

# Productivity Accounts 2014 release

Description of methodology and country notes for Korea

## Introduction

The 2014 database of Korea is taken from the Korea Industrial Productivity (KIP) database. It is based on 72 industries which cover the whole of the Korean economy. This new set of data covers the period 1970-2012 and presents various economic variables which facilitate both gross output growth accounting and value added growth accounting.

This source note proceeds as follows. Part I introduces the issues involved in overview of the data. Part II covers the country specific notes on construction issues and source data. Part III is the appendix which provides some tables.

## Part I General notes for the 2014 release

For Harmonization, the databases of Korea have in common with the following features.

- Period: 1970-2012
- Industrial classifications: 72 industries matched with the NACE Rev. 1 in the EU KLEMS
- Reference year for volume measures: 2000

## Part II Country specific notes: Korea

The source of this dataset of Korea is the Korea Industrial Productivity (hereafter, KIP) database (2014). The KIP 72-industry classification comes from the NACE Rev. 1 that is

used for establishment of the EU KLEMS classification. For convenience, we made this dataset of Korea based on the NACE Rev. 1. Table A.1 in Appendix shows the both classification of the NACE Rev. 1 and the KIP 72.

However, specific industries in Korea are not included in the dataset. In detail, (\_11) Extraction of crude petroleum and natural gas and services, (\_12) Mining of uranium and thorium ores, (\_334t5) other instruments, (\_37) Recycling, (\_70imp) Imputation of owner occupied rents, (\_Q) Extraterritorial organizations and bodies, are excluded, and then 66 industries are actually in the KIP database. In addition, the database does not include the entire time series for three industries: (\_353) Aircraft and space craft (1977-2012), (\_66) Insurance and pension funding (1977-2012), (\_67) Activities related to financial intermediation (1987-2012).

The KIP database constructs gross output and five types of production factors: capital (K), labor (L), energy (E), material (M), and services (S). We will describe formation of these series sequentially.

## **Output and Intermediate**

For output and intermediates, we utilize National Accounts<sup>1</sup> launched by Bank of Korea. National Accounts includes (nominal and real<sup>2</sup>) output and intermediates, compensation of employees and gross operating surplus at current prices. Note that those variables are based on 78-industry classification, including 34 manufacturing industries. Since some industries in this 78-industry classification do not match that of the KIP 72-industry, we use the internal data in Bank of Korea. Categorization of intermediates is also important issues in here because the KIP database is based on 72-industry classification. To subdivide intermediates into the energy (E), the material (M) and the services (S), we use U-table and the IO table. In detail, the energy (E) consists of intermediates from 6 sectors;

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<sup>1</sup> National Accounts are available at the Economic Data System of the Bank of Korea (<http://ecos.bok.or.kr>).

<sup>2</sup> This is established in terms of the basic price

(\_10) Mining of coal and lignite; extraction of peat, (\_11) Extraction of crude petroleum and natural gas and services, (\_12) Mining of uranium and thorium ores, (\_23) Coke, refined petroleum products and nuclear fuel, (\_40x) Electricity supply and (\_402) Gas supply.

Intermediates from (\_50)-(\_Q) are categorized as the services (S). The remainder of intermediates is defined as the materials (M).<sup>3</sup>

## **Labor**

To consider the heterogeneity of labor, labor input has an 18-type classification<sup>4</sup> followed by EU KLEMS suggestion. It is formed of 3 labor types which mean Educational attainment, Gender, Age. The contents of Educational attainment are divided into 3 categories (High, Medium and Low) and the specific descriptions of contents about Educational attainment can be confirmed at Table A.2 in Appendix. Gender has certainly 2 categories (Male, Female). The separation of Age is 3 categories 15-29, 30-49 and 50 and over.

For establishing labor data, we take two sources, Economically Activity Population Survey (hereafter, EAPS) and Survey on Labor Conditions by Employment Type (hereafter, SLCET). EAPS helps us to obtain the following variables: number of employees (EMPE), number of unemployed person and economically active population. In addition, we use SLCET for Total hours worked by compensation of employees (COMP), total hours worked by employees (H\_EMPE). Also, we use SLCET to distribute the number of employee to the KIP 72 industries since EAPS does not provide detailed industry level data.

For labor compensation, we employ the compensation of employees in National Account. In detail, we can obtain the labor's relative share by compensation of

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<sup>3</sup> If water supply is not separable from the electricity, gas, and water supply (E; EUKLMEs code), this should be indicated in the country source notes

<sup>4</sup> Note that since this direct division (into 18 types) is impossible in KIP's 72-industry, we conduct this 18-type division in 15-industry level.

employees/nominal gross output. Last note that for the industry (1) Agriculture, hunting, forestry and fishing, we assume the wage of self-employed and unpaid workers is 80% of the employee.

## **Capital**

Before describing the source of capital input data, we want to notify types of assets first. Assets are divided into 11 types which consist of ① Residential Structure, ② Non-residential structures, ③ Infrastructure, ④ Transport equipment, ⑤ Computing equipment, ⑥ Communications equipment, ⑦ Other machinery and equipment, ⑧ Products of agriculture and forestry, ⑨ other products, ⑩ Software and ⑪ Other intangibles.

Now, we introduce sources of variables focusing on capital stocks and depreciation rates. Since 1968, the Statistics Korea has conducted an economy-side National Wealth Survey (hereafter, NWS) four times since 1968. Korea is one of a few countries to have conducted economy-wide national wealth surveys at a regular interval. Since the first NWS was conducted in 1968, the surveys have been taken every ten years: 1977, 1987, and 1997. For the capital stock series in 1970-1997 we estimate capital stocks for each industry employing weights of 72-industry. The weights of 72-industry are constructed by considering two cases. First, we consider the case of years when the NWS is conducted (1968, 1977, 1987, 1997). Using deflators of gross fixed capital formation, we transform net assets in National Wealth into the real values by applying 2000 year based prices and sort these values in 72- industry. Second, for the remainder years (except for 1968, 1977, 1987, 1997) we apply the interpolation method with steady growth rate assumption.

For the series of capital stocks after 1997 (1998-2012), we estimate them using the PIM because the NWS has not been conducted since 1997. In detail, we first use deflators of gross fixed capital formation to transform 72-industry net assets in National Wealth in 1997. (2000 year based) Next, depreciated values of gross fixed capital formation in 1998-2012 are added in the adjusted assets. To estimate the gross fixed capital formation for each industry (72-industry based), we utilize the Mining and Manufacturing Survey, the IO table and NWS.

## Part III Appendix

[Table A.1 Industry classification: NACE Rev. 1 vs KIP 72]

NACE Rev. 1	Description	KIP 72 classification
TOT	<b>TOTAL ECONOMY</b>	
_1	.....Agriculture	1
_2	.....Forestry	2
_B	...FISHING	3
_10	.....Mining of coal and lignite; extraction of peat	4
_11	.....Extraction of crude petroleum and natural gas and services	5
_12	.....Mining of uranium and thorium ores	6
_13	.....Mining of metal ores	7
_14	.....Other mining and quarrying	8
_15	.....Food products and beverages	9
_16	.....Tobacco products	10
_17	..... <i>Textiles</i>	11
_18	..... <i>Wearing Apparel, Dressing And Dying Of Fur</i>	12
_19	.....Leather, leather products and footwear	13
_20	...WOOD AND PRODUCTS OF WOOD AND CORK	14
_21	.....Pulp, paper and paper products	15
_221	..... <i>Publishing</i>	16
_22x	..... <i>Printing and reproduction</i>	17
_23	.....Coke, refined petroleum products and nuclear fuel	18
_244	..... <i>Pharmaceuticals</i>	19
_24x	..... <i>Chemicals excluding pharmaceuticals</i>	20
_25	.....Rubber and plastics products	21
_26	...OTHER NON-METALLIC MINERAL PRODUCTS	22
_27	.....Basic metals	23
_28	.....Fabricated metal products	24
_29	...MACHINERY, NEC	25
_30	.....Office, accounting and computing machinery	26
_313	..... <i>Insulated wire</i>	27
_31x	..... <i>Other electrical machinery and apparatus nec</i>	28
_321	..... <i>Electronic valves and tubes</i>	29
_322	..... <i>Telecommunication equipment</i>	30
_323	..... <i>Radio and television receivers</i>	31
_331t3	..... <i>Scientific instruments</i>	32
_334t5	..... <i>Other instruments</i>	33
_34	.....Motor vehicles, trailers and semi-trailers	34
_351	..... <i>Building and repairing of ships and boats</i>	35
_353	..... <i>Aircraft and spacecraft</i>	36

<b>NACE Rev. 1</b>	<b>Description</b>	<b>KIP 72 classification</b>
_35x	..... <i>Railroad equipment and transport equipment nec</i>	37
_36	.....Manufacturing nec	38
_37	.....Recycling	39
_40x	.....Electricity supply	40
_402	.....Gas supply	41
_41	...WATER SUPPLY	42
_F	<b>CONSTRUCTION</b>	43
_50	.....Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	44
_51	.....Wholesale trade and commission trade, except of motor vehicles and motorcycles	45
_52	.....Retail trade, except of motor vehicles and motorcycles; repair of household goods	46
_H	...HOTELS AND RESTAURANTS	47
_60	.....Inland transport	48
_61	.....Water transport	49
_62	.....Air transport	50
_63	.....Supporting and auxiliary transport activities; activities of travel agencies	51
_64	...POST AND TELECOMMUNICATIONS	52
_65	.....Financial intermediation, except insurance and pension funding	53
_66	.....Insurance and pension funding, except compulsory social security	54
_67	.....Activities related to financial intermediation	55
_70imp	..... <i>Imputation of owner occupied rents</i>	56
_70x	..... <i>Other real estate activities</i>	57
_71	..... <i>Renting of machinery and equipment</i>	58
_72	..... <i>Computer and related activities</i>	59
_73	..... <i>Research and development</i>	60
_741t4	..... <i>Legal, technical and advertising</i>	61
_745t8	..... <i>Other business activities, nec</i>	62
_L	...PUBLIC ADMIN AND DEFENCE; COMPULSORY SOCIAL SECURITY	63
_M	...EDUCATION	64
_N	...HEALTH AND SOCIAL WORK	65
_90	.....Sewage and refuse disposal, sanitation and similar activities	66
_91	.....Activities of membership organizations nec	67
_921t2	..... <i>Media activities</i>	68
_923t7	..... <i>Other recreational activities</i>	69
_93	.....Other service activities	70
_P	...PRIVATE HOUSEHOLDS WITH EMPLOYED PERSONS	71
_Q	...EXTRA-TERRITORIAL ORGANIZATIONS AND BODIES	72

[Table A.2 : Educational attainment in Korea]

<b>Level</b>	<b>contents</b>
High	University/college and above
Medium	High school
Low	Less than middle school