Mixed Income in the Total Factor productivity, KLEMS Model.

Introduction

The main objective of this document is to articulate the mixed income of the System of national accounts of Mexico with the published results of the Total Factor productivity (TFP), KLEMS model. It is worth noting that the basis and range of the mixed income are mainly the Household unincorporated enterprises where the owner or the household members supply paid or unpaid labor, which is very similar to what is observed in the incorporated enterprises. For such reason and according to the system of national accounts 2008*: **"The balancing item is described as mixed income because it implicitly contains an element of remuneration for work done by the owner, or other members of the household, that cannot be separately identified from the return to the owner as entrepreneur". (Chapter 7 paragraph 7.9)***

In addition, regarding the mixed income, the SNA 2008 mentions that: ***"For unincorporated enterprises, it may not be possible to estimate compensation of employees, consumption of fixed capital and a return to capital separately in which case an estimate of mixed income, covering all these items, should be made".*** (***Chapter 6 paragraph 6.126);*** in this sense the possibility of disaggregating the mixed income was considered since we can identify some of it in the gross operating surplus less taxes on production, therefore a large share of labor income is registered on the gross operating surplus as capital gains.

On the other hand, employment is defined in the SNA 2008 as: ***"In order to be classified as employed, that is, either as an employee or self-employed, the person must be engaged in an activity that falls within the production boundary of the SNA" (Chapter 7, paragraph 7.29).*** Currently the total of labor income is related to the total number of employees, however this information does not show the income distribution within the total labor force. The SNA 2008 (Chapter 24, paragraph 24.37) says that: ***"For this purpose, the following types of household income need to be distinguished:***

a. ***Income accruing to the owners of household unincorporated enterprises with paid employees (employer´s mixed income);***
b. ***Income accruing to the owners of household unincorporated enterprises without paid employees (own-account workers mixed income);***
c. ***Compensation of employees;***
d. ***Property and transfer incomes."***

In this sense, the disaggregation of mixed income allows to identify separately the labor income from the capital income, since both have an important effect on the contribution of the productive factors within KLEMS model and thus on economic growth.

The task is to remove from the gross operating surplus less other taxes the labor income and then incorporate this income into total labor income by using a method that will be described next. It is important to mention that this operation does not affect the Gross Value Added, but it does affect the percentage structure of both capital and labor, since one is decreased while the other is increased respectively.

The labor income removed from the mixed income is attached to its respective labor force, this is to say, to the next categories of employment: own-account workers, employers and unpaid workers. We assume that employees do not generate mixed income.

Lastly, it is worth to mention that even though the SNA 2008 states that it may not be possible to separate the mixed income in both capital income and labor income, this document does separate mixed income based on methods and assumptions found outside both the methodological and conceptual framework of SNA 2008 and until now in the Total Factor Productivity KLEMS Model. Therefore, this effort is featured as an experimental exercise mostly for illustrative purposes to show that there are many methods and assumptions to treat the disaggregation of mixed income, thus the results obtained do not modify the official results published by the National Institute of Statistics and Geography (INEGI) within the System of National Accounts of Mexico.

Sources of information

The data used in this document corresponds to the published results of the total Factor Productivity KLEMS Model and to the results of the Institutional Sector Accounts, both are part of the System of National Accounts of Mexico. In addition, when required, the data was complemented with information from the National Employment and Occupation (Jobs) Survey: Encuesta Nacional de Ocupación y Empleo (ENOE).

Methodology

The methodology to disaggregate the mixed income, by identifying separately the labor income from the capital income, begins with the application of the methodology known as ***LABOR INCOME SHARE (LIS),***[1] that allows to make an imputation of the labor income accruing to the self-employed (own-account workers, employers and unpaid workers). The LIS method allows to estimate only the total labor income. From this total labor income, we subtracted the amount of remunerations of employees, and the result we assume, is the labor income within the mixed income. By knowing the part that corresponds to labor, we assume that what remains corresponds to capital and this remainder was added to the Gross operating surplus less other taxes. Finally, by adding the other taxes we obtained the disaggregation of mixed income between labor and capital. The sum of the new total labor income and the new Gross operating surplus is equal to the Gross value added published in the National accounts of Mexico.

The LIS methods used in the procedure explained before are the LIS5 and LIS6[2], the former suggests and adjustment based on the fact that even when we do not have information on labor income of the self-employed, it is likely that there could be data available on the labor force composition. By using this labor force data, the LIS5 method is the product of the average remuneration of

[1] Guerriero, Marta. "The Labour Share of Income around the World. Evidence from a Panel Dataset". Paper prepared for the fourth Economic Development International Conference of GREThA/GRES "Inequalities and Development: new challenges, new measurements?" University of Bordeaux, France, June 13-15, 2012

[2] Both formulas (LIS5 and LIS6) are based on: Guerriero, Op.cit.

employees times the total labor force, divided by the Gross Value Added, as it is shown in the next equation:

$$LIS5 = \frac{Average\ remuneration\ of\ employees * Total\ Labor\ Force}{Gross\ Value\ Added}$$

The latter (LIS6) assigns the average remunerations of employees to all of those workers that are self-employed but not classified as employers. This part of the labor force represents only those self-employed workers that generate mixed income, this is to say, equation LIS6 is different from equation LIS5 in the numerator, since it excludes employers from the labor force, as it is observed in the next equation:

$$LIS6 = \frac{Average\ remuneration\ of\ employees * (Total\ Labor\ Force - Employers)}{Gross\ Value\ Added}$$

Employing these rates, LIS5 and LIS6, as a percentage of the total labor income within gross value added, we applied the procedure described before to disaggregate the mixed income. Similarly, we proceeded to update the macroeconomic variables corresponding to the components of Gross Value Added: Remunerations of employees and the Gross operating surplus. It is worth to mention again that the adjustment made on the Gross operating surplus, on which the mixed income is included, was applied only to subtract the labor income share of the mixed income in order to add it to the total labor income. This adjustment diminishes the gross operating surplus and increases labor income in the same proportion without affecting the Gross Value Added.

To obtain the number of the total labor force, the next categories were added to the remunerated workers (employees):

- Own-account workers: those that work alone or with help from members from their own household or from other household, but without the commitment to pay for this help;
- Unpaid workers: those that do not get any payment (monetary or in kind) for their efforts. Although they are entitled to some kind of monetary aid and;
- Employers, defined as independent workers that have a number of employees that work in exchange for a monetary or in kind compensation[3].

We included this new data into the TFP KLEMS model database to generate new results, which we compare to the original ones in order to evaluate the impact that they have on Total Factor Productivity.

[3] Concepts taken from the Encuesta Nacional de Empleo (ENOE). Available at: http://www.beta.inegi.org.mx/proyectos/enchogares/regulares/enoe/default.html

Results

Total Factor Productivity

By considering the results coming from this exercise at the Total economy level for the average and annual series 2004-2016, it is possible to observe that the original TFP grows less than the TFP adjusted by the LIS5 and LIS 6 methods, excluding the year 2005 where the original TFP diminishes 0.12 percent compared to 0.27 of LIS5 and 0.24 of LIS6; in addition, the annual average of the original TFP diminished 0.38 percent while the adjusted TFP diminishes in 0.11 and 0.12 percent respectively. It is worth to mention that the original indicator and the adjusted using the LIS method were constructed under the same KLEMS model, however when disaggregating the mixed income in two parts (capital and labor) a change in the magnitude of the share of each factor of production is created, this is to say, when constructing the original TFP the capital factor was weighted using the Gross operating surplus that still had a part of the mixed income, which includes a portion of the labor income; while the adjusted TFP using the LIS5 and LIS6 has a capital factor weighted with the Gross operating surplus that excludes labor income, which was added to the total labor income, that increases the labor share within the total factor contribution.

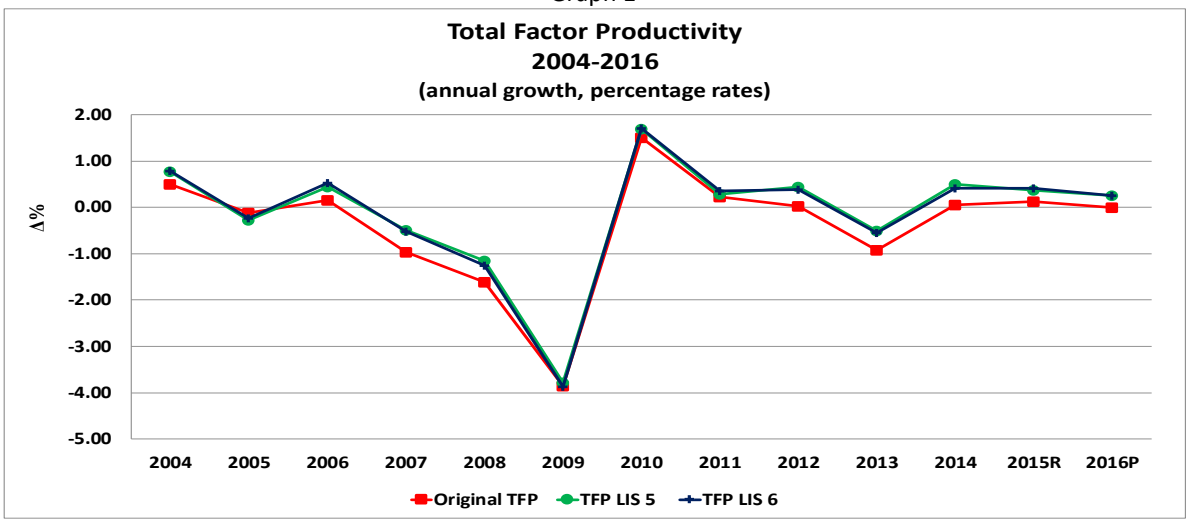
Therefore, in the annual series 2004-2016, the most significant differences between the original TFP and the TFP resulting from the LIS5 and LIS6 methods are located in the following years: 2007, 2008 and from 2012 to 2014. See Table 1.

Table 1

YEARS	Total Factor Productivity (TFP) (annual growth, percentage rates)		
	LIS 5	LIS 6	Original
2004	0.77	0.78	0.49
2005	-0.27	-0.24	-0.12
2006	0.45	0.53	0.15
2007	-0.49	-0.52	-0.96
2008	-1.15	-1.26	-1.62
2009	-3.79	-3.87	-3.86
2010	1.69	1.71	1.50
2011	0.29	0.36	0.22
2012	0.44	0.39	0.03
2013	-0.50	-0.55	-0.92
2014	0.50	0.42	0.06
2015[R]	0.37	0.41	0.12
2016[P]	0.25	0.26	0.00
Average 2004-2016	-0.11	-0.12	-0.38

The figures of TFP adjusted using LIS5 and LIS6 are very similar, despite the fact that LIS6 excludes employers, that are supposed to receive a really small share of labor income, and is not comparable with the share earned by own-account workers or the employees, as shown in the following Graph 1:

Graph 1



The difference between the original and adjusted TFP can be traced mainly to the new capital and labor weights, that have had an impact over the TFP by generating new figures for the contributions of each factor to economic growth, as we will see next.

Capital factor contribution

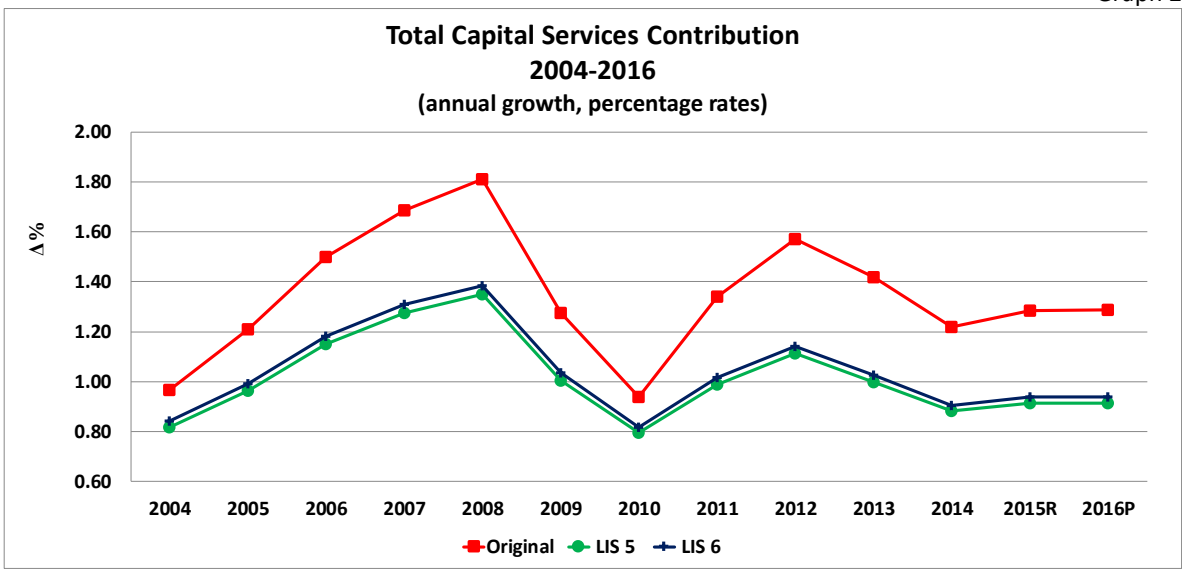
The total capital services contribution (includes ICT and No-ICT assets) features for every year of the annual series 2004-2016, a larger contribution of the original capital factor than the contribution of the adjusted capital factor using the LIS5 and LIS6 methods. Likewise, for the average 2004-2016 where the original capital contribution was of 1.35 percentage points, the contributions of adjusted capital are of 1.01 and 1.04 percentage points for the LIS5 and LIS6 methods respectively. See table 2.

Table 2

YEARS	Capital Services Contribution (annual growth, percentage rates)		
	LIS 5	LIS 6	Original
2004	0.82	0.84	0.97
2005	0.96	0.99	1.21
2006	1.15	1.18	1.50
2007	1.27	1.31	1.69
2008	1.35	1.38	1.81
2009	1.01	1.04	1.28
2010	0.80	0.82	0.94
2011	0.99	1.02	1.34
2012	1.11	1.14	1.57
2013	1.00	1.03	1.42
2014	0.88	0.90	1.22
2015^{R}	0.92	0.94	1.28
2016^{P}	0.92	0.94	1.29
Average 2004-2016	1.01	1.04	1.35

Similarly, a stark difference between trends of the capital factor contributions both original and adjusted (LIS5 and LIS6) was observed, this might be due to the fact that the capital factor features a greater sensibility to the disaggregation of the mixed income, done by excluding the labor income and including it in the total labor income. Therefore, there is a reduction on the amount of Gross operating surplus, which has an impact by reducing the weight capital had with respect to Gross Output. See Graph 2.

Graph 2



Labor factor contribution

Due to the disaggregation of the mixed income in labor income and capital income, and also due to the incorporation of that labor income into the compensation of employees, a major impact was done to the labor services contribution to output and economic growth, such impact was also created by the inclusion of own-account workers, employers and unpaid workers[4], since the original contribution considered just the number of employees both hired directly by the corporation or hired by outsourcing.

In this sense, we can see that for almost every year of the annual series, the Labor services contribution is greater when considering the adjusted TFP using the LIS5 and LIS6 methods, this for nine out of thirteen years of the annual series. This is due, as we already mentioned, to the change in the factor's weight, in this case of the total labor income with respect to Gross output and also due to the impact observed on the Labor services when the labor force was augmented. Hence, only in four years: 2004, 2007, 2010 y 2014 the original labor contribution was greater than the exercises adjusted using the LIS5 and LIS6 methods. For the average of 2004-2016, original labor contribution to economic growth is of 0.31 percentage points compared to 0.38 and 0.36 percentage points of the adjusted labor contribution using LIS5 and LIS6 methods, respectively. See table 3.

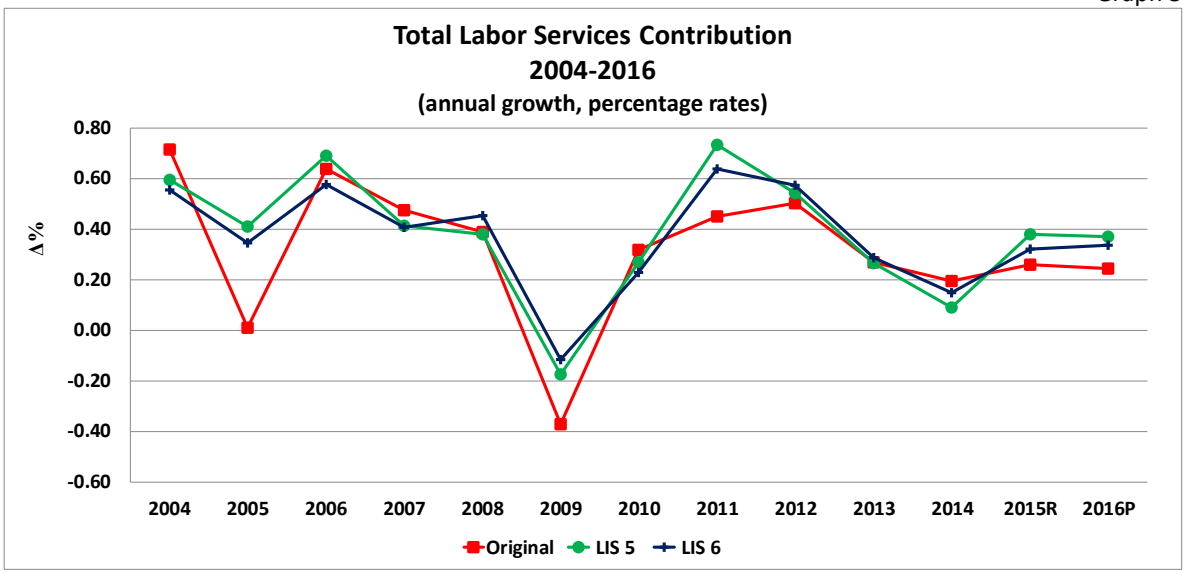
[4] It only includes own-account workers and employers whose production is destined to the market. Self-consumption was excluded.

Table 3

YEARS	Total Labor Services Contribution (annual growth, percentage rates)		
	LIS 5	LIS 6	Original
2004	0.59	0.55	0.71
2005	0.41	0.35	0.01
2006	0.69	0.58	0.64
2007	0.41	0.41	0.47
2008	0.38	0.45	0.39
2009	-0.17	-0.12	-0.37
2010	0.27	0.23	0.32
2011	0.73	0.64	0.45
2012	0.54	0.57	0.50
2013	0.26	0.29	0.27
2014	0.09	0.15	0.19
2015^{R}	0.38	0.32	0.26
2016^{P}	0.37	0.33	0.24
Average 2004-2016	0.38	0.36	0.31

Hence, for the labor services both adjusted and original, the observed trends for the annual series 2004-2016 are really close to each other, however for the years 2005 and 2009 an important gap is observed since both years faced economic crisis. The same situation is observed in 2011. See Graph 3.

Graph 3



Conclusions

The results from this exercise of constructing a Total Factor Productivity adjusted using the LIS5 and LIS6 methods show an improvement regarding TFP growth, compared with the original results published by the System of National Accounts of Mexico. It is worth to mention that this improvement is obtained despite the fact that the adjusted labor contribution increased its share in the output growth when the labor income deducted from the mixed income is added, so this would lead to think that the adjusted TFP would show a decrease, not an increase. Therefore, we need now to look at the Capital services contribution in order to find a possible explanation of this TFP improvement.

The contribution of adjusted capital services excludes the labor income captured in the mixed income, therefore reducing the capital contribution to output growth, (since the capital factor weight is reduced), reducing the factor contribution, resulting in an increase of TFP, when total factor contribution from output growth is subtracted. Therefore, when combining both contributions (capital and labor) we observed that it is the capital contribution the one improving the results of the adjusted TFP.

Lastly, it is worth to mention that even though the SNA 2008 states that it may not be possible to separate the mixed income in both capital income and labor income, this document does separate mixed income based on methods and assumptions found outside both the methodological and conceptual framework of SNA 2008 and until now in the Total Factor Productivity KLEMS Model. Therefore, this effort is featured as an experimental exercise mostly for illustrative purposes to show that there are many methods and assumptions to treat the disaggregation of mixed income, thus the results obtained do not modify the official results published by the National Institute of Statistics and Geography (INEGI) within the System of National Accounts of Mexico.