 Br.Ind.Oc.Tr                    | 106 Lebanon                    |
| 18 Burundi                         | 107 Oman                       |
| 19 Comoros                         | 108 Qatar                      |
| 20 Zaire                           | 109 Saudi Arabia               |
| 21 Benin                           | 110 Fm Dem Yemen               |
| 22 Eq. Guinea                      | 111 Syrn Arab Rp               |
| 23 Ethiopia                        | 112 Untd Arab Em               |
| 25 Djibouti                        | 113 Turkey                     |
| 26 Gambia                          | 114 Fm Yemen                   |
| 27 Ghana                           | 115 Yemen                      |
| 28 Guinea                          | 117 Afghanistan                |
| 29 Cote D'ivoire                   | 118 Bangladesh                 |
| 30 Kenya                           | 119 Bhutan                     |
| 31 Liberia                         | 120 Brunei                     |
| 32 Madagascar                      | 121 Myanmar (Burma)            |
| 33 Malawi                          | 122 Cambodia                   |
| 34 Mali                            | 123 Sri Lanka                  |
| 35 Mauritania                      | 124 Hong Kong                  |
| 36 Mauritius                       | 125 India                      |
| 37 Mozambique                      | 126 Indonesia (Incl Macau)     |
| 38 Niger                           | 127 Korea Rp (South)           |
| 39 Nigeria                         | 128 Laos P.Dem.R               |
| 40 Guinea-Bissau (Incl Cape Verde) | 129 Malaysia                   |
| 41 Reunion                         | 130 Maldives                   |
| 42 Rwanda                          | 131 Nepal                      |
| 43 St.Helena                       | 132 Pakistan                   |
| 44 Senegal                         | 133 Philippines                |
| 45 Seychelles                      | 134 Singapore                  |
| 46 Sierra Leone                    | 135 Thailand                   |
| 47 Somalia                         | 136 Taiwan                     |
| 48 Zimbabwe                        | 137 China                      |
| 49 Togo                            | 138 Korea D P Rp (North)       |
| 50 Uganda                          | 139 Mongolia                   |
| 51 Untd Rp Tanzania                | 140 Vietnam                    |
| 52 Burkina Faso                    | 142 Belgium-Lux.               |
| 53 Zambia                          | 143 Denmark (Incl Faroe Islds) |

Table A1 Sample countries (continued)

| Nr. | Name  | Nr. | Name  |
|-----|---|-----|---|
| 55  | Canada  | 144 | France  |
| 56  | Usa   | 145 | Germany   |
| 57  | Bermuda   | 146 | Greece  |
| 58  | Greenland   | 147 | Ireland   |
| 59  | St Pierre Miqu  | 148 | Italy   |
| 60  | Argentina   | 149 | Netherlands                                     |
| 61  | Bolivia   | 150 | Portugal  |
| 62  | Brazil  | 151 | Spain   |
| 63  | Chile   | 152 | United Kingdom                                  |
| 64  | Colombia  | 154 | Austria   |
| 65  | Ecuador   | 155 | Finland   |
| 66  | Mexico  | 156 | Iceland   |
| 67  | Paraguay  | 157 | Norway  |
| 68  | Peru  | 158 | Sweden  |
| 69  | Uruguay   | 159 | Switzerland                                     |
| 70  | Venezuela   | 161 | Gibraltar                                       |
| 72  | Costa Rica  | 162 | Malta   |
| 73  | El Salvador   | 164 | Albania   |
| 74  | Guatemala   | 165 | Bulgaria  |
| 75  | Honduras  | 166 | Czechoslovakia                                  |
| 76  | Nicaragua   | 167 | Fm German Dm Rp (East)                          |
| 78  | Bahamas   | 168 | Hungary   |
| 79  | Barbados  | 169 | Poland  |
| 80  | Cayman Islds  | 170 | Romania   |
| 81  | Cuba  | 172 | Fm Yugoslavia                                   |
| 82  | Dominican Rp  | 173 | Fm Ussr   |
| 83  | Guadeloupe (Incl Martinique)  | 174 | Australia                                       |
| 84  | Haiti   | 175 | New Zealand                                     |
| 85  | Jamaica   | 176 | Solomon Islds                                   |
| 86  | Neth Antilles   | 177 | Fiji  |
| 87  | St Kitts Nev (Incl Dominica,<br>Montserrat, St Luca,St Vinct,<br>Grenada) | 178 | Kiribati (Incl Solomon Islds, Tonga,<br>Tuvalu) |
| 88  | Trinidad-Tobago   | 179 | New Caledonia (Incl Fr Polynesia,<br>Vanuata)   |
| 89  | Turks Caicos Isl  | 180 | Papua N.Guinea                                  |

*Other geographical regions in data set (nes = not elsewhere specified)*

| Nr. | Name             | Nr. | Name             |
|-----|------------------|-----|------------------|
| 9   | North Africa nes | 141 | Asia Cpe nes     |
| 15  | Ceuca nes        | 153 | Eec nes          |
| 24  | Fr.So.Ant.Tr     | 160 | Efta nes         |
| 54  | Other Africa nes | 163 | Other Eur nes    |
| 71  | Laia nes         | 171 | Fm Eur Cpe nes   |
| 77  | Cacm nes         | 181 | Oth. Oceania nes |
| 90  | Caribbean nes    | 182 | Areas nes        |
| 97  | Rest America nes | 183 | Unknown Partner  |
| 116 | Middle East nes  |     |                  |

## Appendix B Power law estimates

Table B1 GI Pareto exponent estimates of Rank-Size rule;  $BI > 1$ , time dimension

| year | 2-digit trade flows |          |       |        | 3-digit trade flows |          |       |         | 4-digit trade flows |          |       |         |
|------|---------------------|----------|-------|--------|---------------------|----------|-------|---------|---------------------|----------|-------|---------|
|      | estimate            | st error | fit   | # obs  | estimate            | st error | fit   | # obs   | estimate            | st error | fit   | # obs   |
| 1970 | 1.022               | 0.036    | 0.961 | 1,646  | 0.968               | 0.021    | 0.983 | 4,261   | 0.907               | 0.015    | 0.982 | 7,081   |
| 1971 | 1.016               | 0.036    | 0.961 | 1,636  | 0.960               | 0.021    | 0.986 | 4,304   | 0.894               | 0.015    | 0.983 | 7,231   |
| 1972 | 1.012               | 0.035    | 0.957 | 1,703  | 0.961               | 0.020    | 0.988 | 4,479   | 0.898               | 0.015    | 0.984 | 7,351   |
| 1973 | 1.031               | 0.035    | 0.960 | 1,719  | 0.978               | 0.021    | 0.990 | 4,533   | 0.915               | 0.015    | 0.987 | 7,591   |
| 1974 | 1.023               | 0.034    | 0.964 | 1,789  | 0.981               | 0.020    | 0.991 | 4,838   | 0.904               | 0.014    | 0.989 | 8,134   |
| 1975 | 1.008               | 0.034    | 0.966 | 1,793  | 0.964               | 0.020    | 0.992 | 4,779   | 0.899               | 0.014    | 0.990 | 8,017   |
| 1976 | 0.999               | 0.033    | 0.963 | 1,802  | 0.958               | 0.019    | 0.992 | 4,826   | 0.883               | 0.014    | 0.990 | 7,889   |
| 1977 | 1.017               | 0.034    | 0.960 | 1,794  | 0.973               | 0.020    | 0.991 | 4,850   | 0.891               | 0.014    | 0.990 | 7,947   |
| 1978 | 0.979               | 0.031    | 0.966 | 1,961  | 0.926               | 0.018    | 0.991 | 5,147   | 0.852               | 0.013    | 0.989 | 8,338   |
| 1979 | 0.977               | 0.032    | 0.970 | 1,906  | 0.931               | 0.018    | 0.993 | 5,073   | 0.854               | 0.013    | 0.991 | 8,272   |
| 1980 | 0.962               | 0.030    | 0.970 | 2,015  | 0.928               | 0.018    | 0.994 | 5,379   | 0.855               | 0.013    | 0.992 | 8,212   |
| 1981 | 0.953               | 0.030    | 0.968 | 2,017  | 0.924               | 0.018    | 0.992 | 5,405   | 0.850               | 0.013    | 0.988 | 8,129   |
| 1982 | 0.943               | 0.030    | 0.975 | 2,021  | 0.920               | 0.018    | 0.992 | 5,266   | 0.857               | 0.014    | 0.989 | 7,985   |
| 1983 | 0.946               | 0.030    | 0.966 | 1,935  | 0.920               | 0.018    | 0.992 | 5,067   | 0.861               | 0.014    | 0.987 | 7,648   |
| 1984 | 0.938               | 0.030    | 0.972 | 1,917  | 0.915               | 0.018    | 0.992 | 5,106   | 0.858               | 0.014    | 0.989 | 7,681   |
| 1985 | 0.951               | 0.031    | 0.964 | 1,937  | 0.922               | 0.018    | 0.989 | 5,045   | 0.859               | 0.014    | 0.989 | 7,653   |
| 1986 | 0.945               | 0.031    | 0.966 | 1,869  | 0.912               | 0.018    | 0.989 | 5,008   | 0.856               | 0.014    | 0.990 | 7,527   |
| 1987 | 0.940               | 0.031    | 0.964 | 1,891  | 0.909               | 0.018    | 0.990 | 5,057   | 0.860               | 0.014    | 0.990 | 7,575   |
| 1988 | 0.947               | 0.030    | 0.966 | 1,928  | 0.915               | 0.018    | 0.990 | 5,054   | 0.850               | 0.014    | 0.992 | 7,547   |
| 1989 | 0.954               | 0.030    | 0.967 | 1,957  | 0.922               | 0.018    | 0.990 | 5,235   | 0.849               | 0.014    | 0.993 | 7,852   |
| 1990 | 0.927               | 0.029    | 0.969 | 1,981  | 0.908               | 0.018    | 0.992 | 5,347   | 0.850               | 0.013    | 0.992 | 7,946   |
| 1991 | 0.910               | 0.029    | 0.965 | 1,973  | 0.907               | 0.018    | 0.990 | 5,307   | 0.861               | 0.014    | 0.993 | 8,007   |
| 1992 | 0.905               | 0.028    | 0.966 | 2,026  | 0.909               | 0.017    | 0.991 | 5,455   | 0.859               | 0.013    | 0.994 | 8,274   |
| 1993 | 0.895               | 0.028    | 0.975 | 2,090  | 0.900               | 0.017    | 0.992 | 5,540   | 0.851               | 0.013    | 0.995 | 8,353   |
| 1994 | 0.882               | 0.028    | 0.971 | 2,053  | 0.896               | 0.017    | 0.991 | 5,409   | 0.857               | 0.013    | 0.993 | 8,230   |
| 1995 | 0.897               | 0.028    | 0.966 | 2,042  | 0.902               | 0.017    | 0.992 | 5,479   | 0.869               | 0.013    | 0.994 | 8,344   |
| 1996 | 0.911               | 0.028    | 0.970 | 2,045  | 0.912               | 0.017    | 0.993 | 5,560   | 0.871               | 0.013    | 0.993 | 8,419   |
| 1997 | 0.947               | 0.030    | 0.966 | 2,057  | 0.925               | 0.018    | 0.991 | 5,422   | 0.883               | 0.014    | 0.993 | 8,197   |
| all  | 0.955               | 0.006    | 0.968 | 53,503 | 0.928               | 0.003    | 0.991 | 142,231 | 0.869               | 0.003    | 0.991 | 221,430 |



Table B2 GI Pareto exponent estimates of Rank-Size rule;  $BI > 1$ , country dimension

| country | 2-digit trade flows |          |       |       | 3-digit trade flows |          |       |       | 4-digit trade flows |          |       |       |
|---------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|
|         | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs |
| 1       | 1.220               | 0.079    | 0.955 | 477   | 1.100               | 0.045    | 0.926 | 1,217 | 0.968               | 0.029    | 0.915 | 2,250 |
| 2       | 0.876               | 0.138    | 0.812 | 81    | 0.940               | 0.091    | 0.873 | 213   | 1.007               | 0.084    | 0.935 | 289   |
| 3       | 0.958               | 0.174    | 0.884 | 61    | 1.081               | 0.140    | 0.910 | 119   | 1.109               | 0.134    | 0.916 | 138   |
| 4       | 0.904               | 0.062    | 0.937 | 426   | 0.839               | 0.035    | 0.966 | 1,151 | 0.860               | 0.026    | 0.961 | 2,106 |
| 5       | 0.567               | 0.087    | 0.869 | 85    | 0.537               | 0.065    | 0.908 | 137   | 0.461               | 0.057    | 0.870 | 132   |
| 6       | 0.744               | 0.067    | 0.744 | 246   | 0.681               | 0.046    | 0.870 | 436   | 0.509               | 0.028    | 0.918 | 656   |
| 7       | 0.980               | 0.075    | 0.889 | 338   | 0.958               | 0.043    | 0.910 | 997   | 0.884               | 0.031    | 0.955 | 1,628 |
| 8       | 1.249               | 0.099    | 0.955 | 320   | 1.051               | 0.050    | 0.948 | 877   | 0.928               | 0.035    | 0.936 | 1,421 |
| 10      | 0.943               | 0.075    | 0.926 | 314   | 0.820               | 0.048    | 0.917 | 582   | 0.751               | 0.038    | 0.920 | 774   |
| 11      | 0.849               | 0.086    | 0.841 | 193   | 0.654               | 0.055    | 0.896 | 286   | 0.596               | 0.045    | 0.887 | 344   |
| 12      | 0.583               | 0.080    | 0.836 | 107   | 0.574               | 0.063    | 0.926 | 164   | 0.552               | 0.057    | 0.959 | 189   |
| 13      | 1.138               | 0.154    | 0.907 | 109   | 0.852               | 0.093    | 0.879 | 166   | 0.689               | 0.069    | 0.920 | 202   |
| 14      | 1.010               | 0.125    | 0.714 | 130   | 0.722               | 0.078    | 0.870 | 171   | 0.544               | 0.054    | 0.825 | 202   |
| 16      | 1.043               | 0.122    | 0.861 | 146   | 0.868               | 0.079    | 0.950 | 243   | 0.895               | 0.070    | 0.963 | 330   |
| 17      | 0.713               | 0.082    | 0.953 | 151   | 0.645               | 0.060    | 0.906 | 232   | 0.579               | 0.059    | 0.919 | 192   |
| 18      | 0.625               | 0.074    | 0.823 | 142   | 0.598               | 0.056    | 0.879 | 224   | 0.589               | 0.047    | 0.901 | 316   |
| 19      | 0.498               | 0.079    | 0.650 | 80    | 0.366               | 0.043    | 0.839 | 142   | 0.530               | 0.057    | 0.886 | 171   |
| 20      | 1.020               | 0.084    | 0.879 | 294   | 0.738               | 0.048    | 0.876 | 483   | 0.702               | 0.039    | 0.881 | 649   |
| 21      | 0.690               | 0.063    | 0.847 | 237   | 0.686               | 0.044    | 0.940 | 486   | 0.588               | 0.034    | 0.978 | 593   |
| 22      | 0.628               | 0.077    | 0.732 | 134   | 0.567               | 0.053    | 0.861 | 233   | 0.537               | 0.047    | 0.901 | 261   |
| 23      | 0.717               | 0.061    | 0.860 | 280   | 0.725               | 0.045    | 0.932 | 510   | 0.574               | 0.030    | 0.889 | 748   |
| 25      | 0.794               | 0.082    | 0.972 | 188   | 0.838               | 0.053    | 0.975 | 501   | 0.695               | 0.040    | 0.958 | 610   |
| 26      | 0.617               | 0.064    | 0.768 | 188   | 0.581               | 0.045    | 0.888 | 338   | 0.530               | 0.037    | 0.889 | 411   |
| 27      | 0.825               | 0.071    | 0.905 | 267   | 0.720               | 0.051    | 0.922 | 402   | 0.703               | 0.045    | 0.852 | 498   |
| 28      | 0.637               | 0.073    | 0.845 | 154   | 0.612               | 0.055    | 0.896 | 247   | 0.531               | 0.045    | 0.937 | 274   |
| 29      | 0.832               | 0.069    | 0.915 | 294   | 0.778               | 0.047    | 0.912 | 560   | 0.729               | 0.035    | 0.868 | 868   |
| 30      | 0.910               | 0.064    | 0.950 | 400   | 0.758               | 0.036    | 0.972 | 890   | 0.821               | 0.029    | 0.953 | 1,626 |
| 31      | 0.738               | 0.077    | 0.755 | 185   | 0.560               | 0.049    | 0.815 | 259   | 0.502               | 0.045    | 0.797 | 251   |

| Table B2<br>country | 2-digit trade flows |          |       |       | 3-digit trade flows |          |       |       | 4-digit trade flows |          |       |       |
|---------------------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|
|                     | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs |
| 32                  | 0.895               | 0.065    | 0.943 | 383   | 0.680               | 0.036    | 0.966 | 725   | 0.765               | 0.033    | 0.914 | 1,081 |
| 33                  | 0.606               | 0.058    | 0.850 | 221   | 0.595               | 0.039    | 0.935 | 462   | 0.542               | 0.028    | 0.924 | 755   |
| 34                  | 0.759               | 0.060    | 0.931 | 316   | 0.691               | 0.043    | 0.963 | 517   | 0.718               | 0.038    | 0.917 | 711   |
| 35                  | 0.577               | 0.078    | 0.631 | 111   | 0.548               | 0.053    | 0.853 | 216   | 0.597               | 0.047    | 0.905 | 316   |
| 36                  | 0.561               | 0.062    | 0.852 | 164   | 0.775               | 0.049    | 0.926 | 497   | 0.798               | 0.037    | 0.958 | 931   |
| 37                  | 1.013               | 0.070    | 0.863 | 423   | 0.814               | 0.039    | 0.885 | 882   | 0.766               | 0.029    | 0.915 | 1,391 |
| 38                  | 0.585               | 0.084    | 0.837 | 98    | 0.577               | 0.059    | 0.961 | 194   | 0.702               | 0.067    | 0.901 | 221   |
| 39                  | 1.077               | 0.150    | 0.893 | 103   | 0.923               | 0.101    | 0.858 | 166   | 0.775               | 0.074    | 0.948 | 220   |
| 40                  | 0.762               | 0.066    | 0.846 | 267   | 0.644               | 0.040    | 0.912 | 511   | 0.532               | 0.030    | 0.971 | 626   |
| 41                  | 0.529               | 0.076    | 0.859 | 98    | 0.633               | 0.060    | 0.939 | 225   | 0.615               | 0.050    | 0.964 | 304   |
| 42                  | 0.661               | 0.091    | 0.806 | 105   | 0.568               | 0.061    | 0.815 | 176   | 0.507               | 0.045    | 0.793 | 254   |
| 43                  | 0.738               | 0.085    | 0.926 | 152   | 0.678               | 0.050    | 0.937 | 372   | 0.736               | 0.057    | 0.951 | 338   |
| 44                  | 0.702               | 0.053    | 0.818 | 353   | 0.719               | 0.037    | 0.924 | 756   | 0.683               | 0.029    | 0.895 | 1,080 |
| 45                  | 0.757               | 0.079    | 0.912 | 185   | 0.602               | 0.044    | 0.915 | 376   | 0.565               | 0.039    | 0.909 | 426   |
| 46                  | 0.868               | 0.083    | 0.804 | 217   | 0.703               | 0.051    | 0.901 | 385   | 0.588               | 0.039    | 0.927 | 461   |
| 47                  | 0.645               | 0.062    | 0.919 | 214   | 0.649               | 0.049    | 0.927 | 356   | 0.444               | 0.032    | 0.893 | 382   |
| 48                  | 0.851               | 0.067    | 0.935 | 321   | 0.806               | 0.041    | 0.954 | 785   | 0.725               | 0.031    | 0.967 | 1,102 |
| 49                  | 0.580               | 0.059    | 0.801 | 194   | 0.556               | 0.038    | 0.949 | 432   | 0.671               | 0.045    | 0.972 | 451   |
| 50                  | 0.657               | 0.073    | 0.886 | 164   | 0.650               | 0.056    | 0.927 | 274   | 0.579               | 0.041    | 0.897 | 398   |
| 51                  | 0.848               | 0.061    | 0.874 | 391   | 0.692               | 0.035    | 0.911 | 794   | 0.663               | 0.028    | 0.875 | 1,134 |
| 52                  | 0.682               | 0.076    | 0.817 | 163   | 0.618               | 0.053    | 0.906 | 272   | 0.537               | 0.040    | 0.911 | 358   |
| 53                  | 0.593               | 0.085    | 0.774 | 98    | 0.676               | 0.057    | 0.916 | 281   | 0.796               | 0.050    | 0.955 | 509   |
| 55                  | 1.732               | 0.099    | 0.885 | 608   | 1.567               | 0.054    | 0.905 | 1,672 | 1.322               | 0.035    | 0.932 | 2,893 |
| 56                  | 2.250               | 0.109    | 0.930 | 848   | 2.372               | 0.068    | 0.931 | 2,470 | 2.336               | 0.052    | 0.942 | 3,965 |
| 57                  | 0.731               | 0.082    | 0.881 | 160   | 0.752               | 0.061    | 0.918 | 301   | 0.648               | 0.055    | 0.915 | 276   |
| 58                  | 0.578               | 0.077    | 0.804 | 114   | 0.530               | 0.048    | 0.746 | 247   | 0.462               | 0.037    | 0.801 | 308   |
| 59                  | 0.696               | 0.071    | 0.893 | 191   | 0.661               | 0.046    | 0.932 | 418   | 0.561               | 0.035    | 0.921 | 527   |
| 60                  | 0.934               | 0.063    | 0.840 | 445   | 0.981               | 0.037    | 0.928 | 1,381 | 0.836               | 0.024    | 0.934 | 2,378 |
| 61                  | 0.863               | 0.069    | 0.855 | 312   | 0.648               | 0.040    | 0.899 | 529   | 0.622               | 0.033    | 0.922 | 712   |
| 62                  | 1.206               | 0.073    | 0.873 | 541   | 1.139               | 0.042    | 0.934 | 1,485 | 0.959               | 0.028    | 0.938 | 2,423 |

| Table B2<br>country | 2-digit trade flows |          |       |       | 3-digit trade flows |          |       |       | 4-digit trade flows |          |       |       |
|---------------------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|
|                     | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs |
| 63                  | 1.007               | 0.075    | 0.826 | 361   | 0.938               | 0.047    | 0.923 | 811   | 0.827               | 0.029    | 0.944 | 1,595 |
| 64                  | 0.974               | 0.071    | 0.947 | 374   | 1.162               | 0.052    | 0.969 | 984   | 1.025               | 0.037    | 0.974 | 1,545 |
| 65                  | 0.917               | 0.094    | 0.790 | 191   | 0.785               | 0.053    | 0.832 | 433   | 0.862               | 0.046    | 0.966 | 700   |
| 66                  | 1.666               | 0.115    | 0.930 | 419   | 1.358               | 0.054    | 0.963 | 1,279 | 1.166               | 0.033    | 0.969 | 2,452 |
| 67                  | 0.842               | 0.061    | 0.870 | 377   | 0.734               | 0.041    | 0.905 | 631   | 0.646               | 0.030    | 0.911 | 907   |
| 68                  | 0.866               | 0.065    | 0.845 | 356   | 0.830               | 0.040    | 0.846 | 841   | 0.683               | 0.025    | 0.944 | 1,459 |
| 69                  | 1.033               | 0.065    | 0.893 | 506   | 0.881               | 0.036    | 0.910 | 1,170 | 0.736               | 0.023    | 0.907 | 1,991 |
| 70                  | 1.222               | 0.162    | 0.897 | 114   | 1.173               | 0.091    | 0.909 | 329   | 1.031               | 0.060    | 0.960 | 601   |
| 72                  | 1.036               | 0.071    | 0.910 | 429   | 1.124               | 0.047    | 0.965 | 1,131 | 0.925               | 0.032    | 0.970 | 1,670 |
| 73                  | 0.985               | 0.067    | 0.963 | 435   | 1.061               | 0.046    | 0.982 | 1,044 | 0.899               | 0.030    | 0.970 | 1,757 |
| 74                  | 0.988               | 0.064    | 0.920 | 472   | 1.009               | 0.041    | 0.964 | 1,205 | 0.919               | 0.029    | 0.981 | 2,057 |
| 75                  | 0.952               | 0.072    | 0.897 | 354   | 0.834               | 0.043    | 0.942 | 755   | 0.784               | 0.031    | 0.950 | 1,283 |
| 76                  | 0.884               | 0.060    | 0.869 | 437   | 0.878               | 0.041    | 0.945 | 901   | 0.844               | 0.033    | 0.954 | 1,344 |
| 78                  | 1.012               | 0.109    | 0.857 | 173   | 0.824               | 0.062    | 0.914 | 357   | 0.716               | 0.049    | 0.919 | 424   |
| 79                  | 0.928               | 0.067    | 0.935 | 379   | 0.947               | 0.042    | 0.934 | 995   | 0.897               | 0.035    | 0.947 | 1,345 |
| 80                  | 0.834               | 0.089    | 0.908 | 176   | 0.734               | 0.054    | 0.904 | 366   | 0.616               | 0.047    | 0.953 | 346   |
| 81                  | 0.719               | 0.073    | 0.906 | 192   | 0.792               | 0.054    | 0.928 | 427   | 0.654               | 0.035    | 0.912 | 686   |
| 82                  | 0.882               | 0.069    | 0.918 | 327   | 0.837               | 0.045    | 0.890 | 702   | 0.765               | 0.032    | 0.913 | 1,144 |
| 83                  | 0.639               | 0.068    | 0.722 | 175   | 0.737               | 0.049    | 0.881 | 456   | 0.773               | 0.040    | 0.957 | 734   |
| 84                  | 0.976               | 0.072    | 0.866 | 364   | 0.878               | 0.041    | 0.921 | 908   | 0.768               | 0.031    | 0.889 | 1,229 |
| 85                  | 0.824               | 0.072    | 0.898 | 264   | 0.866               | 0.049    | 0.969 | 613   | 0.801               | 0.034    | 0.983 | 1,078 |
| 86                  | 0.968               | 0.151    | 0.790 | 82    | 0.759               | 0.075    | 0.892 | 207   | 0.647               | 0.050    | 0.739 | 330   |
| 87                  | 1.036               | 0.078    | 0.933 | 351   | 0.887               | 0.043    | 0.943 | 858   | 0.832               | 0.034    | 0.961 | 1,229 |
| 88                  | 1.118               | 0.117    | 0.825 | 184   | 1.024               | 0.068    | 0.915 | 449   | 0.813               | 0.043    | 0.926 | 721   |
| 89                  | 0.605               | 0.086    | 0.853 | 98    | 0.586               | 0.057    | 0.927 | 208   | 0.738               | 0.073    | 0.950 | 206   |
| 91                  | 0.820               | 0.070    | 0.936 | 278   | 0.823               | 0.045    | 0.954 | 678   | 0.731               | 0.032    | 0.957 | 1,052 |
| 92                  | 0.636               | 0.073    | 0.852 | 153   | 0.621               | 0.050    | 0.942 | 307   | 0.584               | 0.044    | 0.951 | 356   |
| 93                  | 0.735               | 0.075    | 0.880 | 193   | 0.661               | 0.046    | 0.927 | 405   | 0.650               | 0.042    | 0.943 | 483   |
| 94                  | 0.664               | 0.058    | 0.861 | 263   | 0.615               | 0.041    | 0.853 | 454   | 0.605               | 0.034    | 0.945 | 644   |
| 95                  | 0.919               | 0.063    | 0.899 | 421   | 0.908               | 0.043    | 0.946 | 884   | 0.824               | 0.032    | 0.974 | 1,294 |

| Table B2<br>country | 2-digit trade flows |          |       |       | 3-digit trade flows |          |       |       | 4-digit trade flows |          |       |       |
|---------------------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|
|                     | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs |
| 96                  | 0.864               | 0.079    | 0.914 | 237   | 0.656               | 0.050    | 0.879 | 344   | 0.555               | 0.037    | 0.936 | 451   |
| 98                  | 1.377               | 0.091    | 0.948 | 462   | 1.256               | 0.049    | 0.973 | 1,333 | 1.115               | 0.033    | 0.972 | 2,339 |
| 99                  | 2.557               | 0.173    | 0.919 | 436   | 2.229               | 0.073    | 0.923 | 1,886 | 1.973               | 0.055    | 0.908 | 2,594 |
| 100                 | 0.924               | 0.116    | 0.971 | 127   | 0.927               | 0.072    | 0.948 | 334   | 0.870               | 0.051    | 0.969 | 593   |
| 101                 | 1.062               | 0.071    | 0.928 | 449   | 1.023               | 0.043    | 0.937 | 1,137 | 0.822               | 0.026    | 0.955 | 1,945 |
| 102                 | 1.021               | 0.138    | 0.922 | 109   | 1.034               | 0.092    | 0.898 | 251   | 1.004               | 0.069    | 0.938 | 424   |
| 103                 | 0.762               | 0.118    | 0.911 | 84    | 0.792               | 0.080    | 0.920 | 196   | 0.766               | 0.058    | 0.975 | 348   |
| 104                 | 0.837               | 0.059    | 0.954 | 403   | 0.835               | 0.036    | 0.986 | 1,078 | 0.879               | 0.031    | 0.948 | 1,631 |
| 105                 | 1.100               | 0.134    | 0.925 | 135   | 1.028               | 0.076    | 0.940 | 368   | 0.940               | 0.062    | 0.960 | 453   |
| 106                 | 1.240               | 0.073    | 0.980 | 575   | 1.107               | 0.040    | 0.956 | 1,528 | 0.939               | 0.027    | 0.958 | 2,368 |
| 107                 | 0.817               | 0.141    | 0.911 | 67    | 0.899               | 0.094    | 0.955 | 183   | 1.153               | 0.118    | 0.968 | 192   |
| 108                 | 0.997               | 0.137    | 0.840 | 106   | 1.011               | 0.103    | 0.886 | 192   | 0.833               | 0.097    | 0.899 | 148   |
| 109                 | 1.025               | 0.163    | 0.874 | 79    | 1.033               | 0.103    | 0.880 | 200   | 1.094               | 0.102    | 0.943 | 229   |
| 110                 | 1.237               | 0.245    | 0.904 | 51    | 1.119               | 0.145    | 0.889 | 119   | 1.033               | 0.101    | 0.889 | 210   |
| 111                 | 1.055               | 0.097    | 0.953 | 235   | 0.984               | 0.056    | 0.943 | 627   | 0.903               | 0.042    | 0.966 | 914   |
| 112                 | 0.965               | 0.131    | 0.880 | 108   | 1.033               | 0.083    | 0.947 | 308   | 1.004               | 0.080    | 0.982 | 314   |
| 113                 | 1.142               | 0.078    | 0.919 | 431   | 1.110               | 0.042    | 0.910 | 1,417 | 0.965               | 0.026    | 0.942 | 2,792 |
| 114                 | 0.831               | 0.121    | 0.895 | 95    | 0.717               | 0.074    | 0.925 | 186   | 0.637               | 0.060    | 0.958 | 224   |
| 115                 | 1.037               | 0.151    | 0.887 | 94    | 0.982               | 0.098    | 0.865 | 199   | 0.804               | 0.069    | 0.883 | 270   |
| 117                 | 0.727               | 0.070    | 0.894 | 216   | 0.712               | 0.048    | 0.881 | 435   | 0.635               | 0.035    | 0.890 | 656   |
| 118                 | 0.848               | 0.086    | 0.689 | 195   | 0.521               | 0.035    | 0.932 | 451   | 0.681               | 0.036    | 0.954 | 710   |
| 119                 | 0.801               | 0.084    | 0.918 | 181   | 0.629               | 0.048    | 0.939 | 350   | 0.628               | 0.046    | 0.943 | 375   |
| 120                 | 0.702               | 0.135    | 0.797 | 54    | 0.684               | 0.108    | 0.793 | 80    | 1.170               | 0.194    | 0.921 | 73    |
| 121                 | 0.958               | 0.077    | 0.886 | 309   | 0.724               | 0.040    | 0.912 | 668   | 0.611               | 0.028    | 0.910 | 968   |
| 122                 | 0.750               | 0.062    | 0.889 | 296   | 0.759               | 0.042    | 0.941 | 653   | 0.681               | 0.035    | 0.954 | 770   |
| 123                 | 0.837               | 0.068    | 0.885 | 301   | 0.677               | 0.034    | 0.949 | 787   | 0.780               | 0.031    | 0.952 | 1,254 |
| 124                 | 1.331               | 0.086    | 0.929 | 477   | 1.223               | 0.042    | 0.918 | 1,677 | 1.086               | 0.030    | 0.888 | 2,642 |
| 125                 | 1.362               | 0.081    | 0.881 | 570   | 1.017               | 0.036    | 0.918 | 1,606 | 0.959               | 0.026    | 0.920 | 2,665 |
| 126                 | 1.129               | 0.085    | 0.877 | 354   | 1.107               | 0.053    | 0.934 | 883   | 1.135               | 0.041    | 0.973 | 1,543 |
| 127                 | 1.347               | 0.089    | 0.917 | 458   | 1.291               | 0.045    | 0.937 | 1,680 | 1.189               | 0.032    | 0.950 | 2,729 |

| Table B2<br>country | 2-digit trade flows |          |       |       | 3-digit trade flows |          |       |       | 4-digit trade flows |          |       |       |
|---------------------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|---------------------|----------|-------|-------|
|                     | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs | estimate            | st error | fit   | # obs |
| 128                 | 0.726               | 0.081    | 0.907 | 160   | 0.748               | 0.055    | 0.924 | 366   | 0.649               | 0.040    | 0.914 | 525   |
| 129                 | 0.859               | 0.070    | 0.858 | 305   | 0.889               | 0.044    | 0.936 | 822   | 0.921               | 0.039    | 0.946 | 1,123 |
| 130                 | 0.626               | 0.090    | 0.832 | 96    | 0.571               | 0.049    | 0.857 | 267   | 0.576               | 0.044    | 0.876 | 347   |
| 131                 | 1.003               | 0.083    | 0.911 | 295   | 0.595               | 0.035    | 0.948 | 570   | 0.591               | 0.030    | 0.936 | 777   |
| 132                 | 0.980               | 0.079    | 0.812 | 304   | 0.900               | 0.040    | 0.925 | 1,007 | 0.772               | 0.028    | 0.885 | 1,507 |
| 133                 | 1.067               | 0.069    | 0.907 | 480   | 0.970               | 0.042    | 0.920 | 1,089 | 0.868               | 0.029    | 0.962 | 1,783 |
| 134                 | 1.343               | 0.096    | 0.980 | 393   | 1.328               | 0.053    | 0.979 | 1,245 | 1.420               | 0.046    | 0.964 | 1,948 |
| 135                 | 1.206               | 0.072    | 0.918 | 558   | 1.026               | 0.037    | 0.975 | 1,510 | 1.025               | 0.029    | 0.972 | 2,484 |
| 136                 | 1.386               | 0.087    | 0.926 | 503   | 1.392               | 0.047    | 0.907 | 1,778 | 1.287               | 0.034    | 0.911 | 2,856 |
| 137                 | 1.850               | 0.099    | 0.948 | 705   | 1.317               | 0.039    | 0.960 | 2,245 | 1.093               | 0.024    | 0.945 | 4,064 |
| 138                 | 1.105               | 0.074    | 0.955 | 451   | 0.818               | 0.034    | 0.949 | 1,145 | 0.756               | 0.027    | 0.938 | 1,616 |
| 139                 | 0.727               | 0.075    | 0.806 | 186   | 0.647               | 0.047    | 0.867 | 377   | 0.565               | 0.035    | 0.918 | 536   |
| 140                 | 0.957               | 0.066    | 0.882 | 415   | 0.870               | 0.037    | 0.924 | 1,124 | 0.846               | 0.031    | 0.947 | 1,464 |
| 142                 | 2.807               | 0.143    | 0.945 | 769   | 2.114               | 0.060    | 0.954 | 2,521 | 1.888               | 0.041    | 0.944 | 4,195 |
| 143                 | 1.441               | 0.074    | 0.904 | 763   | 1.325               | 0.039    | 0.981 | 2,313 | 1.197               | 0.028    | 0.962 | 3,732 |
| 144                 | 2.373               | 0.115    | 0.981 | 859   | 2.421               | 0.062    | 0.968 | 3,085 | 2.330               | 0.047    | 0.983 | 4,993 |
| 145                 | 3.710               | 0.190    | 0.874 | 759   | 3.326               | 0.087    | 0.907 | 2,942 | 2.948               | 0.059    | 0.900 | 5,075 |
| 146                 | 1.293               | 0.077    | 0.919 | 559   | 1.074               | 0.039    | 0.916 | 1,546 | 0.973               | 0.026    | 0.937 | 2,817 |
| 147                 | 1.311               | 0.072    | 0.947 | 662   | 1.253               | 0.042    | 0.939 | 1,810 | 1.245               | 0.032    | 0.954 | 2,979 |
| 148                 | 2.149               | 0.121    | 0.937 | 626   | 2.064               | 0.058    | 0.940 | 2,567 | 1.765               | 0.037    | 0.960 | 4,455 |
| 149                 | 1.777               | 0.088    | 0.918 | 815   | 1.779               | 0.050    | 0.930 | 2,510 | 1.542               | 0.032    | 0.944 | 4,529 |
| 150                 | 1.234               | 0.074    | 0.860 | 553   | 1.061               | 0.036    | 0.969 | 1,708 | 1.045               | 0.027    | 0.913 | 2,960 |
| 151                 | 1.704               | 0.093    | 0.946 | 676   | 1.467               | 0.043    | 0.982 | 2,280 | 1.417               | 0.032    | 0.979 | 4,010 |
| 152                 | 2.829               | 0.150    | 0.954 | 715   | 2.586               | 0.070    | 0.953 | 2,711 | 2.475               | 0.055    | 0.972 | 4,037 |
| 154                 | 2.111               | 0.110    | 0.966 | 732   | 1.937               | 0.053    | 0.966 | 2,690 | 1.647               | 0.036    | 0.950 | 4,184 |
| 155                 | 1.132               | 0.075    | 0.894 | 455   | 1.340               | 0.048    | 0.951 | 1,582 | 1.095               | 0.029    | 0.921 | 2,757 |
| 156                 | 0.643               | 0.059    | 0.855 | 239   | 0.588               | 0.037    | 0.883 | 501   | 0.559               | 0.029    | 0.873 | 745   |
| 157                 | 1.328               | 0.084    | 0.899 | 503   | 1.134               | 0.047    | 0.929 | 1,144 | 1.124               | 0.035    | 0.921 | 2,093 |
| 158                 | 1.787               | 0.102    | 0.962 | 615   | 2.006               | 0.064    | 0.968 | 1,961 | 1.420               | 0.034    | 0.951 | 3,506 |
| 159                 | 1.569               | 0.091    | 0.917 | 597   | 1.458               | 0.045    | 0.934 | 2,076 | 1.362               | 0.034    | 0.957 | 3,196 |

| Table B2<br>country | 2-digit trade flows |          |       |        | 3-digit trade flows |          |       |         | 4-digit trade flows |          |       |         |
|---------------------|---------------------|----------|-------|--------|---------------------|----------|-------|---------|---------------------|----------|-------|---------|
|                     | estimate            | st error | fit   | # obs  | estimate            | st error | fit   | # obs   | estimate            | st error | fit   | # obs   |
| 161                 | 1.171               | 0.095    | 0.979 | 302    | 0.962               | 0.049    | 0.976 | 786     | 0.998               | 0.048    | 0.975 | 875     |
| 162                 | 1.218               | 0.092    | 0.916 | 349    | 0.952               | 0.042    | 0.922 | 1,030   | 0.757               | 0.028    | 0.928 | 1,497   |
| 164                 | 0.807               | 0.056    | 0.916 | 416    | 0.840               | 0.038    | 0.932 | 984     | 0.752               | 0.027    | 0.936 | 1,505   |
| 165                 | 1.266               | 0.085    | 0.985 | 439    | 1.312               | 0.051    | 0.978 | 1,329   | 1.144               | 0.035    | 0.966 | 2,117   |
| 166                 | 1.845               | 0.105    | 0.957 | 622    | 1.542               | 0.046    | 0.972 | 2,237   | 1.493               | 0.042    | 0.989 | 2,492   |
| 167                 | 1.158               | 0.116    | 0.970 | 200    | 1.469               | 0.077    | 0.992 | 731     | 1.205               | 0.057    | 0.984 | 886     |
| 168                 | 2.033               | 0.103    | 0.941 | 784    | 1.377               | 0.040    | 0.982 | 2,320   | 1.248               | 0.035    | 0.979 | 2,594   |
| 169                 | 1.470               | 0.089    | 0.964 | 545    | 1.240               | 0.042    | 0.969 | 1,771   | 1.226               | 0.034    | 0.957 | 2,582   |
| 170                 | 1.306               | 0.096    | 0.982 | 373    | 1.445               | 0.059    | 0.973 | 1,193   | 1.346               | 0.041    | 0.970 | 2,119   |
| 172                 | 1.981               | 0.101    | 0.942 | 774    | 1.769               | 0.050    | 0.952 | 2,544   | 1.345               | 0.028    | 0.981 | 4,515   |
| 173                 | 1.403               | 0.100    | 0.905 | 391    | 1.340               | 0.060    | 0.929 | 1,003   | 1.248               | 0.049    | 0.923 | 1,293   |
| 174                 | 1.070               | 0.074    | 0.798 | 420    | 0.983               | 0.040    | 0.916 | 1,205   | 0.964               | 0.029    | 0.910 | 2,238   |
| 175                 | 0.970               | 0.062    | 0.827 | 482    | 0.834               | 0.036    | 0.899 | 1,057   | 0.798               | 0.024    | 0.946 | 2,134   |
| 176                 | 0.624               | 0.073    | 0.654 | 148    | 0.555               | 0.048    | 0.806 | 263     | 0.506               | 0.042    | 0.806 | 288     |
| 177                 | 0.661               | 0.061    | 0.903 | 234    | 0.822               | 0.047    | 0.959 | 611     | 0.711               | 0.034    | 0.953 | 888     |
| 178                 | 0.785               | 0.070    | 0.853 | 248    | 0.636               | 0.040    | 0.921 | 495     | 0.598               | 0.034    | 0.923 | 613     |
| 179                 | 0.884               | 0.087    | 0.795 | 205    | 0.601               | 0.045    | 0.900 | 353     | 0.469               | 0.033    | 0.839 | 410     |
| 180                 | 0.773               | 0.070    | 0.761 | 244    | 0.696               | 0.046    | 0.831 | 460     | 0.590               | 0.036    | 0.912 | 545     |
| all                 | 0.955               | 0.006    | 0.968 | 53,503 | 0.928               | 0.003    | 0.991 | 142,231 | 0.869               | 0.003    | 0.991 | 221,430 |

Table B3 GI slope estimates of Rank-Size rule;  $BI > 1$ , sector dimension

| 2-digit trade flows |          |          |       |        | 2-digit trade flows |          |          |       |       |
|---------------------|----------|----------|-------|--------|---------------------|----------|----------|-------|-------|
| sector              | estimate | st error | fit   | # obs  | sector              | estimate | st error | fit   | # obs |
| 01                  | 1.048    | 0.052    | 0.873 | 797    | 58                  | 2.301    | 0.170    | 0.950 | 365   |
| 02                  | 1.191    | 0.073    | 0.953 | 532    | 59                  | 2.706    | 0.163    | 0.927 | 551   |
| 03                  | 0.787    | 0.025    | 0.903 | 2,024  | 61                  | 1.064    | 0.046    | 0.925 | 1,078 |
| 04                  | 1.283    | 0.067    | 0.894 | 737    | 62                  | 2.177    | 0.124    | 0.969 | 615   |
| 05                  | 0.999    | 0.033    | 0.884 | 1,866  | 63                  | 1.366    | 0.058    | 0.946 | 1,109 |
| 06                  | 0.699    | 0.027    | 0.898 | 1,376  | 64                  | 1.294    | 0.086    | 0.946 | 450   |
| 07                  | 0.646    | 0.022    | 0.764 | 1,710  | 65                  | 1.472    | 0.065    | 0.956 | 1,032 |
| 08                  | 1.103    | 0.046    | 0.926 | 1,138  | 66                  | 1.107    | 0.049    | 0.949 | 1,017 |
| 09                  | 1.334    | 0.061    | 0.978 | 957    | 67                  | 1.696    | 0.089    | 0.970 | 722   |
| 11                  | 1.294    | 0.064    | 0.905 | 814    | 68                  | 1.052    | 0.049    | 0.944 | 939   |
| 12                  | 0.904    | 0.038    | 0.967 | 1,122  | 69                  | 2.156    | 0.117    | 0.981 | 678   |
| 21                  | 0.914    | 0.035    | 0.939 | 1,395  | 71                  | 2.889    | 0.208    | 0.980 | 385   |
| 22                  | 0.796    | 0.036    | 0.891 | 980    | 72                  | 2.581    | 0.182    | 0.983 | 403   |
| 23                  | 0.752    | 0.045    | 0.831 | 548    | 73                  | 1.968    | 0.146    | 0.918 | 364   |
| 24                  | 0.926    | 0.038    | 0.901 | 1,177  | 74                  | 3.005    | 0.212    | 0.924 | 401   |
| 25                  | 1.041    | 0.072    | 0.873 | 413    | 75                  | 2.004    | 0.159    | 0.972 | 319   |
| 26                  | 0.752    | 0.028    | 0.895 | 1,443  | 76                  | 2.020    | 0.140    | 0.904 | 417   |
| 27                  | 0.813    | 0.033    | 0.954 | 1,213  | 77                  | 2.248    | 0.138    | 0.987 | 531   |
| 28                  | 0.777    | 0.031    | 0.863 | 1,260  | 78                  | 3.113    | 0.254    | 0.925 | 301   |
| 29                  | 1.092    | 0.038    | 0.960 | 1,695  | 79                  | 1.388    | 0.086    | 0.979 | 522   |
| 32                  | 0.984    | 0.073    | 0.864 | 366    | 81                  | 2.108    | 0.114    | 0.982 | 687   |
| 33                  | 1.107    | 0.048    | 0.772 | 1,054  | 82                  | 1.770    | 0.098    | 0.941 | 657   |
| 34                  | 0.908    | 0.064    | 0.886 | 404    | 83                  | 1.259    | 0.069    | 0.909 | 668   |
| 35                  | 1.022    | 0.069    | 0.968 | 438    | 84                  | 1.193    | 0.047    | 0.877 | 1,304 |
| 41                  | 0.977    | 0.062    | 0.944 | 494    | 85                  | 1.366    | 0.070    | 0.887 | 758   |
| 42                  | 0.853    | 0.037    | 0.898 | 1,059  | 87                  | 2.435    | 0.173    | 0.966 | 397   |
| 43                  | 1.256    | 0.074    | 0.972 | 580    | 88                  | 1.461    | 0.106    | 0.911 | 379   |
| 51                  | 1.890    | 0.124    | 0.989 | 461    | 89                  | 1.915    | 0.101    | 0.960 | 725   |
| 52                  | 0.966    | 0.049    | 0.967 | 781    | 93                  | 1.170    | 0.059    | 0.965 | 779   |
| 53                  | 2.057    | 0.117    | 0.985 | 620    | 94                  | 0.797    | 0.031    | 0.954 | 1,345 |
| 54                  | 1.405    | 0.073    | 0.967 | 744    | 95                  | 1.456    | 0.146    | 0.891 | 199   |
| 55                  | 1.284    | 0.056    | 0.977 | 1,036  | 97                  | 0.804    | 0.050    | 0.876 | 526   |
| 56                  | 1.124    | 0.054    | 0.954 | 862    | 99                  | 0.808    | 0.041    | 0.800 | 784   |
| all                 | 0.955    | 0.006    | 0.968 | 53,503 |                     |          |          |       |       |
| 3-digit trade flows |          |          |       |        | 3-digit trade flows |          |          |       |       |
| sector              | estimate | st error | fit   | # obs  | sector              | estimate | st error | fit   | # obs |
| 001                 | 0.862    | 0.041    | 0.977 | 880    | 653                 | 1.631    | 0.094    | 0.920 | 607   |
| 011                 | 1.019    | 0.052    | 0.891 | 772    | 654                 | 0.866    | 0.055    | 0.970 | 501   |
| 012                 | 0.869    | 0.072    | 0.941 | 295    | 655                 | 1.545    | 0.096    | 0.917 | 517   |
| 014                 | 1.024    | 0.056    | 0.913 | 680    | 656                 | 1.362    | 0.080    | 0.970 | 576   |
| 022                 | 1.201    | 0.082    | 0.951 | 433    | 657                 | 1.586    | 0.083    | 0.987 | 727   |
| 023                 | 0.857    | 0.063    | 0.909 | 375    | 658                 | 1.141    | 0.048    | 0.981 | 1,154 |

| Table B3 | 3-digit trade flows |          |       |       |        | 3-digit trade flows |          |       |       |
|----------|---------------------|----------|-------|-------|--------|---------------------|----------|-------|-------|
| sector   | estimate            | st error | fit   | # obs | sector | estimate            | st error | fit   | # obs |
| 024      | 1.204               | 0.075    | 0.887 | 521   | 659    | 0.884               | 0.047    | 0.970 | 708   |
| 025      | 1.081               | 0.065    | 0.922 | 560   | 661    | 1.096               | 0.048    | 0.933 | 1,027 |
| 034      | 0.736               | 0.028    | 0.938 | 1,399 | 662    | 1.626               | 0.106    | 0.915 | 471   |
| 035      | 0.722               | 0.031    | 0.961 | 1,069 | 663    | 1.921               | 0.121    | 0.990 | 500   |
| 036      | 0.730               | 0.024    | 0.913 | 1,801 | 665    | 2.241               | 0.127    | 0.942 | 625   |
| 037      | 0.758               | 0.031    | 0.944 | 1,163 | 666    | 1.684               | 0.099    | 0.947 | 580   |
| 041      | 1.211               | 0.104    | 0.861 | 269   | 667    | 0.800               | 0.041    | 0.878 | 750   |
| 042      | 0.606               | 0.033    | 0.816 | 668   | 671    | 0.737               | 0.039    | 0.954 | 724   |
| 043      | 1.238               | 0.095    | 0.883 | 336   | 672    | 1.189               | 0.067    | 0.977 | 630   |
| 044      | 1.061               | 0.075    | 0.904 | 399   | 673    | 1.519               | 0.085    | 0.969 | 634   |
| 045      | 0.878               | 0.064    | 0.981 | 374   | 674    | 1.983               | 0.129    | 0.913 | 471   |
| 046      | 0.987               | 0.061    | 0.951 | 522   | 676    | 1.219               | 0.089    | 0.968 | 372   |
| 047      | 1.139               | 0.066    | 0.958 | 594   | 677    | 1.711               | 0.104    | 0.977 | 541   |
| 048      | 1.487               | 0.070    | 0.981 | 908   | 678    | 2.395               | 0.160    | 0.975 | 450   |
| 054      | 1.045               | 0.039    | 0.937 | 1,452 | 679    | 1.804               | 0.109    | 0.971 | 549   |
| 056      | 1.186               | 0.055    | 0.936 | 932   | 681    | 1.009               | 0.065    | 0.928 | 475   |
| 057      | 0.792               | 0.028    | 0.876 | 1,613 | 682    | 0.700               | 0.042    | 0.923 | 543   |
| 058      | 1.102               | 0.044    | 0.936 | 1,247 | 683    | 0.852               | 0.068    | 0.945 | 314   |
| 061      | 0.676               | 0.026    | 0.891 | 1,327 | 684    | 1.061               | 0.056    | 0.931 | 723   |
| 062      | 1.413               | 0.065    | 0.963 | 954   | 685    | 0.777               | 0.048    | 0.909 | 525   |
| 071      | 0.623               | 0.025    | 0.777 | 1,230 | 686    | 0.916               | 0.057    | 0.943 | 516   |
| 073      | 0.633               | 0.029    | 0.895 | 959   | 689    | 0.693               | 0.044    | 0.926 | 501   |
| 074      | 0.562               | 0.029    | 0.873 | 750   | 691    | 2.046               | 0.116    | 0.973 | 624   |
| 075      | 0.656               | 0.025    | 0.964 | 1,364 | 692    | 1.647               | 0.078    | 0.995 | 882   |
| 081      | 1.107               | 0.046    | 0.928 | 1,147 | 693    | 1.977               | 0.106    | 0.953 | 696   |
| 091      | 1.072               | 0.061    | 0.959 | 624   | 694    | 2.139               | 0.147    | 0.926 | 421   |
| 098      | 1.297               | 0.062    | 0.979 | 883   | 695    | 1.877               | 0.117    | 0.961 | 518   |
| 111      | 1.186               | 0.064    | 0.982 | 686   | 696    | 1.977               | 0.122    | 0.915 | 528   |
| 112      | 1.253               | 0.063    | 0.906 | 792   | 697    | 1.900               | 0.095    | 0.934 | 795   |
| 121      | 0.756               | 0.034    | 0.960 | 1,005 | 699    | 1.375               | 0.081    | 0.955 | 583   |
| 122      | 1.132               | 0.058    | 0.970 | 758   | 711    | 1.801               | 0.133    | 0.971 | 369   |
| 211      | 0.926               | 0.036    | 0.930 | 1,351 | 712    | 1.636               | 0.140    | 0.979 | 273   |
| 212      | 0.839               | 0.038    | 0.953 | 956   | 713    | 2.287               | 0.178    | 0.988 | 329   |
| 222      | 0.801               | 0.043    | 0.905 | 683   | 714    | 1.631               | 0.125    | 0.981 | 340   |
| 223      | 0.625               | 0.025    | 0.916 | 1,290 | 716    | 2.710               | 0.163    | 0.972 | 552   |
| 232      | 0.664               | 0.042    | 0.767 | 497   | 718    | 1.355               | 0.097    | 0.971 | 391   |
| 233      | 1.588               | 0.109    | 0.957 | 423   | 721    | 1.789               | 0.117    | 0.985 | 470   |
| 244      | 0.659               | 0.076    | 0.765 | 152   | 722    | 1.959               | 0.151    | 0.957 | 336   |
| 245      | 0.784               | 0.042    | 0.922 | 699   | 723    | 1.784               | 0.116    | 0.993 | 470   |
| 246      | 0.870               | 0.055    | 0.964 | 507   | 724    | 1.575               | 0.138    | 0.921 | 260   |
| 247      | 0.642               | 0.030    | 0.868 | 903   | 725    | 1.381               | 0.119    | 0.897 | 271   |
| 248      | 1.118               | 0.050    | 0.891 | 1,013 | 726    | 1.467               | 0.133    | 0.935 | 243   |
| 251      | 1.047               | 0.073    | 0.874 | 412   | 727    | 1.798               | 0.120    | 0.936 | 452   |
| 261      | 0.605               | 0.053    | 0.863 | 264   | 728    | 2.400               | 0.181    | 0.954 | 353   |



| Table B3 | 3-digit trade flows |          |       |       |        | 3-digit trade flows |          |       |       |
|----------|---------------------|----------|-------|-------|--------|---------------------|----------|-------|-------|
| sector   | estimate            | st error | fit   | # obs | sector | estimate            | st error | fit   | # obs |
| 263      | 0.645               | 0.027    | 0.889 | 1,153 | 736    | 1.924               | 0.144    | 0.909 | 357   |
| 264      | 0.394               | 0.035    | 0.859 | 248   | 737    | 1.332               | 0.104    | 0.978 | 329   |
| 265      | 0.620               | 0.038    | 0.828 | 535   | 741    | 2.543               | 0.172    | 0.970 | 438   |
| 266      | 1.847               | 0.113    | 0.977 | 538   | 742    | 2.542               | 0.182    | 0.961 | 391   |
| 268      | 0.555               | 0.037    | 0.880 | 457   | 743    | 2.555               | 0.194    | 0.901 | 348   |
| 269      | 1.109               | 0.070    | 0.990 | 502   | 744    | 1.952               | 0.130    | 0.984 | 452   |
| 271      | 0.439               | 0.030    | 0.839 | 436   | 745    | 1.633               | 0.138    | 0.913 | 281   |
| 273      | 1.480               | 0.065    | 0.976 | 1,023 | 749    | 2.921               | 0.199    | 0.941 | 430   |
| 274      | 0.852               | 0.067    | 0.921 | 326   | 751    | 1.869               | 0.146    | 0.921 | 326   |
| 277      | 0.641               | 0.038    | 0.960 | 555   | 752    | 1.767               | 0.143    | 0.971 | 307   |
| 278      | 0.994               | 0.044    | 0.909 | 1,008 | 759    | 1.536               | 0.143    | 0.956 | 232   |
| 281      | 0.709               | 0.048    | 0.903 | 442   | 761    | 1.484               | 0.101    | 0.894 | 428   |
| 282      | 1.288               | 0.072    | 0.986 | 646   | 762    | 1.270               | 0.100    | 0.839 | 324   |
| 286      | 0.496               | 0.061    | 0.898 | 132   | 764    | 2.116               | 0.152    | 0.962 | 386   |
| 287      | 0.661               | 0.028    | 0.863 | 1,132 | 771    | 1.953               | 0.118    | 0.972 | 551   |
| 288      | 1.264               | 0.056    | 0.989 | 1,032 | 772    | 1.926               | 0.118    | 0.992 | 531   |
| 289      | 0.723               | 0.046    | 0.935 | 490   | 773    | 1.549               | 0.084    | 0.973 | 676   |
| 291      | 1.022               | 0.038    | 0.962 | 1,472 | 774    | 1.673               | 0.142    | 0.973 | 279   |
| 292      | 1.054               | 0.038    | 0.962 | 1,507 | 775    | 2.343               | 0.143    | 0.955 | 534   |
| 322      | 0.935               | 0.072    | 0.865 | 340   | 776    | 1.301               | 0.097    | 0.953 | 361   |
| 323      | 0.963               | 0.076    | 0.958 | 325   | 778    | 2.625               | 0.165    | 0.984 | 504   |
| 333      | 1.052               | 0.053    | 0.757 | 776   | 781    | 2.460               | 0.217    | 0.811 | 258   |
| 334      | 1.067               | 0.043    | 0.924 | 1,206 | 782    | 1.977               | 0.158    | 0.949 | 314   |
| 335      | 1.012               | 0.053    | 0.971 | 734   | 783    | 1.374               | 0.088    | 0.974 | 493   |
| 341      | 0.909               | 0.064    | 0.885 | 404   | 784    | 3.420               | 0.277    | 0.906 | 304   |
| 351      | 1.026               | 0.069    | 0.967 | 441   | 785    | 1.472               | 0.113    | 0.946 | 339   |
| 411      | 0.983               | 0.062    | 0.943 | 498   | 786    | 1.823               | 0.113    | 0.984 | 524   |
| 423      | 0.971               | 0.064    | 0.978 | 456   | 791    | 1.359               | 0.094    | 0.965 | 416   |
| 424      | 0.788               | 0.034    | 0.890 | 1,085 | 792    | 1.498               | 0.130    | 0.943 | 267   |
| 431      | 1.258               | 0.074    | 0.972 | 578   | 793    | 0.991               | 0.062    | 0.957 | 517   |
| 511      | 1.949               | 0.135    | 0.965 | 417   | 812    | 2.105               | 0.113    | 0.977 | 688   |
| 512      | 1.543               | 0.094    | 0.990 | 539   | 821    | 1.737               | 0.096    | 0.927 | 658   |
| 513      | 1.384               | 0.094    | 0.901 | 432   | 831    | 1.240               | 0.068    | 0.902 | 669   |
| 514      | 1.602               | 0.117    | 0.976 | 373   | 842    | 1.124               | 0.045    | 0.916 | 1,227 |
| 515      | 1.282               | 0.087    | 0.954 | 430   | 843    | 1.177               | 0.048    | 0.927 | 1,191 |
| 516      | 1.426               | 0.103    | 0.990 | 381   | 844    | 0.966               | 0.042    | 0.921 | 1,070 |
| 522      | 0.907               | 0.046    | 0.962 | 778   | 845    | 1.219               | 0.054    | 0.934 | 1,031 |
| 523      | 1.446               | 0.080    | 0.983 | 651   | 846    | 1.046               | 0.045    | 0.936 | 1,093 |
| 524      | 0.690               | 0.065    | 0.916 | 225   | 847    | 1.223               | 0.056    | 0.946 | 941   |
| 533      | 2.052               | 0.117    | 0.983 | 619   | 848    | 1.058               | 0.051    | 0.931 | 848   |
| 541      | 1.357               | 0.070    | 0.980 | 744   | 851    | 1.332               | 0.068    | 0.881 | 759   |
| 551      | 0.829               | 0.039    | 0.980 | 926   | 871    | 2.023               | 0.167    | 0.973 | 295   |
| 553      | 1.425               | 0.076    | 0.945 | 712   | 872    | 1.646               | 0.119    | 0.975 | 384   |
| 554      | 1.342               | 0.065    | 0.977 | 850   | 874    | 2.068               | 0.151    | 0.981 | 374   |

| Table B3 | 3-digit trade flows |          |       |       |        | 3-digit trade flows |          |       |         |
|----------|---------------------|----------|-------|-------|--------|---------------------|----------|-------|---------|
| sector   | estimate            | st error | fit   | # obs | sector | estimate            | st error | fit   | # obs   |
| 562      | 1.124               | 0.054    | 0.952 | 863   | 881    | 1.869               | 0.160    | 0.981 | 273     |
| 582      | 2.151               | 0.178    | 0.950 | 291   | 882    | 2.462               | 0.202    | 0.955 | 298     |
| 583      | 2.291               | 0.157    | 0.943 | 428   | 883    | 0.917               | 0.050    | 0.976 | 671     |
| 584      | 2.120               | 0.150    | 0.982 | 399   | 884    | 1.316               | 0.096    | 0.966 | 376     |
| 591      | 1.576               | 0.094    | 0.942 | 566   | 885    | 0.945               | 0.076    | 0.872 | 311     |
| 592      | 1.312               | 0.077    | 0.972 | 581   | 892    | 1.618               | 0.087    | 0.984 | 696     |
| 598      | 2.247               | 0.156    | 0.963 | 414   | 893    | 2.093               | 0.113    | 0.980 | 690     |
| 611      | 0.919               | 0.043    | 0.920 | 924   | 894    | 1.189               | 0.076    | 0.947 | 492     |
| 612      | 0.933               | 0.046    | 0.962 | 826   | 895    | 2.211               | 0.137    | 0.922 | 522     |
| 613      | 0.956               | 0.058    | 0.914 | 547   | 896    | 1.083               | 0.065    | 0.970 | 561     |
| 621      | 2.360               | 0.147    | 0.960 | 518   | 897    | 1.103               | 0.062    | 0.949 | 637     |
| 625      | 2.030               | 0.116    | 0.946 | 609   | 898    | 1.690               | 0.124    | 0.988 | 373     |
| 628      | 1.279               | 0.084    | 0.929 | 469   | 899    | 1.413               | 0.077    | 0.968 | 675     |
| 634      | 1.134               | 0.052    | 0.945 | 956   | 931    | 1.177               | 0.060    | 0.962 | 776     |
| 635      | 1.350               | 0.061    | 0.974 | 987   | 941    | 0.807               | 0.031    | 0.947 | 1,349   |
| 641      | 1.072               | 0.090    | 0.898 | 286   | 951    | 1.457               | 0.146    | 0.891 | 199     |
| 642      | 1.595               | 0.075    | 0.957 | 900   | 971    | 0.802               | 0.049    | 0.877 | 526     |
| 651      | 1.346               | 0.062    | 0.962 | 940   | 999    | 0.808               | 0.041    | 0.799 | 777     |
| 652      | 1.306               | 0.056    | 0.963 | 1,072 | all    | 0.928               | 0.003    | 0.991 | 142,231 |

| Table B3 | 4-digit trade flows |          |       |       |        | 4-digit trade flows |          |       |       |
|----------|---------------------|----------|-------|-------|--------|---------------------|----------|-------|-------|
| sector   | estimate            | st error | fit   | # obs | sector | estimate            | st error | fit   | # obs |
| 0011     | 0.873               | 0.049    | 0.966 | 640   | 6413   | 1.064               | 0.082    | 0.887 | 337   |
| 0012     | 0.559               | 0.032    | 0.923 | 606   | 6415   | 1.264               | 0.087    | 0.965 | 426   |
| 0013     | 1.017               | 0.092    | 0.887 | 243   | 6416   | 1.128               | 0.066    | 0.941 | 580   |
| 0014     | 0.992               | 0.060    | 0.941 | 554   | 6417   | 1.246               | 0.078    | 0.960 | 517   |
| 0015     | 0.940               | 0.062    | 0.948 | 466   | 6418   | 1.137               | 0.090    | 0.905 | 321   |
| 0019     | 0.485               | 0.034    | 0.969 | 403   | 6419   | 1.658               | 0.120    | 0.955 | 380   |
| 0111     | 0.846               | 0.045    | 0.853 | 705   | 6421   | 1.107               | 0.051    | 0.946 | 949   |
| 0112     | 0.713               | 0.050    | 0.916 | 402   | 6424   | 1.743               | 0.089    | 0.966 | 773   |
| 0113     | 1.154               | 0.090    | 0.930 | 327   | 6428   | 1.860               | 0.103    | 0.952 | 654   |
| 0114     | 1.190               | 0.085    | 0.842 | 396   | 6512   | 1.098               | 0.062    | 0.946 | 626   |
| 0115     | 0.818               | 0.060    | 0.878 | 366   | 6514   | 2.122               | 0.125    | 0.947 | 572   |
| 0116     | 0.993               | 0.070    | 0.859 | 400   | 6517   | 1.596               | 0.100    | 0.958 | 511   |
| 0118     | 0.869               | 0.044    | 0.948 | 770   | 6519   | 1.034               | 0.048    | 0.957 | 926   |
| 0121     | 0.799               | 0.078    | 0.915 | 210   | 6521   | 0.952               | 0.044    | 0.925 | 932   |
| 0129     | 0.836               | 0.052    | 0.986 | 519   | 6522   | 1.356               | 0.064    | 0.955 | 892   |
| 0142     | 1.098               | 0.070    | 0.897 | 497   | 6531   | 1.457               | 0.089    | 0.912 | 539   |
| 0149     | 1.003               | 0.055    | 0.921 | 659   | 6539   | 1.618               | 0.096    | 0.978 | 565   |
| 0223     | 1.507               | 0.114    | 0.908 | 348   | 6542   | 1.134               | 0.078    | 0.951 | 419   |
| 0224     | 1.119               | 0.075    | 0.954 | 444   | 6549   | 0.693               | 0.048    | 0.962 | 420   |
| 0251     | 1.043               | 0.063    | 0.924 | 541   | 6552   | 0.764               | 0.057    | 0.984 | 359   |
| 0252     | 1.155               | 0.076    | 0.937 | 460   | 6571   | 1.547               | 0.119    | 0.957 | 338   |
| 0341     | 0.775               | 0.032    | 0.960 | 1,172 | 6573   | 1.943               | 0.137    | 0.933 | 404   |
| 0342     | 0.728               | 0.029    | 0.939 | 1,276 | 6575   | 0.913               | 0.041    | 0.961 | 1,012 |

| Table B3 | 4-digit trade flows |          |       |       |        | 4-digit trade flows |          |       |       |
|----------|---------------------|----------|-------|-------|--------|---------------------|----------|-------|-------|
| sector   | estimate            | st error | fit   | # obs | sector | estimate            | st error | fit   | # obs |
| 0343     | 0.675               | 0.034    | 0.942 | 779   | 6577   | 1.604               | 0.106    | 0.966 | 457   |
| 0344     | 0.604               | 0.030    | 0.947 | 822   | 6581   | 0.783               | 0.038    | 0.982 | 843   |
| 0371     | 0.759               | 0.033    | 0.946 | 1,056 | 6583   | 1.054               | 0.052    | 0.865 | 820   |
| 0372     | 0.727               | 0.036    | 0.978 | 802   | 6584   | 1.075               | 0.049    | 0.966 | 979   |
| 0411     | 0.895               | 0.077    | 0.945 | 267   | 6589   | 1.364               | 0.065    | 0.968 | 872   |
| 0412     | 1.124               | 0.107    | 0.847 | 222   | 6591   | 1.150               | 0.094    | 0.990 | 297   |
| 0421     | 0.546               | 0.034    | 0.903 | 512   | 6592   | 0.869               | 0.047    | 0.967 | 683   |
| 0422     | 0.617               | 0.036    | 0.838 | 585   | 6611   | 1.097               | 0.073    | 0.976 | 451   |
| 0451     | 0.981               | 0.097    | 0.910 | 206   | 6612   | 0.900               | 0.038    | 0.907 | 1,102 |
| 0452     | 0.936               | 0.082    | 0.888 | 263   | 6613   | 1.018               | 0.078    | 0.814 | 337   |
| 0459     | 0.800               | 0.064    | 0.972 | 314   | 6618   | 1.380               | 0.072    | 0.993 | 734   |
| 0481     | 0.932               | 0.056    | 0.958 | 561   | 6623   | 1.354               | 0.108    | 0.938 | 314   |
| 0483     | 1.093               | 0.060    | 0.980 | 673   | 6624   | 1.440               | 0.098    | 0.917 | 436   |
| 0484     | 1.472               | 0.074    | 0.973 | 788   | 6631   | 1.462               | 0.108    | 0.968 | 364   |
| 0488     | 1.318               | 0.077    | 0.977 | 586   | 6632   | 1.924               | 0.144    | 0.904 | 358   |
| 0541     | 0.787               | 0.042    | 0.965 | 686   | 6633   | 1.646               | 0.107    | 0.996 | 470   |
| 0542     | 0.762               | 0.033    | 0.928 | 1,086 | 6638   | 1.870               | 0.121    | 0.975 | 476   |
| 0544     | 0.700               | 0.047    | 0.900 | 437   | 6664   | 1.541               | 0.097    | 0.937 | 501   |
| 0545     | 1.049               | 0.040    | 0.971 | 1,381 | 6665   | 1.521               | 0.103    | 0.950 | 433   |
| 0546     | 1.225               | 0.065    | 0.923 | 717   | 6666   | 1.250               | 0.082    | 0.934 | 467   |
| 0561     | 1.153               | 0.059    | 0.880 | 770   | 6672   | 0.746               | 0.043    | 0.850 | 591   |
| 0565     | 1.118               | 0.054    | 0.935 | 851   | 6674   | 0.784               | 0.041    | 0.928 | 719   |
| 0571     | 0.712               | 0.042    | 0.843 | 578   | 6712   | 0.896               | 0.062    | 0.930 | 412   |
| 0572     | 0.778               | 0.043    | 0.902 | 653   | 6713   | 0.788               | 0.065    | 0.972 | 291   |
| 0574     | 0.852               | 0.057    | 0.878 | 453   | 6716   | 0.652               | 0.037    | 0.944 | 623   |
| 0575     | 0.688               | 0.044    | 0.913 | 485   | 6724   | 0.940               | 0.068    | 0.963 | 383   |
| 0577     | 0.713               | 0.032    | 0.927 | 978   | 6725   | 1.172               | 0.067    | 0.980 | 606   |
| 0579     | 0.656               | 0.025    | 0.906 | 1,421 | 6731   | 1.262               | 0.074    | 0.993 | 578   |
| 0583     | 1.006               | 0.044    | 0.954 | 1,030 | 6732   | 1.482               | 0.083    | 0.977 | 639   |
| 0585     | 0.983               | 0.043    | 0.985 | 1,043 | 6733   | 1.366               | 0.088    | 0.966 | 483   |
| 0586     | 0.953               | 0.048    | 0.946 | 780   | 6748   | 1.192               | 0.146    | 0.960 | 133   |
| 0589     | 0.965               | 0.046    | 0.868 | 870   | 6749   | 1.301               | 0.173    | 0.966 | 113   |
| 0611     | 0.596               | 0.027    | 0.854 | 981   | 6781   | 1.407               | 0.110    | 0.946 | 326   |
| 0612     | 0.884               | 0.044    | 0.938 | 818   | 6782   | 1.727               | 0.135    | 0.964 | 329   |
| 0616     | 0.827               | 0.042    | 0.862 | 760   | 6783   | 2.024               | 0.127    | 0.970 | 505   |
| 0619     | 0.790               | 0.033    | 0.883 | 1,161 | 6785   | 2.653               | 0.166    | 0.979 | 511   |
| 0711     | 0.613               | 0.025    | 0.779 | 1,235 | 6793   | 1.446               | 0.112    | 0.977 | 335   |
| 0712     | 0.793               | 0.051    | 0.896 | 480   | 6794   | 1.721               | 0.108    | 0.926 | 511   |
| 0741     | 0.555               | 0.029    | 0.868 | 710   | 6811   | 0.864               | 0.052    | 0.928 | 545   |
| 0742     | 0.531               | 0.068    | 0.681 | 121   | 6812   | 0.903               | 0.097    | 0.898 | 172   |
| 0752     | 0.688               | 0.047    | 0.952 | 422   | 6821   | 0.604               | 0.039    | 0.907 | 486   |
| 0811     | 1.175               | 0.073    | 0.965 | 519   | 6822   | 1.625               | 0.101    | 0.969 | 516   |
| 0812     | 0.874               | 0.040    | 0.916 | 973   | 6831   | 0.762               | 0.062    | 0.923 | 304   |
| 0813     | 0.921               | 0.045    | 0.904 | 826   | 6832   | 1.986               | 0.169    | 0.927 | 276   |

| Table B3 | 4-digit trade flows |          |       |       |        | 4-digit trade flows |          |       |       |
|----------|---------------------|----------|-------|-------|--------|---------------------|----------|-------|-------|
| sector   | estimate            | st error | fit   | # obs | sector | estimate            | st error | fit   | # obs |
| 0814     | 0.662               | 0.040    | 0.902 | 558   | 6841   | 0.814               | 0.048    | 0.876 | 568   |
| 0819     | 1.612               | 0.092    | 0.984 | 617   | 6842   | 1.550               | 0.086    | 0.975 | 654   |
| 1121     | 1.011               | 0.071    | 0.868 | 404   | 6851   | 0.752               | 0.048    | 0.893 | 496   |
| 1123     | 1.218               | 0.069    | 0.923 | 623   | 6852   | 1.248               | 0.087    | 0.969 | 407   |
| 1124     | 0.957               | 0.054    | 0.905 | 637   | 6861   | 0.884               | 0.056    | 0.932 | 494   |
| 1211     | 0.694               | 0.032    | 0.951 | 922   | 6863   | 1.056               | 0.073    | 0.952 | 420   |
| 1212     | 0.717               | 0.035    | 0.968 | 844   | 6899   | 0.725               | 0.089    | 0.980 | 134   |
| 1213     | 0.746               | 0.039    | 0.974 | 748   | 6931   | 1.696               | 0.099    | 0.955 | 592   |
| 1222     | 1.101               | 0.065    | 0.981 | 576   | 6935   | 1.461               | 0.080    | 0.952 | 675   |
| 1223     | 0.815               | 0.045    | 0.917 | 661   | 6951   | 1.142               | 0.059    | 0.970 | 743   |
| 2111     | 1.122               | 0.052    | 0.935 | 916   | 6953   | 1.589               | 0.104    | 0.989 | 463   |
| 2112     | 0.866               | 0.048    | 0.962 | 659   | 6954   | 1.707               | 0.120    | 0.965 | 405   |
| 2117     | 0.661               | 0.037    | 0.928 | 641   | 6973   | 1.497               | 0.085    | 0.941 | 613   |
| 2119     | 0.655               | 0.024    | 0.912 | 1,539 | 6974   | 1.693               | 0.089    | 0.940 | 730   |
| 2222     | 0.780               | 0.082    | 0.887 | 181   | 6991   | 2.004               | 0.140    | 0.898 | 411   |
| 2223     | 0.505               | 0.031    | 0.900 | 522   | 6992   | 1.927               | 0.132    | 0.956 | 423   |
| 2224     | 0.691               | 0.039    | 0.941 | 641   | 6996   | 2.129               | 0.115    | 0.956 | 682   |
| 2225     | 0.503               | 0.030    | 0.896 | 548   | 6997   | 1.657               | 0.095    | 0.940 | 607   |
| 2226     | 0.642               | 0.036    | 0.948 | 644   | 6998   | 1.851               | 0.110    | 0.992 | 564   |
| 2232     | 0.455               | 0.029    | 0.871 | 501   | 6999   | 1.137               | 0.070    | 0.993 | 525   |
| 2234     | 0.648               | 0.069    | 0.956 | 178   | 7133   | 1.699               | 0.139    | 0.884 | 298   |
| 2235     | 0.587               | 0.044    | 0.815 | 361   | 7139   | 2.188               | 0.170    | 0.987 | 332   |
| 2238     | 0.588               | 0.024    | 0.925 | 1,227 | 7149   | 1.404               | 0.190    | 0.968 | 109   |
| 2331     | 1.552               | 0.109    | 0.951 | 408   | 7188   | 1.483               | 0.106    | 0.980 | 392   |
| 2332     | 1.323               | 0.081    | 0.986 | 531   | 7211   | 1.688               | 0.101    | 0.963 | 560   |
| 2471     | 0.943               | 0.067    | 0.946 | 400   | 7212   | 2.030               | 0.155    | 0.932 | 342   |
| 2472     | 0.527               | 0.026    | 0.824 | 810   | 7213   | 0.890               | 0.078    | 0.840 | 260   |
| 2479     | 0.589               | 0.039    | 0.968 | 448   | 7219   | 1.673               | 0.115    | 0.976 | 426   |
| 2481     | 0.721               | 0.047    | 0.937 | 470   | 7234   | 1.512               | 0.181    | 0.996 | 140   |
| 2482     | 1.098               | 0.071    | 0.838 | 472   | 7243   | 1.802               | 0.141    | 0.932 | 325   |
| 2483     | 0.747               | 0.032    | 0.874 | 1,070 | 7247   | 1.413               | 0.130    | 0.931 | 237   |
| 2511     | 1.732               | 0.110    | 0.978 | 495   | 7248   | 1.329               | 0.124    | 0.966 | 231   |
| 2512     | 0.924               | 0.068    | 0.852 | 370   | 7251   | 1.061               | 0.092    | 0.944 | 266   |
| 2516     | 0.902               | 0.085    | 0.909 | 227   | 7252   | 1.296               | 0.141    | 0.953 | 169   |
| 2517     | 0.912               | 0.071    | 0.845 | 333   | 7259   | 1.403               | 0.116    | 0.935 | 294   |
| 2518     | 0.982               | 0.082    | 0.774 | 290   | 7263   | 1.188               | 0.127    | 0.959 | 175   |
| 2613     | 0.599               | 0.069    | 0.777 | 149   | 7269   | 1.161               | 0.120    | 0.969 | 187   |
| 2614     | 0.684               | 0.051    | 0.919 | 357   | 7272   | 2.249               | 0.255    | 0.953 | 155   |
| 2681     | 0.529               | 0.041    | 0.866 | 330   | 7281   | 1.733               | 0.151    | 0.903 | 264   |
| 2682     | 0.621               | 0.044    | 0.916 | 395   | 7283   | 1.721               | 0.115    | 0.976 | 449   |
| 2683     | 0.591               | 0.040    | 0.962 | 431   | 7284   | 2.426               | 0.192    | 0.910 | 319   |
| 2685     | 0.708               | 0.046    | 0.927 | 470   | 7361   | 2.088               | 0.171    | 0.908 | 298   |
| 2686     | 0.877               | 0.056    | 0.949 | 493   | 7369   | 1.748               | 0.146    | 0.986 | 288   |
| 2731     | 1.087               | 0.054    | 0.909 | 814   | 7371   | 1.675               | 0.134    | 0.990 | 311   |

| Table B3 | 4-digit trade flows |          |       |       |        | 4-digit trade flows |          |       |       |
|----------|---------------------|----------|-------|-------|--------|---------------------|----------|-------|-------|
| sector   | estimate            | st error | fit   | # obs | sector | estimate            | st error | fit   | # obs |
| 2732     | 1.355               | 0.072    | 0.981 | 713   | 7413   | 1.595               | 0.113    | 0.981 | 399   |
| 2733     | 1.162               | 0.078    | 0.948 | 444   | 7414   | 2.447               | 0.179    | 0.908 | 375   |
| 2771     | 0.550               | 0.038    | 0.918 | 415   | 7416   | 2.177               | 0.169    | 0.934 | 331   |
| 2772     | 1.011               | 0.072    | 0.961 | 399   | 7431   | 3.109               | 0.427    | 0.934 | 106   |
| 2782     | 0.888               | 0.053    | 0.936 | 572   | 7441   | 1.907               | 0.150    | 0.981 | 323   |
| 2783     | 0.842               | 0.041    | 0.967 | 835   | 7442   | 2.411               | 0.165    | 0.979 | 428   |
| 2784     | 0.674               | 0.060    | 0.884 | 250   | 7451   | 1.502               | 0.135    | 0.963 | 249   |
| 2785     | 0.826               | 0.049    | 0.886 | 559   | 7452   | 1.818               | 0.157    | 0.827 | 267   |
| 2786     | 0.868               | 0.072    | 0.913 | 288   | 7491   | 2.131               | 0.163    | 0.893 | 341   |
| 2789     | 0.982               | 0.047    | 0.956 | 877   | 7492   | 2.409               | 0.171    | 0.950 | 399   |
| 2814     | 0.565               | 0.057    | 0.867 | 198   | 7493   | 2.246               | 0.177    | 0.957 | 323   |
| 2815     | 0.639               | 0.046    | 0.908 | 386   | 7499   | 1.771               | 0.123    | 0.984 | 414   |
| 2816     | 0.761               | 0.058    | 0.889 | 345   | 7511   | 1.710               | 0.130    | 0.941 | 346   |
| 2871     | 0.636               | 0.041    | 0.924 | 474   | 7512   | 1.668               | 0.138    | 0.899 | 292   |
| 2872     | 0.568               | 0.053    | 0.883 | 226   | 7591   | 1.519               | 0.149    | 0.954 | 209   |
| 2873     | 0.415               | 0.030    | 0.789 | 392   | 7641   | 1.949               | 0.137    | 0.978 | 407   |
| 2874     | 0.610               | 0.040    | 0.917 | 464   | 7642   | 1.649               | 0.127    | 0.968 | 335   |
| 2875     | 0.632               | 0.041    | 0.921 | 474   | 7649   | 2.010               | 0.150    | 0.967 | 357   |
| 2876     | 0.506               | 0.036    | 0.854 | 385   | 7721   | 1.847               | 0.208    | 0.964 | 158   |
| 2879     | 0.708               | 0.033    | 0.922 | 902   | 7722   | 1.460               | 0.166    | 0.941 | 154   |
| 2881     | 1.076               | 0.056    | 0.990 | 751   | 7731   | 1.482               | 0.081    | 0.974 | 668   |
| 2882     | 1.253               | 0.055    | 0.986 | 1,021 | 7732   | 1.855               | 0.138    | 0.990 | 362   |
| 2911     | 0.759               | 0.028    | 0.947 | 1,463 | 7742   | 1.615               | 0.147    | 0.971 | 240   |
| 2919     | 1.025               | 0.045    | 0.959 | 1,052 | 7751   | 1.653               | 0.140    | 0.951 | 280   |
| 2922     | 0.591               | 0.028    | 0.927 | 898   | 7752   | 1.512               | 0.087    | 0.952 | 601   |
| 2924     | 0.789               | 0.032    | 0.916 | 1,232 | 7754   | 1.086               | 0.127    | 0.831 | 146   |
| 2925     | 1.160               | 0.061    | 0.924 | 718   | 7757   | 1.995               | 0.140    | 0.968 | 408   |
| 2926     | 1.094               | 0.076    | 0.888 | 419   | 7758   | 2.120               | 0.137    | 0.958 | 476   |
| 2927     | 0.857               | 0.051    | 0.949 | 575   | 7781   | 1.598               | 0.086    | 0.988 | 686   |
| 2929     | 0.909               | 0.038    | 0.957 | 1,166 | 7782   | 1.491               | 0.110    | 0.965 | 368   |
| 3221     | 0.915               | 0.071    | 0.863 | 334   | 7783   | 2.024               | 0.157    | 0.948 | 334   |
| 3224     | 1.092               | 0.106    | 0.914 | 211   | 7784   | 1.226               | 0.113    | 0.903 | 234   |
| 3231     | 0.774               | 0.072    | 0.954 | 229   | 7788   | 1.675               | 0.118    | 0.984 | 403   |
| 3232     | 1.051               | 0.084    | 0.966 | 314   | 7821   | 1.927               | 0.159    | 0.914 | 295   |
| 3341     | 1.070               | 0.048    | 0.951 | 995   | 7822   | 1.360               | 0.128    | 0.976 | 227   |
| 3343     | 0.956               | 0.044    | 0.930 | 956   | 7831   | 1.430               | 0.093    | 0.974 | 470   |
| 3344     | 0.964               | 0.043    | 0.931 | 1,018 | 7849   | 3.282               | 0.278    | 0.895 | 278   |
| 3345     | 1.215               | 0.063    | 0.977 | 756   | 7852   | 1.481               | 0.117    | 0.955 | 323   |
| 3351     | 1.181               | 0.092    | 0.941 | 328   | 7912   | 0.971               | 0.185    | 0.949 | 55    |
| 3352     | 0.903               | 0.059    | 0.961 | 471   | 7925   | 1.111               | 0.229    | 0.920 | 47    |
| 3353     | 0.966               | 0.067    | 0.985 | 419   | 7928   | 1.149               | 0.152    | 0.985 | 114   |
| 3354     | 0.990               | 0.062    | 0.989 | 516   | 7932   | 1.141               | 0.147    | 0.917 | 121   |
| 3359     | 0.698               | 0.056    | 0.946 | 306   | 8121   | 2.148               | 0.161    | 0.863 | 357   |
| 4111     | 0.628               | 0.042    | 0.917 | 444   | 8122   | 1.312               | 0.067    | 0.990 | 775   |

| Table B3 | 4-digit trade flows |          |       |       |        | 4-digit trade flows |          |       |       |
|----------|---------------------|----------|-------|-------|--------|---------------------|----------|-------|-------|
| sector   | estimate            | st error | fit   | # obs | sector | estimate            | st error | fit   | # obs |
| 4113     | 1.083               | 0.086    | 0.921 | 317   | 8124   | 1.798               | 0.113    | 0.949 | 509   |
| 4232     | 0.846               | 0.063    | 0.966 | 366   | 8212   | 1.444               | 0.143    | 0.980 | 203   |
| 4239     | 1.502               | 0.118    | 0.935 | 322   | 8219   | 1.430               | 0.130    | 0.982 | 243   |
| 4241     | 0.549               | 0.058    | 0.860 | 180   | 8421   | 1.074               | 0.047    | 0.938 | 1,040 |
| 4243     | 0.542               | 0.037    | 0.828 | 422   | 8422   | 0.969               | 0.044    | 0.953 | 950   |
| 4249     | 0.771               | 0.036    | 0.905 | 931   | 8423   | 0.943               | 0.040    | 0.905 | 1,124 |
| 4313     | 1.187               | 0.083    | 0.962 | 407   | 8429   | 1.111               | 0.047    | 0.922 | 1,123 |
| 4314     | 0.677               | 0.036    | 0.918 | 689   | 8431   | 1.113               | 0.050    | 0.922 | 1,005 |
| 5111     | 1.668               | 0.247    | 0.937 | 91    | 8432   | 1.092               | 0.050    | 0.955 | 964   |
| 5112     | 1.668               | 0.246    | 0.938 | 92    | 8433   | 1.061               | 0.047    | 0.960 | 1,022 |
| 5119     | 1.668               | 0.247    | 0.937 | 91    | 8434   | 1.078               | 0.047    | 0.915 | 1,034 |
| 5121     | 1.407               | 0.084    | 0.991 | 559   | 8441   | 0.939               | 0.042    | 0.917 | 1,017 |
| 5123     | 1.600               | 0.125    | 0.960 | 326   | 8442   | 0.942               | 0.044    | 0.895 | 911   |
| 5157     | 0.696               | 0.072    | 0.984 | 188   | 8451   | 1.127               | 0.053    | 0.960 | 910   |
| 5161     | 1.585               | 0.143    | 0.982 | 246   | 8452   | 1.112               | 0.054    | 0.926 | 839   |
| 5162     | 1.683               | 0.118    | 0.974 | 408   | 8459   | 1.160               | 0.053    | 0.907 | 958   |
| 5169     | 0.960               | 0.065    | 0.980 | 437   | 8461   | 1.046               | 0.046    | 0.925 | 1,050 |
| 5221     | 1.593               | 0.099    | 0.951 | 516   | 8463   | 0.625               | 0.046    | 0.963 | 371   |
| 5222     | 0.718               | 0.046    | 0.937 | 482   | 8465   | 0.841               | 0.043    | 0.962 | 774   |
| 5224     | 1.533               | 0.113    | 0.988 | 365   | 8471   | 1.180               | 0.059    | 0.960 | 794   |
| 5225     | 0.804               | 0.044    | 0.962 | 679   | 8472   | 1.128               | 0.055    | 0.944 | 832   |
| 5231     | 1.530               | 0.086    | 0.972 | 626   | 8481   | 0.953               | 0.051    | 0.920 | 710   |
| 5239     | 1.082               | 0.071    | 0.962 | 465   | 8482   | 1.148               | 0.075    | 0.934 | 473   |
| 5331     | 1.651               | 0.106    | 0.974 | 487   | 8483   | 0.878               | 0.050    | 0.944 | 626   |
| 5334     | 1.905               | 0.102    | 0.973 | 704   | 8484   | 1.265               | 0.072    | 0.934 | 616   |
| 5411     | 1.185               | 0.101    | 0.962 | 277   | 8741   | 1.293               | 0.078    | 0.987 | 556   |
| 5413     | 1.398               | 0.091    | 0.983 | 475   | 8745   | 1.611               | 0.120    | 0.975 | 360   |
| 5414     | 1.037               | 0.063    | 0.947 | 536   | 8748   | 2.058               | 0.164    | 0.982 | 316   |
| 5415     | 0.916               | 0.068    | 0.969 | 365   | 8749   | 1.637               | 0.127    | 0.985 | 335   |
| 5416     | 1.009               | 0.068    | 0.981 | 441   | 8811   | 1.449               | 0.127    | 0.895 | 260   |
| 5417     | 1.466               | 0.079    | 0.977 | 695   | 8813   | 1.619               | 0.170    | 0.954 | 181   |
| 5419     | 1.702               | 0.103    | 0.989 | 549   | 8822   | 2.524               | 0.210    | 0.966 | 288   |
| 5513     | 0.826               | 0.039    | 0.980 | 912   | 8841   | 1.705               | 0.152    | 0.925 | 252   |
| 5542     | 1.298               | 0.063    | 0.977 | 836   | 8842   | 1.070               | 0.078    | 0.968 | 376   |
| 5543     | 1.386               | 0.080    | 0.981 | 598   | 8851   | 0.863               | 0.071    | 0.856 | 292   |
| 5621     | 0.967               | 0.050    | 0.965 | 740   | 8852   | 1.421               | 0.108    | 0.897 | 347   |
| 5622     | 0.628               | 0.041    | 0.931 | 473   | 8921   | 1.532               | 0.090    | 0.987 | 573   |
| 5623     | 0.905               | 0.086    | 0.933 | 224   | 8922   | 2.082               | 0.134    | 0.949 | 486   |
| 5629     | 1.119               | 0.066    | 0.953 | 575   | 8925   | 0.808               | 0.079    | 0.920 | 208   |
| 5921     | 1.172               | 0.076    | 0.940 | 480   | 8928   | 1.248               | 0.069    | 0.969 | 649   |
| 5922     | 1.256               | 0.076    | 0.971 | 546   | 8931   | 1.748               | 0.087    | 0.975 | 806   |
| 5981     | 0.931               | 0.063    | 0.936 | 443   | 8939   | 1.984               | 0.114    | 0.982 | 602   |
| 5989     | 2.307               | 0.172    | 0.972 | 359   | 8942   | 1.156               | 0.083    | 0.931 | 388   |
| 6113     | 0.790               | 0.102    | 0.910 | 120   | 8946   | 1.366               | 0.092    | 0.975 | 439   |

| Table B3 |          | 4-digit trade flows |       |       |        | 4-digit trade flows |          |       |         |
|----------|----------|---------------------|-------|-------|--------|---------------------|----------|-------|---------|
| sector   | estimate | st error            | fit   | # obs | sector | estimate            | st error | fit   | # obs   |
| 6114     | 0.828    | 0.077               | 0.961 | 232   | 8947   | 0.919               | 0.060    | 0.959 | 464     |
| 6282     | 1.917    | 0.121               | 0.973 | 505   | 8981   | 1.562               | 0.123    | 0.957 | 325     |
| 6289     | 1.102    | 0.077               | 0.925 | 415   | 8982   | 1.761               | 0.154    | 0.953 | 263     |
| 6341     | 0.802    | 0.037               | 0.939 | 925   | 8983   | 1.631               | 0.120    | 0.991 | 371     |
| 6342     | 1.000    | 0.054               | 0.942 | 697   | 8991   | 0.849               | 0.049    | 0.965 | 591     |
| 6343     | 1.255    | 0.075               | 0.959 | 566   | 8996   | 1.320               | 0.110    | 0.903 | 290     |
| 6351     | 1.067    | 0.057               | 0.939 | 711   | 8997   | 1.156               | 0.054    | 0.950 | 920     |
| 6353     | 1.199    | 0.062               | 0.932 | 746   | 8998   | 1.798               | 0.109    | 0.970 | 547     |
| 6359     | 1.210    | 0.056               | 0.980 | 921   | 8999   | 0.966               | 0.070    | 0.891 | 386     |
| 6411     | 1.085    | 0.107               | 0.751 | 207   | 9999   | 0.800               | 0.040    | 0.803 | 783     |
| 6412     | 1.079    | 0.076               | 0.932 | 400   | all    | 0.869               | 0.003    | 0.991 | 221,430 |