

Korea

WP1:Inter-industry Accounts

1. NA data

A. Nominal

◦ Sources:

- National Accounts from the Bank of Korea (BOK). The dataset contains gross output, intermediate consumption, value-added, and the components of value-added (all at current prices) for the period of 1970-2005 at the 78-industry level.
- Unpublished BOK 397-industry level data for gross output obtained for the period of 1970-2005

◦ Comments:

- For the breakdown of 78 industries to 72 EUKLEMS industries, we have used weights based on BOK internal data for 397-industry gross output.
- For the period of 1970-1994, some industries are not separated in the 397-industry gross output data: (322,323), (351,353), (51,52), (60-63), (65-67) based on 2000 Korean SIC. For the breakdown of these industries except for transportation industries (60-63) has been made using weights obtained from the IO tables of Korea. For transportation industries (60-63), we have used information in the Report on the Transport Survey published by Korea National Statistical Office (NSO).

B. Volume

◦ Sources:

- National Accounts contain gross output and value added at constant prices for the period 1970-2005 at 78-industry level.
- Unpublished BOK 397-industry data for gross output at constant price.

◦ Comments: See Nominal.

2. SUT data

A. Nominal

◦ Sources:

- National Accounts (1987, 1994, 1999, 2004) from BOK reports annual series (1985-2002) of real Use Tables (U-Tables).
- The Bank of Korea has also published Input-Output Tables (commodity-by-commodity) since 1960.

◦ **Comments:**

- Since the Bank of Korea reports real Use (U) Tables, nominal Use Tables should be generated for obtaining nominal intermediate input shares, which are used in estimating total factor productivity. Following Timmer (2005), we have used the commodity prices to nominalize all uses of the commodities under the assumption that the same commodity has the same price whichever industry uses it.

$$P_{ij}^X = P_i^C \quad \text{for all } j$$

where P_{ij}^X denotes a price index for intermediate input of commodity i in industry j , and P_i^C denotes a price index of commodity i . The commodity prices (P_i^C) we have used are the weighted averages of domestic and imported commodity prices, since the Use Tables cannot be separated into domestic and imported Use Tables to apply separated prices. Producer's Price Index (PPI) has been used as a proxy for domestic commodity prices (P_i^D), and Imported Price Index (CIF) has been used as imported commodity prices (P_i^{IM}). Even though PPI is not purchaser's price for the lack of transportation and trade margins, it is a reasonable proxy for domestic commodity price index.

• **B. Volume:**

◦ **Sources:**

- National Accounts (1987, 1994, 1999, 2004) reports annual series (1985-2002) of real Use Tables (U-Tables).
- The Bank of Korea has also published Input-Output Tables (commodity-by-commodity) since 1960.

◦ **Comments:**

- Extra detailed decomposition had to be made by making use of Use Tables and Input-output Tables. In addition to real and nominal gross output and both nominal and real value-added at basic prices, real and nominal intermediate inputs at purchase prices can be obtained from Use Tables. In the case of Use Tables before 1995, all the intermediate commodity inputs by industry are measured at purchase prices. Since

1995, those inputs have been measured at incomplete basic prices in the sense that those inputs include trade and transportation margins but isolate net production tax to the last row of intermediate input matrix. So, we have changed the Use Tables after 1995 into Use Tables at purchase price by allocating net production tax to each commodity proportional to each volume.

- While Use Tables for 1985-1994 are in 1995 prices, those for 1995-2002 are in 2000 prices. Therefore, we have converted the former into Use Tables in 2000 prices by using implicit GDP deflators. For the years 1970-1984 we have used the 1985 tables as benchmark tables, and for the years 2003-2005 we have used the 2002 tables.
- The Bank of Korea has also published Input-Output Tables (commodity-by-commodity) since 1960. Its most recent 2003 Input-Output Table is the 20th Table. Input-Output Tables are used to decompose commodities to 72 categories. For example, the table for 2000 has 28, 77, 168, 404 commodities in large, medium, small, and basic classifications, respectively. We have annual series of each industry's gross output, value-added, intermediate input, and so on. However, because we do not have annual series of each commodity's data in Input-Output Tables, we have applied the interpolation method between existing tables and normalized them to the National Accounts data.

WP2: Labour Accounts

1. Employment

- **Sources:**

- Economically Active Population(EAP) Yearbook from National Statistical Office
- Survey Report on Wage Structure (SRWS) from the Ministry of Labour
- Mining and Manufacturing Census and Survey from National Statistical Office
- Employment Table (supporting table to Input-Output Tables) from the Bank of Korea

- **Methods:**

- Aggregate employment from Korean NSO (primarily Economically Active Population Survey). Estimates for detailed employment (EMP and EMPE) based on monthly business survey data. For the breakdown of employment into the 72 EUKLEMS industries, we have used the raw data file of Survey Report on Wage Structure that contains detailed industry data at the 3-digit level except for 1971-1974 (4-digit level) and 2001-2005 (2-digit level). There are breaks in industry classification in 1993 due to the industry

reclassification in 1991 (and applied to SRWS in 1993 and after) as well as in 2001 due to change in the level of industry classification from 3-digit to 2-digit level. We have used Mining and Manufacturing Census and Survey (5-digit level) to correct discontinuity in the Mining and Manufacturing sector for the period 1970-1992 and 2001-2005. To correct discontinuity in the service sector, ad hoc methods have been used. To calculate number of persons engaged for some detailed industries, compensation and Employment Table (supporting table to IO Tables) are also used.

- **Comments:**

- Survey Report on Wage Structure is not available in 1970, 1975, and 1977. Data in 1971, 1976, and 1978 are used for missing years, respectively.
- Employment Tables supporting to Input-Output Tables exist in every 5 year (1975-2000). We used employment numbers in 1975 for 1970-1974 and in 2000 for 2001-2005.

2. Hours

- **Sources:**

- Economically Active Population(EAP) Yearbook from National Statistical Office
- Survey Report on Wage Structure (SRWS) from the Ministry of Labour
- Mining and Manufacturing Census and Survey from National Statistical Office
- Employment Table (supporting table to Input-Output Tables) from the Bank of Korea

- **Methods:**

- We calibrated time series of hours worked per person for each of the sub-industries using raw data file of Survey Report on Wage Structure. Then we got total hours by persons engaged multiplying average hour by the persons engaged. Because we used same weight sources, total hours by employed persons are calculated by same method as above.

- **Comments:**

- Annual hours worked per employee (including overtime) in some industries reach up to 3,500 hours. These high numbers are not measurement errors, but actually exist.

3. Labor Composition

- **Employment (or Hours)**

- **Sources:**

- Survey Report on Wage Structure from the Ministry of Labour

- **Methods:**

- The data are classified by two types of gender (Male and Female), three types of age (below 30, 30-49, and 50 or above), and three types of education (middle school or under, high school, college or above) and, therefore, there is a total of 18 categories of labor. We construct labor composition data for 15 industries (For the lower level we assume the same composition as the higher level).
- After calculating share in the 18-categories each year and each industry, we took average share of 1970-1976 as benchmark share for 1970, the average share of 1977-1985 for 1977, and the average share of 1986-1992 for 1986. Then we interpolated the shares for years in the three periods, (1971-1976), (1978-1985), and (1987-1992). In contrast to the earlier period, the data for 1993-2005 shows stability, thus we stopped using interpolation for that period.
- Since agriculture, forestry, and fishing sector is missing the Survey Report on Wage Structure for the period of 1984-1998, we interpolated the missing years using 1983 and 1999 data for this primary sector. Since the share of women in this primary sector and mining industries is not stable, we applied labor composition of males to that of females. There are other exceptional cases in selecting benchmark year because of instability in some industries such as (34 to 37), (40 to 41) and (71 to 74) based on 72 EUKLEMS industry codes

◦ ***Comments:***

- Korean educational system consists of (i) elementary school (6 years), (ii) middle school (3 years), (iii) high school or some vocational schools (3 years), (iv) Junior College (2 years) or College (4 years). In the Wage Structure Survey, elementary school graduates cannot be distinguishable from middle school graduates. 2-year junior college graduates also cannot be distinguishable from 4-year college graduates.

• **Compensation**

◦ ***Sources:***

- Survey Report on Wage Structure from the Ministry of Labour

◦ ***Methods:*** We calibrated compensation share for each year and each industry using the same way of calculation of hour share.

WP3: Capital Accounts

1. Main sources for GFCF

- National Accounts from the Bank of Korea: gross fixed capital formation (GFCF) in current prices and in constant prices for the period of 1970-2005 by 13 industries and by 7 types of goods.
- Fixed Capital Formation Matrix (FCFM) in the Input-output Supporting Tables by the Bank of Korea in 1990, 1995, 2000 and 2003 reports 98-asset by 71-industry.
- National Wealth Survey (NWS) in 1968, 1977, 1987, and 1997 as weights for further decomposition of GFCF by National Accounts. NWS 1977 as a single benchmark estimate of net stock for applying possible perpetual inventory method.

2. Methods: (for estimating industry * asset)

- Current GFCF: For the construction of the GFCF-matrix we relied on investment data by the National Statistical Office of Korea in current prices for the period 1970-2005. The NSO of Korea provided GFCF for 7 assets and 13 industries separately. We have used the Fixed Capital Formation Matrices (FCFM) and the National Wealth Surveys (NWS) for several years to redistribute the 7 asset types to 11 assets, thereby further distinguishing between Computing Equipment, Communications Equipment and Other Machinery and Equipment (See 3. Definition of ICT Assets). Using a RAS procedure we estimated the GFCF matrix by asset and industry, based on the total GFCF data and the 2000 FCFM matrix. The 2000 FCFM was aggregated to fit the dimensions of the National Accounts GFCF data (13 industries, 11 assets). In addition, we moved part of Infrastructure from Public Administration and Defense (L) to Transport, Storage and Communications (I), which corresponded with the total investments for those industries. To prevent the resulting GFCF Matrix from deviating too much from the 2000 FCFM, which served as the RAS blueprint, we constraint the change in any cells' share in total investment by asset and industry to a factor 3.5. The resulting GFCF Matrix was further expanded to incorporate detail for Manufacturing (D), Wholesale and Retail Trade (G), Hotels and Restaurants (H), Transport, Storage and Communications (I) and Real Estate and Business Activities (K). We again employed a RAS procedure based on the 2000 FCFM matrix, aggregated to fit the minimum requirements of the EU KLEMS growth accounts. The two stage RAS procedure resulted in a 32 industry by 11 asset GFCF Matrix.
- Constant GFCF: We deflated the yearly 32 industry by 11 asset current GFCF Matrix by 11 asset-specific price deflators based on the GFCF data provided by the National Statistical Office of Korea.

3. Definition of ICT assets

- Following the OECD guidelines, we have selected three assets from the list of 98-asset in FCFM: (1) Computing Equipment consisting of electric computing equipment (main parts and accessory equipment) (2) Communication Equipment and (3) Software.

4. Initial capital stock:

- To estimate the initial capital stock in 1977, we have arranged National Wealth Survey (NWS) in 1977 into 11-asset by 32-industry. As an exception to the above, the initial stock for the Residential Structures was estimated by dividing the 1977 Investment by the standard EU KLEMS depreciation rate for this asset (0.0114).