

# Notlar | Briefs

No.2017-1

## *Sectoral Labor Productivity in Turkey After the Revision of the National Accounts*

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### **Özet:**

Türkiye İstatistik Kurumu (TÜİK) revize ettiği milli gelir serilerini 12 Aralık 2016 tarihinde yayımlamıştır. Bu notta, revize edilen GSYH verileriyle hesaplanan toplam ve sektörel işgücü verimliliğine dair temel gözlemler paylaşılacaktır. Başlıca bulgular şu şekilde özetlenebilir:

1. Yeni seriyle hesaplanan toplam işgücü verimliliği 2011 yılı itibariyle eski seriyle hesaplanan verimlilik serisinden ayrılmakta; eski verimlilik serisi bu yıl itibariyle durağan bir seyir izlerken yeni verimlilik serisi artmaya devam etmektedir.
2. 2005 – 2015 yılları arasında toplam işgücü verimliliğindeki büyümeye katkıda bulunan lider sektörler tarım, imalat sanayi, toptan ve perakende ticaret, inşaat, ve ulaştırma, depolamadır.
3. Milli gelir hesaplarında yapılan revizyondan en fazla etkilenen sektörlerden biri inşaat sektörüdür. Yeni seriye göre ve cari fiyatlarla hesaplandığında inşaat sektöründe işgücü verimliliği 2009 yılında Türkiye ortalamasından yüksektir ve 2015 yılında inşaat sektörü verimliliğinin Türkiye ortalamasına oranı (göreceli verimlilik oranı) daha da artmıştır. Eski seriyle ve cari fiyatlarla hesaplandığında ise inşaat sektöründe işgücü verimliliği her iki yılda da Türkiye ortalamasının altında gözükmemektedir ve göreceli verimlilik oranında bu iki yıl arasında bir artış söz konusu değildir.
4. Yeni seriyle ve cari fiyatlarla hesaplanan inşaat sektörü işgücü verimliliği hem 2009 hem 2015 yılında imalat sanayi sektörü verimliliğinden yüksektir. Eski seride ise cari fiyatlarla inşaat sektörü işgücü verimliliği imalat sanayinininkinden düşük gözükmemektedir.

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## **Abstract:**

Turkish Statistical Institute (Turkstat) issued revised national income series as of December 12, 2016. This policy note presents a few observations on overall and sectoral labor productivities in Turkey calculated with revised GDP series by comparing them with their old counterparts. Highlights can be listed as follows:

1. The new overall labor productivity diverges from its old counterpart in 2011 and continues to increase while the latter slows down.
2. For the period between 2005 and 2015 agriculture, manufacturing, wholesale and retail trade, and transport and storage are the leading sectors driving growth in the new overall labor productivity.
3. One of the sectors most affected by the revision in the national accounts is the construction industry. With the new series labor productivity expressed in current prices in the construction industry is above the national average (relative labor productivity) in 2009 and the ratio increases in 2015. Under the old series, relative labor productivity in construction in current prices is below the national average in these years and the ratio does not increase between these two years.
4. Under the new series, labor productivity in current prices in construction is higher than that in manufacturing while the opposite is true under the old series.

## I. Introduction

Turkstat has recently revised national income series in order to be in line with the System of National Accounts (2008 SNA) and the European System of National and Regional Accounts (ESA 2010). One of the economic indicators affected by this revision is labor productivity which is measured as output per worker. Since this is one of the main indicators describing economic performance of a country it is important to understand the behavior of this indicator after the income revision. So, the scope of this note is to present main observations on overall and sectoral labor productivities in Turkey.

## II. Data

In all calculations presented in this note, sectoral national income and employment data provided by Turkstat are used. *Annual GDP by production approach (2009 base) by kind of economic activity* is used for sectoral income data. This follows the NACE Rev.2 classification and is provided for twenty sectors. Level labor productivity is calculated by using chain linked volume series while chain linked percentage change is used in calculations of labor productivity growth.

On the other hand, five different series are used to build a unified sectoral employment data set. Turkstat started to provide new employment series (*Economic activity by years and sex*) since 2014 under the NACE Rev.2 classification. The series are provided for eighteen sectors and are used as the basic sectoral employment series in this note. Similarly, Turkstat updated the employment series between 2005 and 2013 (*Economic activity by years, NACE Rev.2*) in order to solve discrepancies between the Household Labor Force Survey and Continuous Household Labor Force Survey.<sup>3</sup> However, this updated employment data is not provided for eighteen sectors as in the new employment series but given only for the agriculture, manufacturing, construction and services sectors, in addition to aggregate employment data. So, only aggregate employment data are used from this updated employment series. In addition, for the period before 2005 aggregate employment data are taken from State Planning

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<sup>3</sup> This new updated employment series covering the period 2005-2013 is consistent with the new employment series issued since 2014.

Organization's database (*Developments in Domestic Labor Market*). The updated series for the period 2005 – 2013 are extended backward by using growth rates obtained from the aggregate employment series taken from the State Planning Organization. Using this extended aggregate series and sectoral employment shares obtained from employment series previously published sectoral employment series are constructed for the period 1988 – 2013. For sectoral shares, two different sectoral employment series are used. For the period between 2004 – 2013, *Economic activity by years* which follows NACE Rev. 2 classification is used, while for the periods 2000 – 2003 and 1988 – 1999 *Economic activity (9 groups) by years and sex* series which follow the NACE Rev.1 classification are used.

Before presenting basic observations on labor productivity, it is important to note one major change in real GDP data induced by the revision of the national accounts. After the revision, real GDP data is calculated as chain-linked volume measures instead of fixed-base year constant price estimates. Hence, the new real GDP series have lost their additivity property. This means that total GDP is not equal to the sum of GDP by industries except for the reference year where real GDP is equal to current GDP. This prevents sector aggregations in labor productivity calculations. Thus, labor productivity is calculated for sixteen sectors since 2004, even though sectoral income data is provided for twenty sectors and the sectoral employment data is available for eighteen sectors.<sup>4</sup> For the period between 1998 and 2003, since employment data follows NACE Rev.1 classification (i.e. sectoral employment data is available for nine sectors) employment data for sectors except agriculture, mining, manufacturing and construction are provided as sum of several sectors' employment. Due to the non-additivity property of the new GDP data, these aggregated sectors' output cannot be

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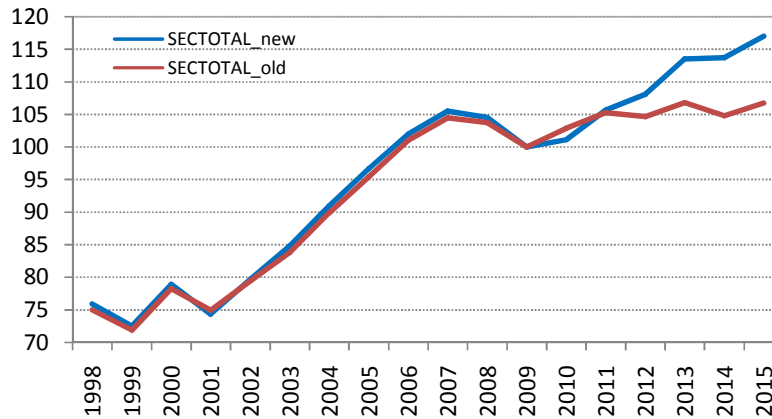
<sup>4</sup> Here, the problem is led by non-additivity of the new GDP series while employment series can be aggregated. Although, the new employment series also follows NACE Rev. 2 classification it is provided for eighteen sectors. Employment data for “Electricity, gas, steam and air conditioning supply” and “Water supply, sewerage, waste management and remediation activities” sectors are aggregated and given as “Electricity, gas, steam, water supply, sewerage etc.”. Similarly, employment data for “Other service activities” and “Activities of household as employers” sectors are aggregated and issued as “Other social, community and personal service activities”. On the other hand, these sectors' output data are issued separately and since they cannot be aggregated, labor productivity for these four sectors cannot be calculated.

calculated. So for this period, labor productivity can be calculated only for agriculture, mining, manufacturing and construction sectors. Thus in this note, because of this non-additivity property of real GDP data, we discuss labor productivity behavior mostly for the period between 2004 and 2015, except for overall labor productivity.

### III. Basics Observations on Labor Productivity

Figure 1 displays overall labor productivity obtained by both revised GDP, new GDP hereafter, (SECTOTAL\_new) and GDP before the revision, old GDP hereafter, (SECTOTAL\_old). SECTOTAL\_new is calculated by dividing the “sectoral total” chain-linked volume measure by total employment while SECTOTAL\_old is equal to the sum of real GDP by industries in 1998 prices over total employment. They are both indexed to 100 in 2009. Two series go hand in hand till 2009. They start to rise after 2001 crisis and the increase is continuous until 2007. Following the global financial crisis, they are subject to a soft decline until 2009. Both series recover until 2011. Then they start to diverge, as overall labor productivity obtained by the new income series continues to increase while the old labor productivity slows down and oscillates around a level that is roughly equal to its level before the global financial crisis.

**Figure 1. Labor Productivity Index (overall, level, 2009=100)**



Overall labor productivity growth, which is calculated as the difference between growth in sectoral total GDP and employment growth, is given in Figure 2.<sup>5</sup> It presents a similar relation between old and new labor productivities and their evolutions across time are consistent with their level counterparts. Until 2009, both series follow a similar trend with small divergences in 2001, 2002 and 2003. After 2009, the divergence between the old and new series starts to get larger but sharpens after 2011. Both series experienced a positive growth except for years 1999, 2001, 2008 and 2009 which explains the continuous rise in overall labor productivity till 2009. However, the new labor productivity series is never subject to a negative growth after 2009 while the old labor productivity series experiences a contraction in 2012 and 2014. Moreover, during this period growth of new labor productivity is always larger than that of old labor productivity.

**Figure 2. Labor Productivity Growth (%)**



Before moving on to a discussion of sectoral labor productivities, it would be useful to review sectoral employment shares to give an idea about sector sizes. Figure 3 gives sectoral employment share averages that are equal to or larger than 5 percent for the period between 2005 and 2015. AGR, MAN and WRT are, respectively, the three largest sectors for the given period.<sup>6</sup> They are followed by CONS.

<sup>5</sup> Labor productivity growth has also been calculated as percentage change in level labor productivity for both overall and sectoral labor productivities. Similar results with minor differences are obtained.

<sup>6</sup> For the full sector names, see Appendix at the end of the note.

**Figure 3. Employment Shares (% average 2005-2015)**

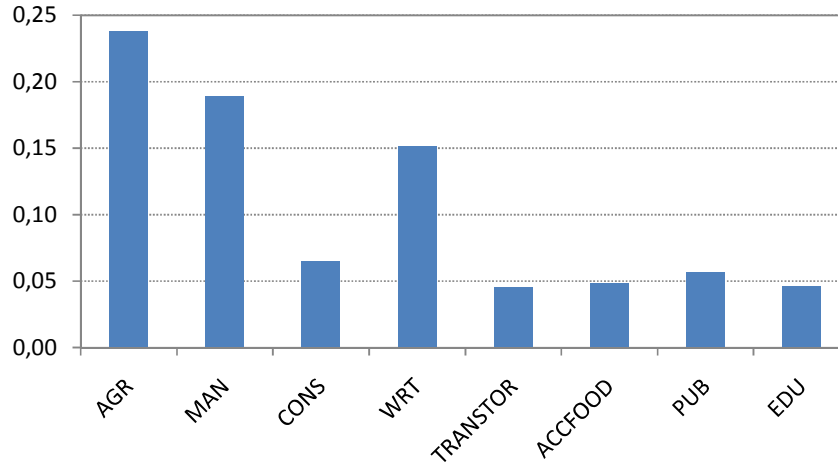


Figure 4 shows average labor productivity growth for the period 2005-2015 for selected sectors using the new series. AGR, MAN, CONS, WRT and TRANSTOR grew more than overall labor productivity (which grew by around 2.5 percent per annum). The growth rate of WRT, which is 4 percent, is the largest among these sectors and it is followed, respectively, by MAN, AGR and CONS. Labor productivities in ACCFOOD, PUB and EDU experienced a contraction.

**Figure 4. Labor Productivity Growth (% average 2005-2015)**

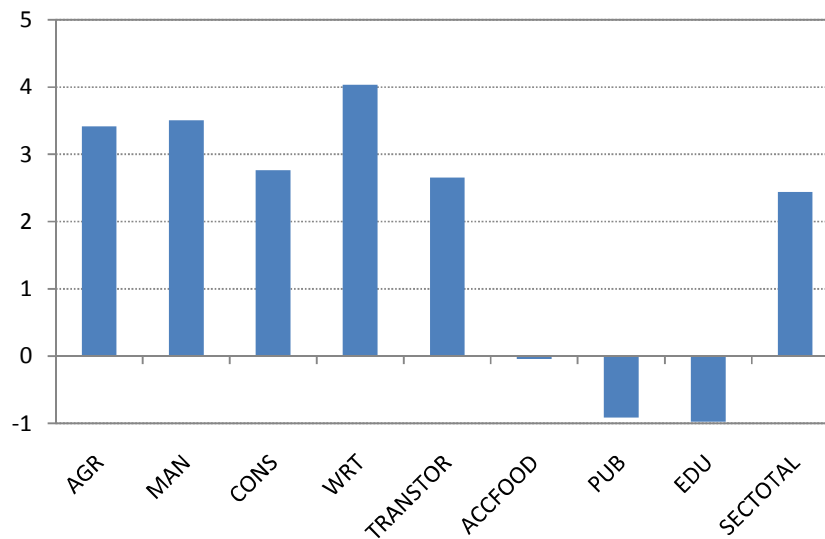
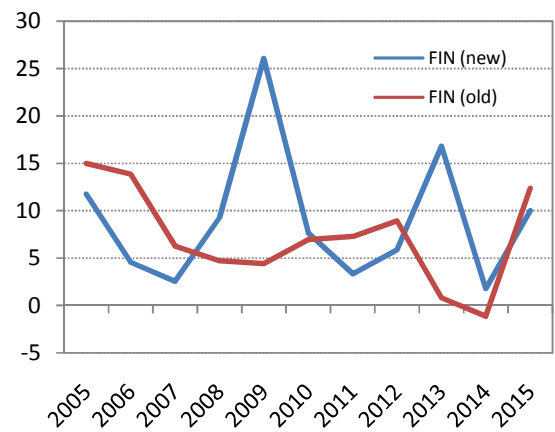
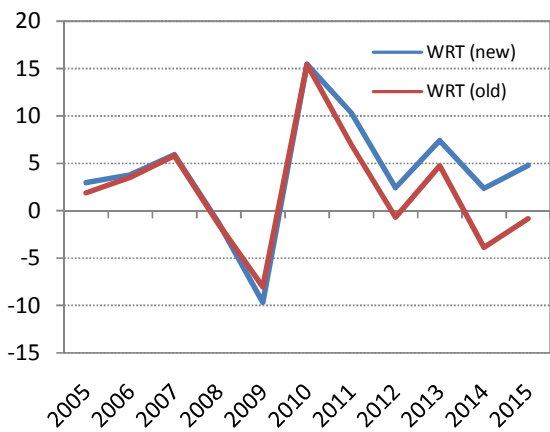
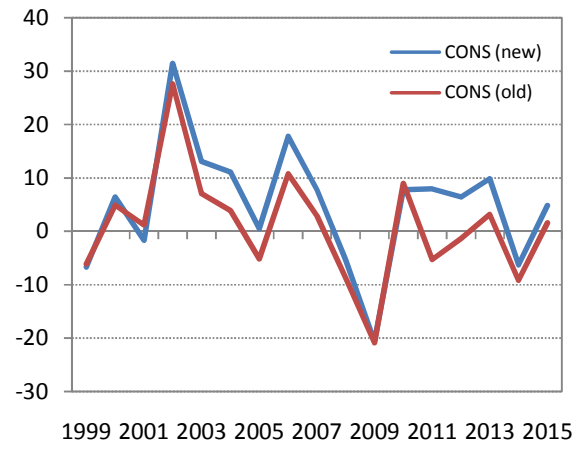
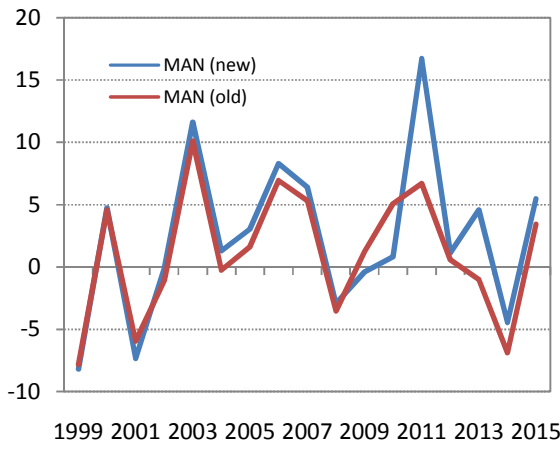
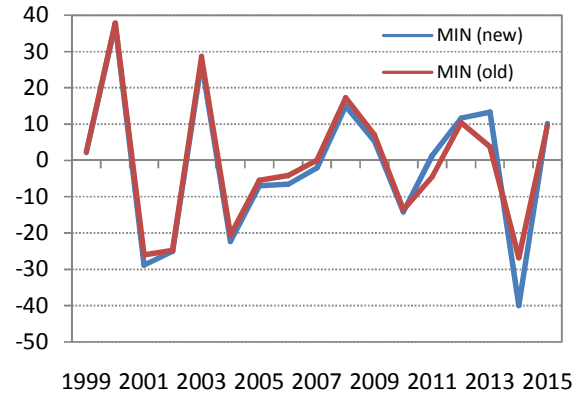
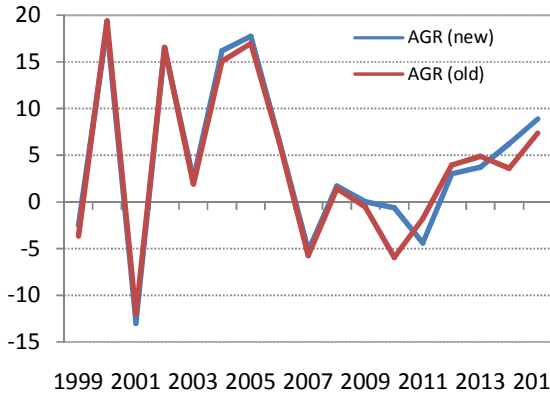


Figure 5 presents labor productivity growth in some of these sectors across time by comparing them with their old counterparts. Although, MIN and FIN are relatively small sectors having employment shares less than 5 percent they are kept in the analysis because MIN is one of the sectors having longest data available, which is useful in the comparison of old and new labor productivity growth, and FIN displays a large difference between old and new labor productivity growth rates. For the given period, new labor productivity growth rates in FIN are mostly higher than their old counterparts. There are two peaks in labor productivity growth in this sector; one is in 2009 where the growth rate is 26 percent and the other is in 2013 with 17 percent growth. There is also divergence between new and old labor productivity growth rates in MAN, CONS and WRT but in smaller amounts compared to those in FIN. Discrepancy between old and new series starts in 2004 for MAN, in 2003 for CONS and in 2010 for WRT. Generally, new growth rates are larger than their old counterparts. However, in AGR and MIN both series have similar trends. When the focus is on the variation of labor productivity growth in these sectors across time, one can see that among given sectors AGR and MIN are sectors where labor productivity has contracted most in the 2001 crisis. In 2009, CONS and WRT are the sectors where labor productivity growth decreased most.



**Figure 5. Labor Productivity Growth (%)**

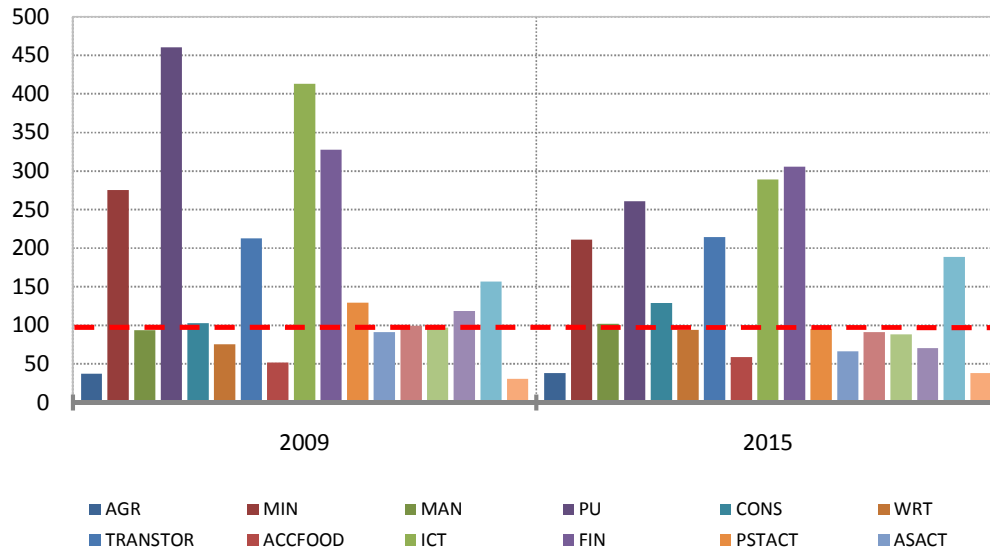


Finally, the level of labor productivity is compared across sectors. Because of the non-additivity property of the new GDP series, this comparison can only be made in current prices and is undertaken for the years 2009 and 2015. In order to compare easily sectoral labor productivities, we set average labor productivity (obtained by weighting each sector's labor productivity by its employment share) for each year to 100 and then index each sector's labor productivity relative to the average. This exercise also allows us to see how the dispersion of sectoral productivity changed between 2009 and 2015. Of course, because the comparison is based on current prices, this exercise does not allow us to ascertain whether any changes in the dispersion or ranking of sectoral productivities are due to changes in real volumes or changes in sectoral prices.

Figure 6a provides labor productivities in current prices for all sectors in the two years while Figure 6b presents the same information only for sectors with labor share of at least 5 percent. The first figure shows that the dispersion of sectoral labor productivity decreased in 2015 compared to 2009, since in 2015 sectors' relative labor productivity positions are closer to the average. Indeed the standard deviation of labor productivity decreased between 2009 and 2015 by 73 percent. Note also that the employment shares of many of the industries with labor productivity above the national average are less than 5 percent.

When we focus on sectors having employment shares larger than 5 percent, TRANSTOR, CONS and MAN are, respectively, the most productive sectors in both years. Productivity ranking among selected sectors remains the same in these years. In 2015, labor productivities relative to the average in CONS and MAN increased compared to 2009. It is interesting to note that labor productivity in CONS is higher than that in MAN under the new series and the gap has actually increased between 2009 and 2015 (compare with old series below).

**Figure 6a. Labor Productivities in Current Prices (level, all sectors, new series, average labor productivity=100)**



**Figure 6b. Labor Productivities in Current Prices (level, selected sectors, new series, average labor productivity=100)**

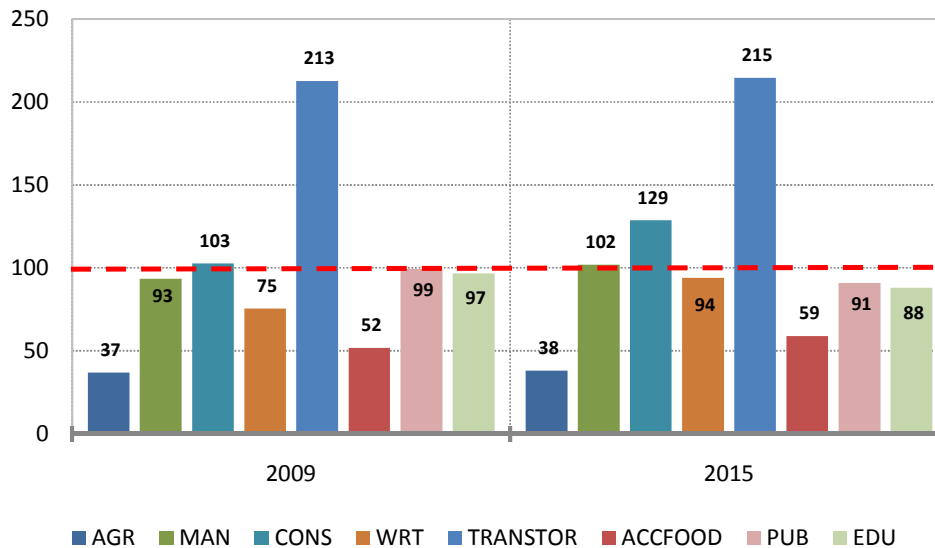
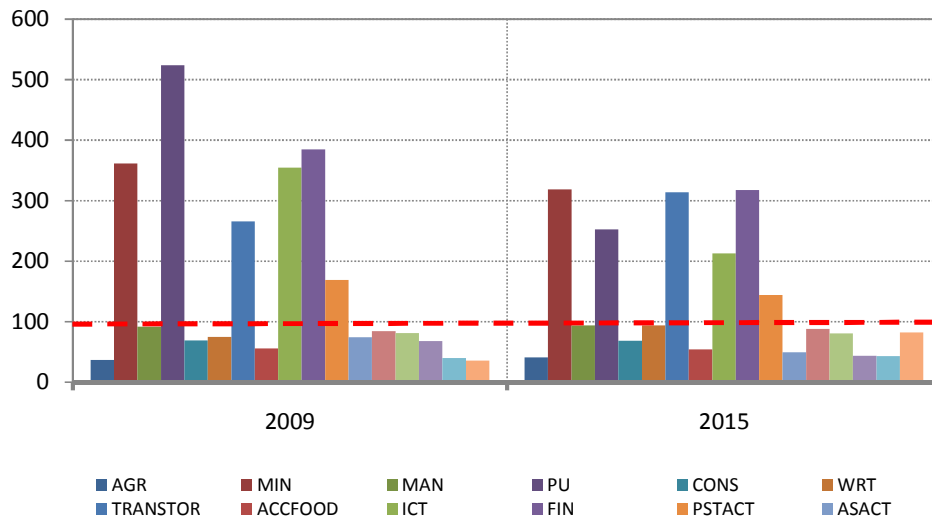


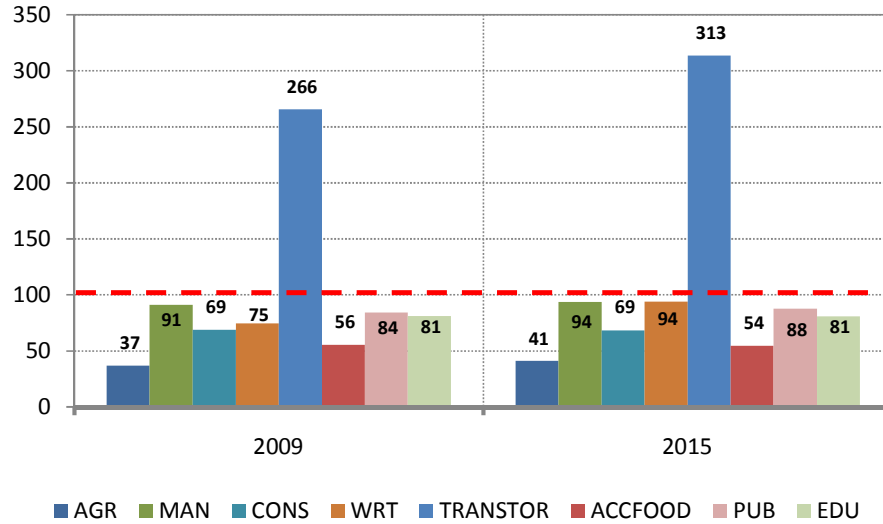
Figure 7a and Figure 7b present a similar analysis but this time using the old GDP series. The purpose of doing the same analysis with old GDP series is to see if the

revision has affected the ranking of sectoral labor productivity. One can observe from Figure 7a that labor productivity variance decreased between 2009 and 2015, as in Figure 6a. The decrease in standard deviation of sectoral labor productivity under the old series is also around 70 percent. However, ranking of labor productivity in CONS is different in this case. It is lower than the average in both years and its relative position did not increase in 2015 compared to 2009. Moreover, under the old series labor productivity in CONS is lower than that in MAN.

**Figure 7a. Labor Productivities in Current Prices (level, all sectors, old series, average labor productivity=100)**



**Figure 7b. Labor Productivities in Current Prices (level, selected sectors, old series, average labor productivity=100)**



## IV. Conclusion

This note documents basic observations on both overall and sectoral labor productivity calculated by Turkstats' new GDP data by comparing it with their old counterparts. One important observation is that overall labor productivity derived from the new GDP series continues to increase after 2011 while its old counterpart slows down. Regarding sectoral labor productivities, one can observe that AGR, MAN, WRT, CONS and TRANSTOR are leading sectors that have an increasing effect on overall labor productivity for the period 2005 – 2015; labor productivity in these industries grew faster than aggregate productivity. Moreover, labor productivity growth rates obtained by the new GDP series in MAN, CONS, WRT and FIN are mostly higher than their old counterparts. Finally, variance of labor productivity across industries is lower in 2015 compared to 2009 both with new and old GDP series. However, labor productivity in CONS relative to average labor productivity is higher with the new GDP series compared to its old counterpart and it increased from 2009 to 2015 while it remained almost the same in the old series.

## Appendix

AGR: Agriculture, forestry and fishing

MIN: Mining and quarrying

MAN: Manufacturing

PU: Public utilities (Electricity, gas, steam and air conditioning supply + Water supply, sewerage, waste management and remediation activities)

CONS: Construction

WRT: Wholesale and retail trade

TRANSTOR: Transport, storage

ACCFOOD: Accommodation and food service activities

ICT: Information and communication

FIN: Financial and insurance activities

REST: Real estate activities

PSTACT: Professional, scientific and technical activities

ASACT: Administrative and support service activities

PUB: Public administration and defence; compulsory social security

EDU: Education

SOCACT: Human health and social work activities

ART: Arts, entertainment and recreation