Data Appendix
"Large Devaluations and the Real Exchange Rate"
by A. Burstein, M. Eichenbaum and S. Rebelo
April 2005

In this appendix we describe our data sources and key steps in the analysis of our data. Additional material including our data and replication material for tables and figures in the paper are available at: http://www.econ.ucla.edu/arielb/AdditionalMaterialLargeDevJPE.html

1. Argentina

- CPI

  - Source: Instituto Nacional de Estadisticas y Censos (INDEC)
  - Measured in Buenos Aires
  - Weights: 1991-04: 1988-based-index (based on 1985-86 household expenditure survey) , 2001-03: 1999-based-index (based on 1996-7 household expenditure survey)
  - Non-tradables: Food-out, Food away from home, Apparel services, Housing (Rent, Fuel and utilities, Other expenses), Household operations, Medical care services, Public Transportation, Communication, Tourism, Flowers, plants, and animal care, Other recreation services, Personal care services, Other services.
  - Price of goods potentially controlled by the government: index produced by Ministerio de Economia.
  - Disaggregated prices according to their import and export content: 818 CPI items, divided into goods and services, classification into 6 categories made by Indec (imported, exportable, mixed origin, with imported inputs, with exportable inputs, local goods).

- Import and export prices

  - Source: (INDEC), Imported products in producer wholesale price index.
  - Consumer import prices: "Índices de valor, precio y cantidad de las importaciones por uso económico, base 1993=100", Index, quarterly frequency.
  - Monthly export prices are not available.

- Input-output table

  - Source: Ministerio de Economia
  - Year: 1997

2. Brazil

- CPI

  - Source: Instituto Brasileiro de Geografia e Estatistica (IBGE), and International Financial Statistics (IFS).

  - Measured in Rio de Janeiro, Porto Alegre, Belo Horizonte, Recife, São Paulo, Belém, Fortaleza, Salvador e Curitiba, Distrito Federal and Goiânia.

  - Weights and sub-index categories were updated in August 1999. We obtained the index for the whole sample period from the IFS. The official CPI index and the one we compute using tradable and non-tradable categories differ by 1%.

  - Weights: Based on 1995-1996 household expenditure survey.

  - Non-tradables: Food away from home, Housing (Rent, Maintenance expenses, Electricity), Public Transportation, "Atendimento", Medical Services, Personal Services, Recreation, Education.

  - Price of goods potentially controlled by the government: constructed using prices of Housing public services, Tuition, Public Transportation, Postal services, and Pay-phones.

- Import and export prices

  - Source: Fundação Centro de Estudos do Comércio Exterior (FUNCEX).

  - Dollar prices, converted into local currency using dollar nominal exchange rate.

  - Consumer import prices: simple average of durable and nondurable consumption import prices.

- Input-output table

  - Not available.

  - We compute the import share in consumption using national accounts data. Direct import content = Imported consumption / Private consumption, Total import content = Total Imports / Final Demand.

  - We report the average between 1997 and 1999.

  - Source: IBGE and FUNCEX.

3. Korea

- CPI

  - Source: Korea National Statistical Office (KNSO).

  - Measured in 36 major cities.

- Weights: Based on the 1995 household expenditure survey.

- Non-tradables: Food out, Housing less materials, Household services, Medical care less medicines, less medical appliances, Education and culture, less stationary, less culture and recreation durables, Transport and communication less private transport, Miscellaneous goods and services less toilet, less cigarettes.

- Price of goods potentially controlled by the government: Electric charges, Water charge, Sewage disposal charge, Doctor's fee, Hospitalization charges, National university, College tuition, Graduate school tuition, Public high school tuition, Public middle school tuition, Kindergarten fee, Preparatory school fee (1 subject), Preparatory school fee (multi subjects), Newspaper, Local bus (adult), Local bus (student), Local bus (express), Cross country bus fare, Intercity highway fare, Taxi fare, 3rd class train, 2nd class train, 1st class train, Subway fee, Domestic flight fee, Airport fee, International fee, Lubricating fee, Parking fee, Express road pass fee, Basic call rates, Local call rates, Long distance call rates, Public phone charges, Domestic postage, Oversea postage, Public bath fee

- Import and export prices

  - Source: KNSO

- Input-output table

  - Source: KNSO
  - Year: 1995

4. Mexico

- CPI

  - Source: Banco de Mexico
  - Measured in 46 cities
  - Weights: Published in 1994, based on 1989 household expenditure survey. For the period 1988-1994 we also use those weights.
  - Non-tradables: Services price index, Education price index, Administered and Concerted price index less fuel (all prepared by Bank of Mexico).
  - Housing (for 1988-1994 period): The expenditure weight is the sum of "Owners' equivalent rent of primary residence" and "Rent". For the price series we use the housing rent index from the CPI (the owners' equivalent rent of primary residence index was only introduced in the CPI in January 1995).
  - Price of goods potentially controlled by the government: Electricity, Local phone-call, Long distance phone-call, International phone-call, Taxi fare, Public bus, Automobile tax, Education (kindergarten, elementary, high school, university).

- Import and export prices

  - Source: Banco de Mexico.
  - Dollar prices, converted into local currency using dollar nominal exchange rate.

- Input-output table

  - Source: Banco de Mexico
  - Year: 1990

- GDP and Consumption

  - Source: Bank de Mexico

5. Thailand

- CPI

  - Source: Bank of Thailand
  - Measured in urban areas in 37 provinces
  - Disaggregated index to construct price of tradables and non-tradables not available.

- Import and export prices

  - Source: Bank of Thailand

- Input-output table

  - Not available.
  - Calculated import share in consumption using trade data and NIPA. Total import share is consumer imported goods + imported intermediate goods for consumer goods / consumption.
  - We report the average of 1996 and 1997.
  - Source: Bank of Thailand

6. Finland

- CPI

  - Source: Bank of Finland
  - To construct P^T and P^N we used the price index and weights of goods and services that the Bank of Finland provides, based on data from the ECB.
  - Weights: provided by the Bank of Finland, based on "Monthly review of major macroeconomic, financial and monetary developments", ECB.

- Import and export prices

  - Source: IFS

- Input-output table

  - Source: OECD
  - Year: 1995

- GDP and Consumption

  - Source: OECD

7. Italy

- CPI

  - Source: Bank of Italy
  - P^N is the services price index, and P^T is the weighted average of Unprocessed food, Processed Food, Energy, Non-energy industrial goods, and Tobacco. We used 1992 weights for these categories.

- Import and export prices

  - Source: IFS, and Bank of Italy.
  - All prices are unit values.
  - Aggregate monthly prices are from IFS, and disaggregated prices are produced by Bank of Italy.

- Input-output table

  - Source: OECD
  - Year: 1992

- GDP and Consumption

  - Source: OECD

8. Sweden

- CPI

  - Source: Statistics Sweden, IFS
  - Weights: Computed by Statistics Sweden using data from National Accounts, Household Budget Surveys, and National Agricultural Survey. We use the weights from the year 2000.
  - Non-tradables: Owner-occupied housing: Water and dwelling services, Electricity, Rented and housing co-operative dwellings: rent including heating, Imputed rent for owner occupiers, Household maintenance, Outpatient services, Operation of vehicles, Transport services, Postal services, Telephone services and equipment, Recreational and cultural services, Catering services, Accommodation services, Other services n.e.c.

- Import and export prices

  - Source: Statistics Sweden

- Input-output table

  - Source: Statistics Sweden
  - Year: 1995

- GDP and Consumption

  - Source: Statistics Sweden

9. UK

- CPI

  - Source: National Statistics Online (consumer price index, and NOT retail price index), IFS
  - To construct P^T and P^N we use the price index and weights of goods and services produced by National Statistics.
  - The weighted average of P^T and P^N do not exactly add up to the official CPI reported in the IFS. We use the latter as our measure of the overall CPI.

- Import and export prices

  - Source: IFS

- Input-output table

- – Source: OECD
- – Year: 1998

- GDP and Consumption

  - – Source: OECD

10. U.S.

- CPI

  - – Source: Bureau of Labor Statistics (BLS)
  - – The P^T and P^N measures used for the large appreciation RER decompositions, were the commodity and services price indices. When we studied the Mexican devaluation we also used the rent of shelter price index.
  - – Weights: In Table 3 we report the weight of 'commodities' in the CPI, in December 1997.

- Import and export prices

  - – Source: BLS

- Input-output table

  - – Source: Bureau of Economic Analysis (BEA)
  - – Year: 1997

11. Export and import price deflators

- Countries: Argentina, Brazil, Indonesia, Korea, Malaysia, Mexico, Philippines, Thailand, and Uruguay.

- We constructed annual export and import price deflators using nominal and real export and import values obtained from United Nation's Statistical database.

- Table 2 also reports annual trade weighted exchange rates and CPI inflation obtained from the IFS.

12. Other data

- Nominal exchange rates: IFS, period average.

13. Price data for 'small-exchange-rate-fluctuations' countries

- Source: IFS

- We used import and export price indices when possible, and unit values when price indices are not available.

- When import price indices were available, and export price indices weren't, we assumed that the export price index is equal to the import price index. This is the case for Denmark, Argentina

- In a few cases, we corrected spurious entries in the IFS series. In the case of level jumps in a variable x (Mexico, CPI 19771Q1, Netherlands, IPI and EPI 1997Q1), we define a new variable y, such that $y(T) = x(T)$, $y(T + 1) = y(T)$, and $y(T + t) = y(T+t-1)*x(T+t)/x(T+t-1)$. In the case of outliers without a level jump, (Canada, IPI and EPI 1981Q1), we simply take the average of the observations immediately before and after.

14. Trade-weights

- The trade share of country i from country j is 0.5 exports$_j^i$ / exports^i + 0.5 imports$_j^i$ / imports^i , where exports^i and imports^i denote total exports and imports of country i, exports$_j^i$ denotes exports of country i to country j, and imports$_j^i$ denotes imports of country i from country j.

- For each country, we obtain import and export data from the IMF's Direction of Trade Statistics.

- For the 'small-exchange-rate-fluctuations' countries, export and import shares are computed as simple averages using annual data from 1980 to 2002. For each country we chose the set of 20 countries with which this country has the highest trade share. We then eliminated those countries for which we do not have import and export price indices. The remaining 17 countries are: Australia, Canada, Denmark, Finland, Germany, Greece, Italy, Japan, Korea, Mexico, Netherlands, Spain, Sweden, Switzerland, United Kingdom, USA, and Venezuela.

- For the large and medium devaluation countries (except for Italy and UK, where we use the same weights as above), export and import shares were computed as simple averages using annual data from three years prior to the devaluation. For each country under study, we chose the set of countries that are the largest trading partners for which we have price data.

15. Argentina supermarket survey

- We collected weekly prices for 58 goods and 10 services between March 27 and December 24, 2002.

– Good prices collected in eight supermarkets (total of 546 items).

– Each service price was collected from one or two locations (total of 17 items).

• Goods:

– apples, aspirin, bananas, band-aid, batteries, bedsheets, Big Mac, bic pen, bleach, blue jeans, bottled beer, bread, cereal, chicken, chocolate, chocolate biscuit, cigarettes, coffee, color film, computer mouse, cooking oil, two types of deodorant, diapers, diesel, diskettes, dulce de leche (a local desert), eggs, filet mignon, flour, gasoline, hake (an ocean fish), herbal tea (yerba mate), leather shoes, light bulb, mayonnaise, milk, microwave, mineral water, music CD, ossobucco, polenta, potatoes, printer, printer paper, printer toner, recordable CD, rice, shampoo, shaving blades, soft drink, spaghetti, sugar, television, toothpaste, veal scallops, wine, and writing paper.

• Services:

– bus fare, haircut, movie theater, newspaper, parking, payphone, stamp, taxi, train fare, and video rental.

• An item is a type of brand and size collected in a given supermarket. For example, cooking oil, Cocinero brand, bottle, 1.5 liters, in Disco supermarket.

• A brand/size groups all items of the same brand and size within a product category. For example, cooking oil, Cocinero brand, bottle, 1.5 liters.

• We deleted those items for which we have prices for less than 25% of the weeks. There are 518 remaining items for goods, and 17 for services.

• The number of brand/sizes, and supermarkets within a brand/size, varies across product categories and brand/sizes. For example, we have 7 brand/size of cooking oil collected in 8 supermarkets (not all items were collected in the 8 supermarkets).

• We computed the frequency of price adjustment for each item as the number of weeks with a price change relative to the precious period divided by the number of weeks for which we have data for that item. The duration for an individual item is 1/frequency. We also computed the frequency and duration of price increases and decreases. We aggregate the weekly data into a monthly frequency as follows. A monthly price change for an individual item takes place when the price level changes during that month, relative to the previous observed price level for that item (which might not necessarily belong to the same month).

• We are now more specific at how we defined the frequencies and durations for each item. At weekly frequency, we define, for each item j and each week w, the following

9

variables:

$$DEN_{j,w} = \begin{cases} 1 & \text{if } P_{j,w} \text{ and } P_{j,w-1} \text{ are observed} \\ 0 & \text{otherwise} \end{cases}$$

$$NUM_{j,w} = \begin{cases} 1 & \text{if } DEN_{j,w} = 1 \text{ and } P_{j,w} \neq P_{j,w-1} \\ 0 & \text{otherwise} \end{cases}$$

The frequency of price changes for item j is

$$F_j = \frac{\sum_{w=1}^{W} NUM_{w,t}}{\sum_{w=1}^{W} DEN_{w,t}} \;,$$

where W is the number of weeks.

- The associated duration for item j is $1/F_j$. Whenever $F_j = 0$, we replaced the implied duration by the number of periods the price of the item was observed before aggregating at the category level, thus obtaining a lower bound on category durations.

- We aggregated the frequencies and durations at the product category level using two methods: (1) taking a simple average of the frequency and duration across brand/sizes within a product category, and (2) taking a simple average across all items within a product category (without first aggregating into brand/sizes). The frequency and duration of each brand/size were computed as a simple average of the frequency and duration across items of a brand/size. The results obtained using these two methods are very similar. We report in table 9 only results based on method (2).

- To aggregate weekly into monthly observations, we define a new weekly variable

$$\widehat{NUM}_{j,w} = \begin{cases} 1 & \text{if } P_{j,w} \neq P_{j,w-t}, \text{ where } t \text{ is smallest integer such that } P_{j,w-t} \text{ is observed} \\ 0 & \text{if } P_{j,w} = P_{j,w-t}, \text{ where } t \text{ is smallest integer such that } P_{j,w-t} \text{ is observed} \\ NaN & \text{otherwise} \end{cases}$$

We define a monthly indicator of price change

$$NUM_{j,m} = \max_{w \in W_m} \left\{ \widehat{NUM}_{j,w} \right\} \;,$$

where W_m is the set of all weeks pertaining to month m. Note that $NUM_{j,m} = NaN$ whenever $\widehat{NUM}_{j,w} = NaN$ for all weeks in a month. The monthly frequency for item j is then

$$F_j = \frac{\sum_{m=1}^{M} NUM_{j,m}}{\sum_{m=1}^{M} 1_{NUM_{j,m} \neq NaN}} \;,$$

where $1_{NUM_{j,m} \neq NaN}$ denotes the indicator function which takes a value equal to one when $NUM_{j,m} \neq NaN$ and zero otherwise, and M is the number of months.

16. Argentina CCR data

- CCR in Argentina does not allow us to disseminate the raw data.

- The data can be purchased by contacting Pablo Mateu, Director de Cuentas, CCR Market Knowledge, Blanco Encalada 3202, Buenos Aires, Argentina, 4546-7100.

17. The Economist Intelligence Unit Data

- For each large devaluation country, we study the response of prices in the largest city of that country. These are: Buenos Aires in Argentina, Sao Paulo in Brazil, Mexico City in Mexico, Seoul in South Korea, Bangkok in Thailand. Price are collected in September of each year, in low and high price outlets.

- We choose the set of items whose price was sampled at least 2 years after the devaluation. Given this constraint, the set of items can differ across countries. We group items into 4 categories: Clothing, durables, food, and other miscellaneous goods. The list of items in Brazil, is as follows:

- Clothing: Business suit, two piece, medium weight, Tights, panty hose, Child's jeans, Child's shoes, dresswear, Child's shoes, sportswear, Girl's dress, Boy's jacket, smart, Boy's dress trousers, Business shirt, white, Men's shoes, business wear, Socks, wool mixture, Dress, ready to wear, daytime, Women's shoes, town, Women's cardigan sweater.

- Durables: Electric toaster (for two slices), Compact disc album, Television, color (66 cm), Low-priced car (900-1,299 cc), Compact car (1300-1799 cc), Family car (1800-2499 cc), Deluxe car (2500 cc upwards).

- Food: White bread, 1 kg, Yoghurt, natural (150 g), Milk, pasteurized (1 l), Olive oil (1 l), Peanut or corn oil (1 l), Potatoes (2 kg), Onions (1 kg), Mushrooms (1 kg), Tomatoes (1 kg), Carrots (1 kg), Oranges (1 kg), Butter, 500 g, Apples (1 kg), Lemons (1 kg), Bananas (1 kg), Lettuce (one), Eggs (12), Peas, canned (250 g), Tomatoes, canned (250 g), Peaches, canned (500 g), Sliced pineapples, canned (500 g), Beef: filet mignon (1 kg), Margarine, 500 g, Beef: steak, entrecote (1 kg), Beef: stewing, shoulder (1 kg), Beef: roast (1 kg), Beef: ground or minced (1 kg), White rice, 1 kg, Pork: chops (1 kg), Pork: loin (1 kg), Ham: whole (1 kg), Bacon (1 kg), Chicken: frozen (1 kg), Chicken: fresh (1 kg), Frozen fish fingers (1 kg), Fresh fish (1 kg), Instant coffee (125 g), Ground coffee (500 g), Spaghetti (1 kg), Tea bags (25 bags), Cocoa (250 g), Drinking chocolate (500 g), Coca-Cola (1 l), Tonic water (200 ml), Mineral water (1 l), Orange juice (1 l), Flour, white (1 kg), Sugar, white (1 kg), Cheese, imported (500 g), Cornflakes (375 g).

- Other miscellaneous goods: Batteries (two, size D/LR20), Razor blades (five pieces), Toothpaste with fluoride (120 g), Facial tissues (box of 100), Hand lotion (125 ml), Shampoo & conditioner in one (400 ml), Lipstick (deluxe type), Kodak color film (36 exposures), Paperback novel (at bookstore), Cost of six tennis balls e.g. Dunlop,

Wilson, Frying pan (Teflon or good equivalent), Soap (100 g), Laundry detergent (3 l), Toilet tissue (two rolls), Dishwashing liquid (750 ml), Insect-killer spray (330 g), Light bulbs (two, 60 watts), Aspirins (100 tablets).

- We computed a price index for each category in each country. These are computed as weighted averages of price indices for each item in the product category, where price indices are normalized to 1 in the year of the devaluation. Weights for each item are computed as follows.

- Each item was matched to an item in the US CPI. The US CPI weight of December 2002 was then assigned to each item. There are cases of more than 1 item matched to one US CPI item. In this case, the US CPI weight was divided by the number of items in the EUI category.

- The prices indices that we constructed from the Economist Intelligence Unit were then compared with the official CPI in each country. We chose the set of goods or index categories in each country that most resembles the set of goods in The Economist's dataset. We weighted the items or categories using the official CPI weights (described above).

- The set of items in each country are as follows:

    - Argentina: Food and beverages at home, Apparel and clothing, Household appliances and equipment, Household cleaning products, Medical care products, New motor vehicles for personal use, Audio, computing, and video equipment, Newspapers, magazines and book, Personal care products, Stationery.

    - Brazil: Men's apparel, Women's apparel, Infant's apparel, Footwear, Food at home, Household cleaning products, Personal care products, Furniture and bedding, Household appliances and equipment, Audio, computing, and video equipment, New motor vehicles for personal use, Medical care products.

    - Korea: Food, Clothing and footwear, Medicines, Stationery, Newspaper & books, Culture, recreation durables, Passenger car, Personal care, Household appliances, Household miscellaneous expenses.

    - Mexico: Apparel, Footwear, Household appliances and accessories, Household cleaning products, Medical care products, Personal care products, New motor vehicles, Newspapers and magazines, Recreational products.

    - Thailand: Food, Clothing.

18. Computing Import Shares from Input-output Tables

Suppose there are $n-1$ domestic intermediate goods, and an imported good. There are two final goods: consumption, and another good which is the sum of investment, government expenditures, and exports. The final goods are produced using the $n-1$ domestic intermediate goods and the imported good. The $n \ x \ 1$ vectors C and F correspond to expenditures on each domestic intermediate good in the production of the two final goods. The nth row

in C and F is the value of imports in the production of each final good. Each domestic intermediate good is produced using a combination of domestic intermediate goods and the imported good. Vector T represents the total use of each domestic intermediate good and imported good that is required to produce both final goods. Matrix A represents the amount of each domestic intermediate good and imported good used to produce T. For example, element (i, j) denotes the expenditure on domestic intermediate good i to produce 1 dollar of good j. The nth column of A consists of all 0's because imported goods are not produced using domestic intermediate goods.

The direct import content in consumption is given by $[0_{1,n-1}\ 1]\, C\ /\ 1_{1,n}C$.

To compute the total import content we define: $B = (I_n - A)^{-1}$. The total import content is given by $[0_{1,n-1}\ 1]\, BC\ /\ 1_{1,n}C$.

Note that we making the standard assumption that the import content of intermediate inputs is the same no matter what component of final demand it is used for. We make this assumption because we do not have information about the input-output structure for each individual component of final demand. In some cases it is possible that the import content is higher for intermediate inputs that are used to produce investment or export goods. This might explain why the total import content in consumption is so high in Korea. Specifically, we could be attributing to consumption some imports that are actually used to produce investment and export final goods.

Appendix. - A-2 -. Data Analysis, Statistics, and Probability. Glossary, cont'd. cumulative frequency Cumulative frequency speci-fies how many data values are of a particular number or smaller. For example, in the data set {1, 1, 2, 2, 3, 3, 4, 4, 4, 5, 26}, the cumulative frequency for the value 4 is nine, since there are nine values in the set that are 4 or less. The cumulative frequency for the value 2 is four; the cumulative frequency for the value 26 is 11; and so on. An appendix is a supplementary section of an APA format paper. Learn what you should include and how you should format your appendices. The APA official stylebook suggests that the appendix should include information that would be distracting or inappropriate in the text of the paper. Some examples of information you might include in an appendix include: Raw data (presented in an organized, readable format). Extended or detailed descriptions. Demographic details about participants or groups. Appendix: Data sets used in the tutorials. Where to find what you need: Guide to R: Home. Downloads: R tutorial scripts and data files. 1. The California Test Score Data Set. The data used here are from all 420 K-6 and K-8 districts in California with data available for 1998 and 1999. Test scores are the average of the reading and math scores on the Stanford 9 standardized test administered to 5th grade students.