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**Working Paper**

## The Agricultural Productivity Gap and Self-Employment Bias in the Labor Income Share

IZA Discussion Papers, No. 13415

**Provided in Cooperation with:**

IZA – Institute of Labor Economics

*Suggested Citation:* Paul, Saumik; Thomas, Liam (2020) : The Agricultural Productivity Gap and Self-Employment Bias in the Labor Income Share, IZA Discussion Papers, No. 13415, Institute of Labor Economics (IZA), Bonn

This Version is available at:

<https://hdl.handle.net/10419/223857>

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ISSN: 2365-9793

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## ABSTRACT

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# The Agricultural Productivity Gap and Self-Employment Bias in the Labor Income Share\*

We propose a theory-based adjustment to the labor income share to correct for the self-employment bias. Through a two-sector neoclassical framework with agriculture and non-agriculture, we derive the productivity-adjusted aggregate labor income share in terms of the agricultural productivity gap, and the labor income share in non-agriculture and value-added factor shares. We then construct a novel dataset on the labor income share at a sector level comprising of 53 countries. By applying the theory-based adjustment to our data, the average values for the aggregate and agricultural productivity-adjusted labor income share are 0.42 and 0.51, respectively. The gap between the productivity-adjusted and unadjusted figures are statistically significant only in agriculture, which can be attributed to the heavily underreported income from self-employed workers in agriculture. These findings appear robust at a more disaggregated level of non-agricultural sectors, as self-employment explains almost 98% of the variation in this gap.

**JEL Classification:** E24, E25, J30

**Keywords:** labor income share, cross-country data, income distribution, self-employment

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\* This paper involved a large amount of quantitative work, and the authors thank (in alphabetical order) Hironobu Isaka, Saloni Lakhia, Abdelbari Lakhim, Yoko Oishi and Ken Suzuki for excellent research assistance.

## Introduction

The functional distribution of income has long been considered as the principal issue in political economy.<sup>1</sup> It has recently regained prominence with the inclusion of the labor income share (LIS) as an indicator of the United Nations Sustainable Development Goal 10, to reduce inequality within and among countries. The task of measuring the LIS comes with many challenges, the greatest being the measurement of the LIS for the self-employed, which constitutes almost half of the global workforce. This is discussed in an early work by Gollin (2002), which has instigated further studies to estimate the counterfactual labor income of the self-employed by the workforce composition, though these estimations are mostly determined by some rule of thumb assumptions.<sup>2</sup> Moreover, the adjustments proposed by Gollin (2002) fail to address the variations in the rate of self-employment and in the earnings of the self-employed between sectors. The main alternative method is to concentrate on a particular sector that is less affected from self-employment, but this method is too narrow for a country-wide analysis.

We propose an alternative strategy to correct for the self-employment bias in the aggregate LIS. Our adjustment framework focuses on the agriculture sector, where self-employment is the most prevalent (Fields 2019; ILO 2018; Gindling and Newhouse 2013). We adopt a two-sector neoclassical model consisting of agriculture and non-agriculture. Based on a two-factor (capital and labor) Cobb-Douglas production framework with a constant LIS over time, the ratio of LIS in agriculture to non-agriculture equals the agricultural productivity gap.<sup>3</sup> Through this framework, we use the agricultural productivity gap to correct for the self-employment bias.<sup>4</sup>

To first estimate the ratio of LIS in non-agriculture, we use our unadjusted labor income share equation:

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<sup>1</sup> David Ricardo's statement, published back in 1817, serves as a testimony to this fact, "*To determine the laws which regulate [this] distribution is the principal problem in political economy.*"

<sup>2</sup> The thumb rule typically assumes the share of self-employment to employment income share to be two-thirds. ILO (2019) uses micro surveys to impute a counterfactual wage to self-employed workers based on this ratio. This is followed by studies such as Ellis and Smith (2007) and Treeck (2017). Additionally, there are many variants including Cho, Hwang and Schreyer (2017) who assume the self-employed share of income to be one half.

<sup>3</sup> The agricultural productivity gap is measured as the ratio of value added per worker in non-agriculture to agriculture (Gollin, Lagakos and Waugh, 2017).

<sup>4</sup> Appendix 1 shows a positive correlation between self-employment rates and the agricultural productivity gap suggesting a larger gap in productivity between agriculture and non-agriculture could be correlated with prevalence of self-employment, particularly in agriculture.

(Equation 1.1)

$$LIS = \frac{\text{Average monthly earning}_{tk} \times 12 \times \text{Number of employees}_{tk}}{\text{Value added}_{tk}}$$

The numerator represents labor income. We assume the proportion of ambiguous income is the same as that of other sectors, which related literature has found to be accurate (Gomme and Rupert 2004).<sup>5</sup> This enables us to calculate the labor income from average annual earnings and the number of employees. For the denominator, we use value-added instead of GDP to accommodate the sector level (Gomme and Rupert, 2004). We create a novel dataset to attain values from 53 countries for the non-agriculture LIS.

Moving on to our productivity-adjusted aggregate LIS, we use the agricultural value-added per worker and the agricultural productivity gap from Gollin, Lagakos and Waugh (2017). We generate a proxy measure for the LIS in agriculture ( $\theta_A$ ) using the agricultural productivity gap ( $G_{N/A}$ ) and the non-agricultural LIS ( $\theta_N$ ) in Equation 1.2:

(Equation 1.2)

$$\theta_A = G_{N/A} \times \theta_N$$

Since the aggregate LIS ( $\theta$ ) can be written as an average of the sectoral LIS weighted by sectoral value-added shares,<sup>6</sup> we can estimate the aggregate LIS without using a direct measure of the LIS in agriculture. Equation 1.3 shows the expression of the aggregate LIS after replacing  $\theta_A$  from Equation 1.2 in the weighted average of the sectoral LIS and readjusting the terms. We determine  $\theta$  to be the productivity-adjusted aggregate LIS, which can be calculated using the agricultural productivity gap ( $G_{N/A}$ ), the non-agricultural LIS ( $\theta_N$ ), and the value-added share of agriculture ( $\delta_A$ ).

(Equation 1.3)

$$\theta = \theta_N [G_{N/A} \delta_A + (1 - \delta_A)]$$

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<sup>5</sup> See appendix 3 for the concept of ambiguous and unambiguous elements of national income.

<sup>6</sup>  $\theta = \delta_A \theta_A + (1 - \delta_A) \theta_N$ , where  $\delta_A$  = value-added share of agriculture.

One limitation in measuring the productivity-adjusted aggregate LIS is that it does not allow for a simultaneous identification of the productivity-adjusted LIS in both the agriculture and non-agriculture sectors. Therefore, any measurement error associated with the LIS in non-agriculture will in turn produce a biased productivity-adjusted LIS in agriculture, and a biased productivity-adjusted aggregate LIS. As a robustness check, we follow an alternative solution. Instead of measuring the LIS for each sector, we measure the ratio of the LIS between groups of two sectors with the sectoral productivity gap. This method avoids the identification problem since we are employing a single equation to estimate an unknown ratio. The difference between the sectoral LIS ratio and the sectoral productivity ratio indicates the size of the self-employment bias, which we examine from the disaggregated non-agriculture sector. Through this process, we identify the main source of the measurement error within the non-agricultural sector to be self-employment. Finally, we use sectoral data from Japan as a second robustness check to find the degree to which a large self-employment bias in productivity-adjusted agriculture LIS can explain the prevalence of self-employment in agriculture in a country example.

We begin by developing a novel dataset at the sector level combining the GGDC 10-Sector Database, the Socio-Economic Account (SEA), and ILOSTAT.<sup>7</sup> Our novel sector level dataset covers 53 countries across five regions based on the most recent World Bank country classifications.<sup>8</sup> The data is originally compiled at a disaggregated 10-sector level, and then combined to obtain the aggregated figures. There are 20 developing countries.<sup>9</sup> From this data, we find the unadjusted LIS for each sector. At the disaggregated level, GOV accounts for the largest LIS at 0.46, followed by TRA, MAN, WRT, and TRA, all averaging close to 0.40. PU has the smallest LIS at 0.16 followed by MIN at 0.22 (see footnote 4 for the classification of sectors).

We next estimate the productivity-adjusted aggregate LIS (equation 1.3) using our unadjusted sectoral LIS data, and the agricultural productivity-gap and value-added share data from Gollin, Lagakos and Waugh (2017). The average values between 1996 and 2006

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<sup>7</sup> The GGDC 10-sector database covers agriculture, hunting, forestry and fishing (AGR); Mining and quarrying (MIN); 3. Manufacturing (MAN); Electricity, gas and water supply (PU); Construction (CON); Wholesale and retail trade, hotels and restaurants (WRT); Transport, storage, and communication (TRA); Finance, insurance, real estate and business services (FIRE); Government services (GOV); Community, social and personal services (OTH).

<sup>8</sup> In our sample, we have nine countries from East Asia and the Pacific, 27 from Europe and Central Asia, 8 from Latin America and the Caribbean, two from the Middle East and North Africa, two from North America, and five from Sub-Saharan Africa.

<sup>9</sup> For three countries, we have data for only one year (Italy, Colombia, and Peru), and for 45 countries data is available for at least 5 years.

for the aggregate productivity-adjusted LIS and the unadjusted aggregate LIS are 0.42 and 0.40, respectively. The average values in the same time period for the productivity-adjusted LIS and the unadjusted LIS in agriculture are 0.51 and 0.38, respectively. The discrepancy between the productivity-adjusted and unadjusted figures are much higher in agriculture compared to the aggregate figures and are statistically significant at 5%.

The difference between the productivity-adjusted labor income share and the labor income share measure from Karabarounis and Neiman (2014) and ILO (2019) is 0.72 and 0.68, respectively. The results from our robustness checks suggest that this gap is likely to be driven by the presence of the self-employment bias in measuring the LIS in agriculture. The correlation between the productivity-based LIS ratio and the unadjusted LIS ratio based on our novel data indicates that the agricultural sector contains the largest difference between the sectoral LIS ratio and sectoral productivity ratio when a more disaggregated level of non-agricultural sectors is considered. Finally, sector level findings from Japan between 1970-2002 show a substantial difference between the agriculture sector, where the gap between productivity-adjusted and unadjusted LIS is higher, and all other sectors, where the gap is near or below zero. The regression results show that almost 98% of the LIS gap is driven by self-employment. Altogether, the robustness checks validate the use of the productivity-adjusted LIS to determine the self-employment bias in the agricultural LIS.

To the best of our knowledge, this is the first paper to apply a theoretical model to address the self-employment bias in the labor income share. The reciprocal relationship between the agricultural productivity gap and the ratio of sectoral labor income shares, in addition to the data on the agricultural productivity gap from Gollin, Lagakos and Waugh (2017) suggest that the non-agricultural labor income share is as low as 0.30. Gollin, Lagakos and Waugh (2017) consider this to be highly implausible when considering Gollin's (2002) estimates of the LIS of around 0.65. However, Karabarounis and Neiman (2014) estimate the aggregate LIS to be less than 0.30 for almost one quarter of the 112 countries in the sample. The recent ILO study (2019) suggests similar evidence. This is also consistent with a global decline of the share of labor documented by a vast amount of literature.<sup>10</sup> Together, they validate the productivity-adjusted corrections to the labor income share made in this paper.

Our paper is related to the wider literature attempting to overcome the measurement issues of the labor income share, particularly the literature on measuring the self-employment LIS, including Freeman (2011), Karabarounis and Neiman (2014), Treck (2017) and Guerriero (2019). However, these papers largely follow the limited methodology from Gollin (2002).

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<sup>10</sup> Elsby, Hobijn, and Sahin (2013); Karabarounis and Neiman (2014); Piketty (2014); Piketty and Zucman (2014); Paul (2019b), Paul (2020), among others.



There is also a large group of literature that tries to calculate the LIS while avoiding the self-employment impact by only focusing on the manufacturing sector (Azmat et al 2011; Bridgman 2017; Daudey and Garcia-Peñalosa 2007; Kehrig and Vincent 2017). This approach is also problematic because of the inherent narrowness of a single sector study, as well as the limited sector-specific data available for many countries.

Our paper also contributes to the growing literature on the analysis of the labor income share at a disaggregate level. Recent studies<sup>11</sup> show that a deeper understanding of the differences between sectoral labor income share trends and heterogeneity across firms provides valuable insight on the drivers of the labor income share. Böckerman and Maliranta (2012) use longitudinal plant-level data in Finland to show that micro-level restructuring can explain a significant amount of the differences between the declining labor income share and increasing labor productivity. Autor et al. (2020) use micro panel data from the 1982 United States Economic Census on manufacturing, retail trade, wholesale trade, services, utilities and transportation, and then document the fall in the labor income share based on the rise of superstar firms. Similar evidence is found in Kehrig and Vincent (2018).

We attempt to build on this research by creating a novel dataset with data from Karaborbounis and Neiman, data on productivity by Gollin, Lagos and Waugh, and self-employment data by La Porta and Shleifer, to calculate the agricultural self-employment LIS through the agricultural productivity gap. We hope that by presenting an alternative dataset and method, our analyses are useful for further studies concerned with the sector-level LIS.

We structure the paper as follows. In section 2, we briefly discuss the issues related to the measurement of the LIS. Section 3 introduces our unadjusted novel sectoral data. Section 4 shows the relationship between the productivity gap and the labor income share, and how we use this to determine the agricultural LIS. In section 5, we discuss the robustness check results based on measuring the ratios of the LIS in different sector. Section 6 shows the outcomes of a case study on Japan, followed by our concluding remarks in section 7.

## **2. Measurement issues**

Traditional interpretations of the LIS have a minimal emphasis on self-employment. The concept only found major interest after work by Gollin (2002). Gollin highlighted the

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<sup>11</sup> Autor et al. (2020); Böckerman and Maliranta (2012); Dao, Das, Koczan, and Lian (2017); Kehrig and Vincent (2018); Oishi and Paul (2018); Paul (2019a); Paul (2019c); Valentinyi, and Herrendorf. (2008).

necessity of the self-employment to be accurately measured for the LIS and offered a set of adjustments to accomplish this task. These adjustments have since been utilized in further literature to understand the relationship between the self-employed and employed. However, many of these studies still retain Gollin's methodology, including its arbitrary assumption of the self-employed wage level.

The first study of the relationship between the labor and capital income share (Cobb and Douglas 1928) measured the labor income with no adjustment for self-employment income. This practice is retained in recent literature (Daudey and Garcia-Peñalosa 2007, Jayedev 2007) and is calculated as follows:

(Equation 2.1)

$$LIS \equiv \frac{\textit{Labor income}}{\textit{National income}}$$

Equation 2.1 determines labor income as the compensation of employees. In the numerator, the labor income includes the labor compensation of self-employment, and excludes government wages and salaries, compensation in non-profit institutions, private compensation, and farm compensation (Gomme and Rupert, 2004). In the denominator, national income excludes indirect taxes such as production and imports (minus subsidies), which do not represent any return to capital or labor (Glyn 2009; Gollin 2002; Izyumov and Vahaly 2015; Rognlie 2015), and consumption of fixed capital (Glyn 2009; Kuznets 1959; Piketty and Zucman 2014).

The outstanding issue in this equation is that it does not account for many of the income sources that contribute to the self-employment share, such as intangible inputs, mixed income, non-private and informal sectors. This is particularly a problem for developing countries where these are major sources of income. If self-employment contributions are disregarded, they become implicitly classified as capital income, when often they include returns to both labor and capital. This leaves an underestimation of the LIS.

Another method to measure the LIS is to consider the combination of capital and labor in self-employment income to be the same combination as the rest of the economy (Atkinson,

1983; Kravis 1959). This is reflected in the equation by deducting mixed income from the value added in the denominator:

(Equation 2.2)

$$LIS \equiv \frac{\text{Labor income}}{\text{Value added } (-\text{indirect taxes} - \text{fixed capital}) - \text{mixed income}}$$

This measurement is limited because it considers LIS to be the same throughout all enterprises, when the LIS will change significantly due to factors such as workforce size, the relative intensiveness of labor and capital, and unique country characteristics. It also mistakenly measures the LIS in some economies as greater than one (Bernanke and Gürkaynak 2001). The same methodology has been employed by the US Bureau of Labor Statistics (Gomme and Rupert, 2004) and sees wide use in the literature (Izyumov and Vahaly 2015; Bernanke and Gürkaynak 2001; Rognlie 2015; Ryan 1996).

Gollin (2002) proposes three adjustment approaches to estimate the LIS, of which two use mixed income and one uses employment compensation. These are shown below with CoE as compensation of employees, MI as mixed income, E as the number of wage employees, and TE as the number of total employees.

(Equation 2.3)

$$LS_{G1} = \frac{CoE + MI}{GDP}$$

$$LS_{G2} = \frac{CoE}{GDP - MI}$$

$$LS_{G3} = \frac{\frac{CoE}{E} \times TE}{GDP}$$

G1 interprets all income of household businesses as labor. G2 interprets the share of labor income for mixed income is the same as for all employees. G3 uses labor compensation instead of mixed income, which means it directly relies on the share of self-employment

through labor survey data. Gollin argues that these three adjustments give estimates that are consistent with the claim that factor shares are approximately constant between countries.

Out of these three, G3 has become a methodology of choice for academics and international organizations. The strength of this measurement is its use of employee data to determine the compensation of the self-employed, which is generally available for most countries. However, specific workforce data to measure the LIS at a sufficient level is more difficult to obtain, particularly for developing countries. Also, a problem with this measurement is its requirement of a broad rule of thumb assumption to find the relative wage of the self-employed, which is also particularly problematic for developing countries where self-employed workers are often the bulk of the workforce.

In this paper, we compare our adjusted LIS to two other recent measurements of the LIS. One is from a paper by Karabarbounis and Neimann (2014), which focuses on the corporate sector LIS in which there is a low degree of disruption from self-employment. The other is the ILO report (2019) which employs a microdata survey approach. We concentrate more on the comparison with the ILO report since their measurement covers all sectors, so it is more relevant to the aggregate self-employment LIS.

The ILO paper distinguishes itself from Gollin's approach by arguing that there are too many limitations in his methodology to reflect the complex variations of self-employment between different countries, that it does not reflect the complexities of the relationship with vulnerable employment, and that it disregards the evolving relative wage over time (ILO 2019). Through their Harmonized Microdata collection, they propose an alternative approach to account for the self-employment income. The main utility of this collection is that it comes from a survey with details on labor related earnings of employees, hours worked, economic activity, worker occupation, rural or urban residence, and other key demographic variables (ILO 2019). The shared variables in this microdata are used with their relative wages to impute a counterfactual wage for the self-employed. Consequently, the estimations from specified groups of the population in this method provide greater accuracy than the measurements provided by Gollin that rely on a constant wage level for the total workforce.

The ILO measurement has its own methodological limitations. It still requires assumptions driven by the wage levels of the specified groups of workers identified in the microdata to find the wages for the unobserved self-employed workers. This is limited since the employment share and relative income level of self-employment workers in each sector will greatly vary, so the wage level between working groups cannot accurately indicate the

relative self-employed wages. With this in mind, we recognize the need for alternative approaches to estimate the self-employment LIS, and so we use this paper to calculate our own approach through the agricultural productivity gap.

### 3. Estimation of Sectoral Labor Income Share

#### 3.1. Data

We use three data sources for our sectoral LIS measurement. These are the GGDC 10-Sector Database, the Socio-Economic Account (SEA), and ILOSTAT. The GGDC 10-Sector Database, published by the Groningen Growth and Development Centre (GGDC), shows long-run macroeconomic statistics on the sectoral level for 42 countries<sup>12</sup> from 1950 to 2013.<sup>13</sup> The Socio-Economic Account (SEA), provided by The World Input Output Database (WIOD), shows country-level industrial output, capital investment and stocks, and employment by skill type for 40 countries from 1995 to 2009.<sup>14</sup> The data in SEA is mainly estimated based on EU KLEMS (an analysis of capital (K), labor (L), energy (E), materials (M), and service (S) inputs) for countries in the European Union, EUROSTAT, and the OECD's Structural Analysis database (STAN). ILOSTAT<sup>15</sup> is a data source compiled by the International Labour Organization (ILO), with data on labor, consumer, population, and some socio-economic indicators. In addition, the ILO offers information on the data source, its characteristics, changes in methodologies, and indications of unreliability for each value over time and among countries. This is summarized in appendices 2 and 3.

#### 3.2. Methodology

We begin our methodology with the general definition of the LIS, which is the ratio of how much of national income accrues to labor (Lübker 2007). This is shown for year  $t$  and sector  $k$  as:

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<sup>12</sup> Including West Germany

<sup>13</sup> <https://www.rug.nl/ggdc/productivity/10-sector/>

<sup>14</sup> <http://www.wiod.org/database/seas13>

<sup>15</sup> [https://www.ilo.org/ilostat/faces/wcnav\\_defaultSelection?\\_adf.ctrl-state=6ghjloohd\\_110&\\_afLoop=316028130615831&\\_afWindowMode=0&\\_afWindowId=6ghjloohd\\_107#!%40%40%3F\\_afWindowId%3D6ghjloohd\\_107%26\\_afLoop%3D316028130615831%26\\_afWindowMode%3D0%26\\_adf.ctrl-state%3Dbl8xscafv\\_9](https://www.ilo.org/ilostat/faces/wcnav_defaultSelection?_adf.ctrl-state=6ghjloohd_110&_afLoop=316028130615831&_afWindowMode=0&_afWindowId=6ghjloohd_107#!%40%40%3F_afWindowId%3D6ghjloohd_107%26_afLoop%3D316028130615831%26_afWindowMode%3D0%26_adf.ctrl-state%3Dbl8xscafv_9)

(Equation 3.1)

$$LIS \equiv \frac{Labor\ income_{tk}}{National\ income_{tk}}$$

To apply this to the sector level and overcome the issues in measuring intangible inputs, non-private sectors, informal sectors, and mixed income, we employ an alternative approach by Gomme and Rupert (2004) that replaces GDP with value-added.

(Equation 3.2)

$$LIS = \frac{Labor\ income_{tk}}{Value\ added_{tk}}$$

We assume that the proportion of ambiguous income is the same in this sector as other sectors, which has been recognized in studies on ambiguous income (Gomme and Rupert 2004).<sup>16</sup> This lets us calculate the labor income from the following values:

(Equation 3.3)

$$= \frac{Average\ monthly\ earning_{tk} \times 12 \times Number\ of\ employees_{tk}}{Value\ added_{tk}}$$

We next evaluate both the earnings and value added in the current exchange rate of each country. We adjust the currency unit for countries that have experienced redenomination or have introduced a new currency in their sample periods, which is calculated in appendix 5. For the classification of economic activities, we follow the GGDC ten-sector classification based on ISIC Rev. 3. We are limited to countries available with data according to ISIC Rev. 3, since we cannot accurately reconstruct ISIC Rev. 4 country data into Rev. 3 without more comprehensive data. The estimated value added is obtained from the GGDC and SEA. The

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<sup>16</sup> See appendix 3 for the concept of ambiguous and unambiguous elements of national income.

SEA released in 2012 provides the value-added data for 35 economic activities based on ISIC Rev. 3, which we organize into 10 groups.<sup>17</sup>

For the first step in calculating our adjusted LIS, we obtain the mean nominal monthly earnings of employees and the number of employees from our dataset of countries. We calculate the total income of 18 sectors for which data is available, then organize these into 10 sectors by combining multiple sectors into WRT, FIRE, CON and OTH. We find significant differences in the size of employment and the average earnings at both the 18-sector and 10-sector level, so we do not require the missing sectors from the 18-sector level for the 10-sector level labor income. We use different calculations for AGR and for countries without the 18-sector level employment data. For AGR, this is because many countries do not have separate earnings data for the fishery sector on the 18-sector level. Instead, we assume that employees in the agriculture and fishery sectors share the same average level of earnings.<sup>18</sup> For the countries that do not have available 18-sector level employment data,<sup>19</sup> we instead use the GGDC employment data to multiply these countries by the average of the 18-sector earnings data within each of the 10-sector categories. A summary of the aggregation method is in appendix 4.

In the earnings data, some country results are limited to only weekly and hourly earnings.<sup>20</sup> To find the monthly figures, we multiply the hourly working hour data by the weekly working hour data obtained from ILOSTAT, which we multiply by 4.33. We then determine the missing values by assuming monotonic time trends to determine the working hours and the number of employees. We split the time trends of our estimations between the 1990s and the 2000s when possible.<sup>21</sup>

We move on to determine the broader sector LIS for the ten sectors by calculating the average LIS of each sector weighted by the number of employees in each sector. We create two LIS measurements for the tertiary sector: one with PU, WRT, TRA, FIRE, GOV, and OTH, and the other with these sectors except GOV and OTH due to measurement problems. We exclude GOV since it contains complications in measuring taxes and subsidies (Gomme and Rupert

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<sup>17</sup> AGR, MIN, MAN, PU, CON, WRT, TRA, FIRE, GOV, OTH.

<sup>18</sup> The impact of using the agriculture sector earnings as a proxy for the fishery sector earnings on the calculation of the labor income share in AGR should be small, as the size of the fishery sector is small relative to that of agriculture.

<sup>19</sup> The People's Republic of China, Taipei China, and the US.

<sup>20</sup> Weekly earnings are available for the dataset for Australia, Egypt, Great Britain, United States, Canada, and Ireland. Hourly wages are available in some of the datasets for Denmark, Spain, Sweden, Australia, Austria, Germany, and Malta.

<sup>21</sup> One exception is Canada, where only the data for 2016 is available. We extrapolate the data to every year.

2004) and is not measured the same in all countries, which causes comparability issues. For instance, some countries prefer to use wages while others use capital compensation.<sup>22</sup> OTH is excluded because it involves a category that has a LIS equal to one by definition.<sup>23</sup>

Even with our conservative aggregation and the limited range of observations from our configured imputation method results, some of the remaining LIS values are unreliable. Out of the 4221 calculated LIS values, there are 275 measured as above one. We eliminate all such values that appear to have been caused by distortions. An example is an employment or earnings hike, which occurs for Peru in 2002. We also remove whole sectors that have multiple unreliable values due to factors such as counting the income of part time workers as full time income, which we believe to cause the discrepancies in a number of sectors such as AGR and OTH in Brazil. Another cause of multiple unreliable values is the varying size of the informal sector within the value-added, earnings, and employment ratios. Finally, if there are multiple relevant data sources for a country, and one of these sources has unreliable values and considerable differences from the others, we remove this source to prevent any issue when analyzing the change over time. This occurs in the data for Brazil after 2003. Following these deductions, we are left with 3868 observations.

### 3.3. Data Coverage

Appendix 5 shows our data coverage of 53 countries across five regions based on the most recent World Bank classification of countries, which all have data for at least one year in at least one sector.<sup>24</sup> This includes 20 developing countries (based on the World Bank classification), of which five are from East Asia and the Pacific and five from Sub-Saharan Africa. Some of the countries have a very limited amount of data, such as Italy, Columbia and Peru with only one year, but there abundant data for most countries, with over five years of results for 45 countries.

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<sup>22</sup> For a further discussion on growth accounting for the government sector, see for example Mas (2005).

<sup>23</sup> The category is “Activities of private households as employers and undifferentiated production activities of private households”. For a further discussion on this sector, see the EU KLEMS Consortium’s “EU KLEMS Growth and Productivity Accounts Version 1” (2007).  
[http://www.euklems.net/data/EUKLEMS\\_Growth\\_and\\_Productivity\\_Accounts\\_Part\\_II\\_Sources.pdf](http://www.euklems.net/data/EUKLEMS_Growth_and_Productivity_Accounts_Part_II_Sources.pdf)

<sup>24</sup> Nine from East Asia and the Pacific, 27 from Europe and Central Asia, eight from Latin America and the Caribbean, two from the Middle East and North Africa, two from North America, and five from Sub-Saharan Africa



Appendix 6 shows the country-level LIS data coverage for 10 sectors.<sup>25</sup> While some sectors have a limited range of data such as OTH from only 16 countries, AGR from 34 and GOV from 35, there is sufficient data including MIN, MAN, PU, and TRA from around 50 countries. For the developing countries in our sample, we find at least 10 years of available data for the People’s Republic of China, Indonesia, Peru, Mauritius, Mexico, Egypt, and Botswana. Also, some countries have available data for only one sector, such as the manufacturing LIS for Malaysia in just 2000 and 2001.

### **3.4. Primary, Secondary and Tertiary sector level analysis**

We categorize the 10 GGDC disaggregated sectors into primary, secondary and tertiary sectors. AGR and MIN as the primary sector; MAN and CON as the secondary sector, and PU, WRT, TRA, FIRE, GOV, and OTH as the tertiary sector. Table 3.1 shows the average unweighted figures for these three categories and the ten disaggregated sectors across all countries. On average, the secondary and the tertiary sector employees receive around 35% of the total income, whereas primary sector employees receive around 25%, and the primary sector LIS receives up to as much as 87%. At the disaggregated level, GOV accounts for the largest LIS at 46%, followed by TRA, MAN, WRT, and TRA with an average of around 40% each. The smallest LIS is PU at 16% followed by MIN at 22%. The maximum LIS in all sectors except for PI and MIN is over 90%.

[Table 3.1 is about here]

### **3.5. Cross-country comparison by primary, secondary, and tertiary sectors**

In appendix 7, we compare the average unweighted regional LIS of the primary, secondary, and tertiary sectors. The smallest LIS in all regions is in the primary sector, except for the Middle East and North Africa (MENA) and Sub-Saharan Africa (SSA) regions. Europe and Central Asia have the highest LIS in the secondary sector. The tertiary sector LIS is the largest in East Asia and the Pacific (EAP) and North America. Also, MENA and SSA have a similar share of average LIS in all three sectors, but other regions such as North America and EAP show a significantly smaller primary sector than the other sectors.

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<sup>25</sup> We follow the Groningen Growth Data Center (GGDC) classification of 10 sectors (AGR, MIN, MAN, PU, CON, WRT, TRA, FIRE, GOV, and OTH).

We next compare the outcomes in these three sectors at the country level in appendix 8. We find considerable variation in the LIS estimates within each category and each region. For the East Asia and the Pacific region, the countries with the highest average LIS across all sectors is the Republic of Korea at 0.48 and Chinese Taipei at 0.41. In the primary sector for the Philippines, the LIS decreases to as much as 0.02. Spain is the only country in our sample with an average LIS over 0.50 in all sectors. In the Latin America and Caribbean region, Costa Rica has the highest primary LIS at 0.48 and tertiary LIS at 0.54. Brazil has the highest secondary sector LIS at 0.59.

Overall, we find no discernable trends or similarities in the estimates of the LIS either across sectors of a country or within a sector across countries, aside from a slightly smaller average LIS in developing countries.

## **4. The productivity-adjusted LIS**

### **4.1. The relationship between the agricultural productivity-gap, self-employment, and LIS**

In this section, we introduce our productivity-adjusted LIS by first discussing the relationship between the agricultural productivity gap and self-employment. We calculate the sectoral LIS for agriculture and non-agriculture using Equations 1 and 2, the aggregate LIS data from Karabarbounis and Neiman (2014),<sup>26</sup> and the agricultural value-added and agricultural productivity gap data provided by Gollin, Lagakos and Waugh (2017).<sup>27</sup>

For our 74-country sample, as the agricultural productivity gap becomes larger, the agriculture LIS tends to increase and the non-agriculture LIS tends to decrease. The correlation between the agricultural productivity gap and the non-agricultural LIS is particularly strong with a goodness of fit of 0.46. A wider agricultural productivity gap suggests a simultaneous wider gap in the LIS between sectors.

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<sup>26</sup> Karabarbounis and Neiman (2014) follow Gollin (2002)'s second adjustment approach.

<sup>27</sup> The agricultural productivity gap is the ratio of value added per worker in non-agriculture to agriculture (Gollin, Lagakos and Waugh, 2017).

[Figure 4.1 is about here]

We then consider the link between the agricultural productivity gap, the LIS and the ratio of self-employment. Figure 4.2 shows that countries with a higher agricultural productivity gap have a higher ratio of self-employment, as both the agricultural productivity gap and self-employment ratio have a negative relationship with the LIS, with a goodness of fit at 0.18 and 0.44, respectively. We can thereby determine that a larger agricultural productivity gap, which is prevalent in developing countries (Gollin, Lagakos and Waugh 2017), is associated with a wider gap in LIS across sectors. Since a larger self-employment share will increase the discrepancies when measuring the LIS, it threatens the accurate estimation of the total LIS (ILO 2019).

[Figure 4.2 is about here]

#### **4.2. Estimation and summary statistics of the Productivity-adjusted LIS**

We propose a productivity-based adjustment to correct for the self-employment bias in the LIS (Equations 1.2 and 1.3). In a two-sector two-factor Cobb-Douglas model, the aggregate LIS can be expressed as a function of the agricultural productivity gap, the sectoral value-added shares, and the LIS (Equation 1.3). We estimate the productivity-adjusted aggregate LIS through our own unadjusted sectoral LIS data, the agricultural productivity-gap and value-added share data for 36 countries (Gollin, Lagakos and Waugh 2017), and the productivity-adjusted LIS in agriculture. Table 4.1 shows the summary statistics. The unadjusted LIS figures for the non-agricultural sector are available in 53 countries, and available for the agricultural sector in 28 countries. Since we do not use agriculture LIS to calculate the productivity-adjusted LIS, it has a smaller sample size than in the unadjusted LIS.

[Table 4.1 is about here]

From 1996 to 2006, the aggregate productivity-adjusted LIS averages 0.42, and the unadjusted aggregate LIS averages 0.40. In the same time period, the agricultural productivity-adjusted LIS averages 0.51 and the unadjusted agriculture LIS averages 0.38. The discrepancy between the productivity-adjusted and unadjusted figures are much higher in agriculture compared to the other sectors, and is statistically significant at 5%. The average gap between the productivity-adjusted and unadjusted aggregate LIS is 0.01 with a standard deviation of around 0.02, whereas for the agriculture sector, this increases to an average of 0.17 and standard deviation of 0.16. We show a scatter plot of the productivity-adjusted aggregate LIS for 36 countries (Figure 4.3, Panel A) and the productivity-adjusted LIS in agriculture for 32 countries (Figure 4.3, Panel B).

[Figure 4.3 is about here]

The correlations between the productivity-adjusted LIS and the LIS from Karabarbounis and Neiman (2014) and ILO (2019) are 0.72 and 0.68, respectively. We largely attribute this difference to the self-employment gap. While most countries show close correlations between the measurements, a few show a sizeable difference. The most notable difference is that the productivity-adjusted LIS shows a greater divergence between countries with a lower LIS and countries with a higher LIS than the results in both Karabarbounis and Neiman, and the ILO paper. For instance, the productivity-adjusted calculation measures the Netherlands and Egypt LIS by around 0.20 lower, and the Lithuania LIS by around 0.20 higher.

[Figure 4.4 is about here]

## **5. Robustness checks with productivity-adjusted LIS measures**

One limitation of the productivity-adjustment mechanism to the LIS (Equations 1.2 and 1.3) is that it does not obtain the productivity-based LIS in non-agriculture, so any measurement error associated with the LIS in non-agriculture will be attributed to the productivity-adjusted LIS in agriculture (Equation 1.3). Consequently, instead of attempting to determine the robustness of our results by identifying the LIS for each sector, we identify the ratio of the LIS between each combination of two sectors. This has no identification problem because we are using a single equation to find a solution for a single unknown factor. By generalizing the two-sector (agriculture and non-agriculture) production technology for any sector (with

a production function of  $y_i = A_i L_i^{\theta_i} K_i^{1-\theta_i}$  for sector  $i$ ) while assuming competitive factor markets, the relationship between the sectoral productivity (value-added per worker) gap and the ratio of LIS across sectors is shown as:

(Equation 5.1)

$$\frac{\theta_i}{\theta_j} = \frac{VA_j/L_j}{VA_i/L_i}$$

$VA_i$  represents the value-added productivity and  $\theta_i$  represents the labor share of income in sector  $i$ . If the LIS in sector  $i$  is twice as large as in sector  $j$ , the labor productivity in sector  $i$  will be approximately half the size of the labor productivity in sector  $j$ . We assume the difference to be largely driven by a productivity-wage gap due to self-employment. A self-employed bias in earnings, such as a systematic return of lower wages when there is no productivity gap between the self-employed and the employees, can explain the gap between the labor productivity ratio and the LIS ratio. In equation 5.2, the difference between these two ratios is represented by  $\emptyset$ , which we determine within the scope of this study to be the self-employment bias, though this may also be affected by additional factors such as the depreciation of capital or the role of profit.

(Equation 5.2)

$$\frac{\theta_i}{\theta_j} = \emptyset \frac{VA_j/L_j}{VA_i/L_i} \quad \text{when} \quad \frac{\theta_i}{\theta_j} \neq \frac{VA_j/L_j}{VA_i/L_i}$$

We first estimate the productivity-based LIS ratio (the left-hand side of equation 5.2) using data from the Groningen Growth Data Center (GGDC), which provides the sectoral value added and employment shares for ten sectors.<sup>28</sup> For the productivity-based LIS ratios, the data is provided for a group of 22 countries,<sup>29</sup> though some of the observations are limited (Appendix 10). There are 20 or more observations for all sectors except for GOV at 17 and MIN at 18. The mean of all sectors is 2.43 with the greatest variance in MIN, which averages 9.83 in the numerator and 0.71 in the denominator.

For the estimated LIS ratio from our novel data, the available samples are from the same 22 group of countries. These samples consist of a smaller sample size with an average of 13 countries (Appendix 11). The OTH sector has only five entries. The average ratio is 1.81.

<sup>28</sup> AGR, MIN, MAN, CON, PU, WRT, TRA, FIRE, GOV, and OTH.

<sup>29</sup> BRA, BWA, CHN, COL, CRI, DNK, EGY, ESP, FRA, GBR, IDN, ITA, KOR, MEX, MUS, MYS, NLD, PER, PHL, SGP, SWE, USA.

The MIN sector has the widest range of variables with average ratios of 6.82 in the numerator and 0.64 in the denominator, far greater than any other average in either the numerator or denominator of all sectors, which all range between 3.14 and 0.64. Our estimated LIS ratio has a smaller amount of data, but there are still some similar observations when compared with the productivity-based LIS ratio. These both show MIN with a much larger variance between ratios than other sectors, with the average of most ratios below three. Additionally, MAN has the least variance in both measurements. There is a reasonable difference between the two total averages at 0.62.

[Table 5.1 is about here]

We show the correlations between the two measurements of LIS in Table 5.1 and find a close relationship between many of the sectors. Out of the 90 results, 32 show a strong correlation of 0.90 or greater, and 57 show a correlation greater than 0.60. There is a particularly high significance in the numerators and denominators of OTH at 0.98 and 0.97, GOV at 0.86 and 0.78, and MIN at 0.75 and 0.87. The lowest correlation is in the agricultural sector. The overall strength in these results provide us with more confidence in the validity of our LIS adjustment.

[Figure 5.1 is about here]

Appendix 12 shows four of the relationships in the correlation tables. These relationships together show a significant contrast, with some sectors showing a close correlative relationship such as GOV and TRA, and others with no correlation as observed in AGR and CON. The correlation between PU and MAN and the correlation between MIN and WRT suggest that countries diverge more in the estimated LIS ratio than in the productivity-adjusted LIS ratio. The large variance between sectors shows how the sector-level reveals more about the relationship between labor productivity and LIS than the aggregate level.

## **6. Self-employment and productivity-adjusted LIS for Japan**

In this section, we perform a robustness test to check if the large discrepancy between productivity-adjusted labor income and the adjusted LIS is truly determined by a larger self-employment LIS in agriculture. This study only focuses on Japan due to data limitations. We

use the 2017 Regional Japan Industrial Productivity (R-JIP) databases compiled by RIETI (The Research Institute of Economy, Trade, and Industry) and Hitotsubashi University.<sup>30</sup> Following Paul (2019b), we determine the LIS by sector as the ratio of nominal total labor compensation to nominal value added (at current prices). Since the nominal total labor compensation includes employee compensation and mixed income, it automatically adjusts for labor compensation of non-workers (non-employees). Aside from the mining industry due to measurement issues, we combine all sectors into six key sectors: agriculture, construction, manufacturing, trade and commerce, services, and utilities. The self-employment data is obtained from the Statistical Survey Department, Statistics Bureau, Ministry of Internal Affairs and Communications in Japan.<sup>31</sup> The self-employment data is available from 1970 until 2002.

[Figure 6.1 is about here]

In the left panel of Figure 6.1, the agricultural self-employment rate remains at a high level near 50% throughout 1970 to 2002. The self-employment rate of the other sectors shows a ratio of 20% or under with a steady declining trend, aside from the utilities sector that continues along 3%. In the right panel, the unadjusted LIS trend shows a high degree of variance between key sectors. The utilities sector is relatively consistent with a LIS of around 0.30. This period also shows a decreasing trend in the services, agriculture, and trade and commerce sectors, and an increasing trend in the construction and manufacturing sectors. Also, the largest aggregate decline in the late 1980s can be explained by the Japanese asset price bubble.

### **6.1. Productivity-adjustment to the sectoral labor income share**

To find the productivity-adjusted LIS figures, we assume that the self-employment bias in the manufacturing sector is negligible due to low self-employment rates and a large share of total employment. With this assumption, we use manufacturing as the base sector from where we calculate the productivity-adjusted LIS in the other sectors. This is calculated by first

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<sup>30</sup> The R-JIP database compiles value-added output in current and constant prices, quality-adjusted labor input, and quality-adjusted capital input for all 23 industrial sectors,<sup>30</sup> with available data for every year from 1970 to 2012.

<https://www.rieti.go.jp/en/database/R-JIP2017/index.html#09>

<sup>31</sup> Table 19-8-a, “Employed Persons by Industry, Employment Status and Sex (1953-2002)”

denoting the manufacturing LIS as sector  $\theta_M$ , the manufacturing sector productivity as  $VA_M/L_M$ , and all other sectors as ( $j$ ).

(Equation 6.1)

$$\theta_j|_{Productivity-adjusted} = \frac{\theta_M \times (VA_M/L_M)}{VA_j/L_j}.$$

We then determine the LIS gap as follows:

(Equation 6.2)

$$LIS\_GAP_j = \theta_j|_{Productivity-adjusted} - \theta_j|_{Unadjusted}.$$

The unadjusted LIS found in Figure 6.1 is then subtracted from the productivity-adjusted LIS to determine the LIS gap in Figure 6.2. This figure shows a substantial difference between the agriculture sector, where the self-employment gap is at around 1.50, and the other sectors where the gap is measured at zero or below. The self-employment gap in all sectors is relatively consistent. The unrealistic value of the agriculture LIS can be explained by the bias in the agricultural sector labor productivity due to self-employment. We test this in appendix 13 by comparing the adjusted labor productivity of agriculture with an unadjusted counterfactual measurement of the labor productivity in agriculture.

[Figure 6.2 is about here]

We calculate a counterfactual labor productivity in agriculture from the unadjusted LIS using the following formula:

(Equation 6.3)

$$\frac{VA_A}{L_A}|_{Counterfactual} = \frac{\theta_M \times (VA_M/L_M)}{\theta_A|_{Unadjusted}}, \text{ where } \theta_A|_{Unadjusted}$$



We find a sizeable difference in the trend from 1970 to 2002 when comparing these two measurements. The increase in the actual labor productivity in agriculture is around five times greater than in the counterfactual labor productivity measurement. This can be attributed to the heavily underreported value added from self-employed workers in agriculture, which gives way to a higher labor productivity measurement. With this test, we find that the productivity-adjusted LIS figures can be misleading if the figures themselves contain self-employment bias.

[Table 6.1 is about here]

## **6.2. Productivity-adjusted LIS and self-employment: A regression analysis**

Finally, we use a regression in Table 6.1 to show the extent to which self-employment can explain the gap in the sectoral LIS for Japan. The first two columns (models 1 and 2) show the regression outcomes on the LIS at the sector level. We exclude the manufacturing sector in the regression analysis since this is used as the base sector. This gives us a total of 165 observations from five sectors between 1970 and 2002. Fixed effects are included in the regression to control for time-invariant factors associated with each sector. We find that a percentage point increase in self-employment is associated with a 1.04 percent point increase in the sectoral LIS, with the model explaining 89.6% of the variations in the LIS. The outcomes are similar for the non-agricultural sample in model 2, except that this model explains 94% of the LIS variations. The goodness of fit is lower when agriculture is included in the sample, which reflects the measurement errors associated with a high rate of self-employment in agriculture.

The last two columns in Table 6.1 show the outcomes on the LIS gap. We calculate the LIS gap as the difference between the productivity-adjusted LIS and unadjusted LIS. As the gap increases, the unadjusted LIS moves further away from the adjusted LIS estimate. An increase in self-employment is positively correlated with the LIS gap, but with no statistical significance. However, almost 98% of the variation in the LIS is explained by self-employment. We also find a relatively high goodness of fit at 80% when agriculture is excluded. These results support our understanding of the agricultural self-employment as the primary driver of the LIS gap, and is the main source of the gap between the adjusted LIS and the productivity-based LIS for the agriculture sector.

## 7. Concluding remarks

Our paper addresses the principal issue in measuring the labor income share, which is finding the labor income share of the self-employed. Two main methods are used to estimate the wages of a country's self-employed workers to determine their share of labor income. One is to apply a general rule of thumb to a country's predicted relationship of the self-employed income using the income of employed workers among other factors. The other is to only examine the LIS data of a particular sector with minimal disruptions from self-employment. Both approaches have limitations, the first approach requiring an arbitrary assumption for the constant wage ratio between employed and self-employed workers, and the second approach producing just a limited picture of the total economy.

We show that a productivity-adjusted methodology can estimate the self-employment bias in the LIS. Our approach follows the Cobb-Douglas production framework and derives the ratio of the agricultural to non-agricultural LIS as equal to the ratio of non-agricultural to agricultural value added per worker. We use this framework to determine the aggregate labor income share by estimating the agricultural productivity gap and the LIS in non-agriculture and value-added factor shares.

Between 1996 and 2006, our sample of 32 countries averages 0.42 for the aggregate productivity-adjusted LIS and 0.51 for the agricultural productivity-adjusted LIS. The discrepancy between the productivity-adjusted figures and the unadjusted figures is much higher in agriculture compared to the aggregate figures. The results from our robustness checks suggest that this gap is likely to be driven by the self-employment bias in the measurement of the LIS in agriculture. The correlation between the productivity-based LIS ratio and the unadjusted LIS ratio indicates that the agricultural sector contains the largest difference between the sectoral LIS ratio and sectoral productivity ratio, when considered at a disaggregated level of non-agricultural sectors. Finally, a sector level analysis of Japan from 1970 to 2002 shows a large gap between the productivity-adjusted and unadjusted LIS in agriculture, and that almost 98% of the LIS gap is explained by the presence of self-employment.

As more data continues to be made available for detailed sector-level analyses, we hope for further research to build upon our findings. This is particularly the case for developing countries where a large majority of workers are self-employed. The lack of developing countries is notable in our datasets, so access to additional labor force information is essential

to strengthen our results. Future studies should also consider potential massive future shifts in the nature of work that will impact the self-employment LIS. For instance, the rise in digitalisation and the gig economy will lead to new forms of jobs that can reduce employment barriers faced by workers. Some recent examples of these jobs include the 2118 ‘Taobao Villages’ in China, the online freelancing platforms Indiez in India and Wonderlabs in Indonesia, and Asuku, the online platform for business sector experts in Nigeria. While the number of workers employed in these jobs is still minimal, with freelance workers only at 0.3% of the total workforce in developing economies, we expect this to grow substantially due to the rising available opportunities in technology and the widespread use of mobile devices in the developing world. The impact on developing countries could result in a sizeable shift of workers from the agricultural self-employment LIS to other sectors such as finance and private services, potentially causing a degree of convergence with developed countries. This suggests that more research on the self-employment labor income share will be needed to understand how the global economy continues to transform.

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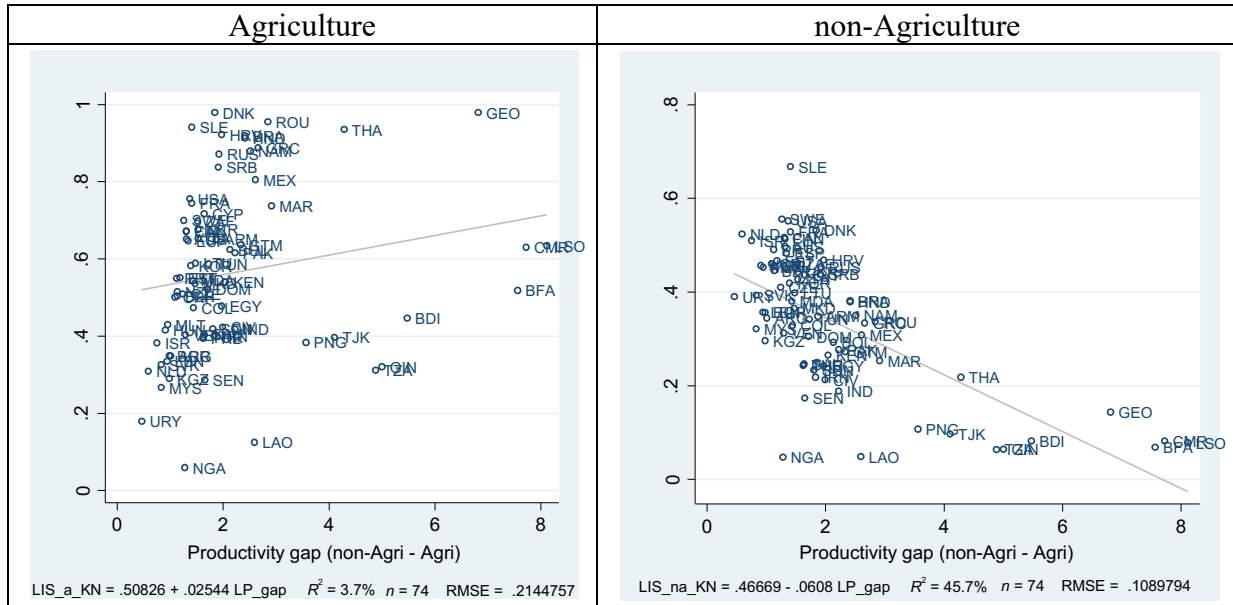


**Table 3.1: Summary Statistics of the Sectoral Labor Income Share**

	Observations	Mean	Standard Deviation	Min	Max
Primary	495	0.28	0.18	0.01	0.87
Secondary	506	0.35	0.14	0.08	0.73
Tertiary	516	0.36	0.15	0.05	0.92
AGR	317	0.40	0.25	0.01	0.97
MIN	480	0.20	0.14	0.00	0.82
MAN	492	0.40	0.14	0.07	0.97
PU	486	0.16	0.11	0.03	0.74
CON	438	0.32	0.22	0.03	1.00
WRT	419	0.40	0.16	0.04	0.97
TRA	455	0.40	0.16	0.09	0.97
FIRE	392	0.28	0.19	0.03	0.99
GOV	307	0.46	0.15	0.14	0.93
OTH	82	0.33	0.18	0.10	0.99

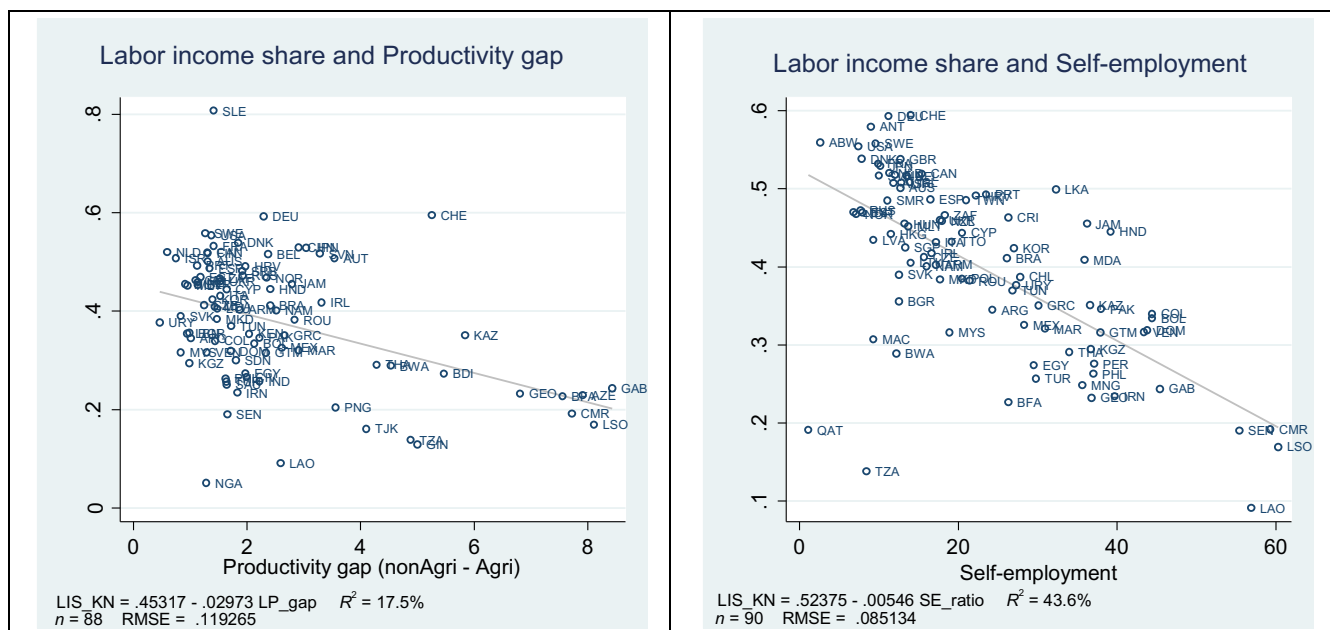
Source: Authors' own calculations.

**Figure 4.1. Sectoral labor income shares and the agricultural productivity gap**



Source: Authors' own complication using labor income share data is from Karabarbounis and Neiman (2014), and productivity gap (between non-agriculture and agriculture) data from Gollin, Lagakos and Waugh (2017).

**Figure 4.2. Labor income share, Self-employment, and Agricultural Productivity gap**



Source: Authors' own compilation using self-employment data from La Porta and Shleifer (2014), and productivity gap (between non-agriculture and agriculture) data from Gollin, Lagakos and Waugh (2017).

**Table 4.1. Productivity-adjusted and unadjusted figures**

	Obs	Mean	Std. Dev.	Min	Max
A. Productivity-adjusted aggregate LIS	36	0.419	0.114	0.273	0.738
B. Unadjusted aggregate LIS	28	0.399	0.126	0.261	0.740
Difference (A-B)	28	0.012	0.020		
C. Productivity-adjusted LIS in Agriculture	32	0.506	0.218	0.100	0.940
D. Unadjusted LIS in Agriculture	28	0.373	0.218	0.016	0.709
Difference (C-D)	28	0.170*	0.168		

Source: Authors' own calculations

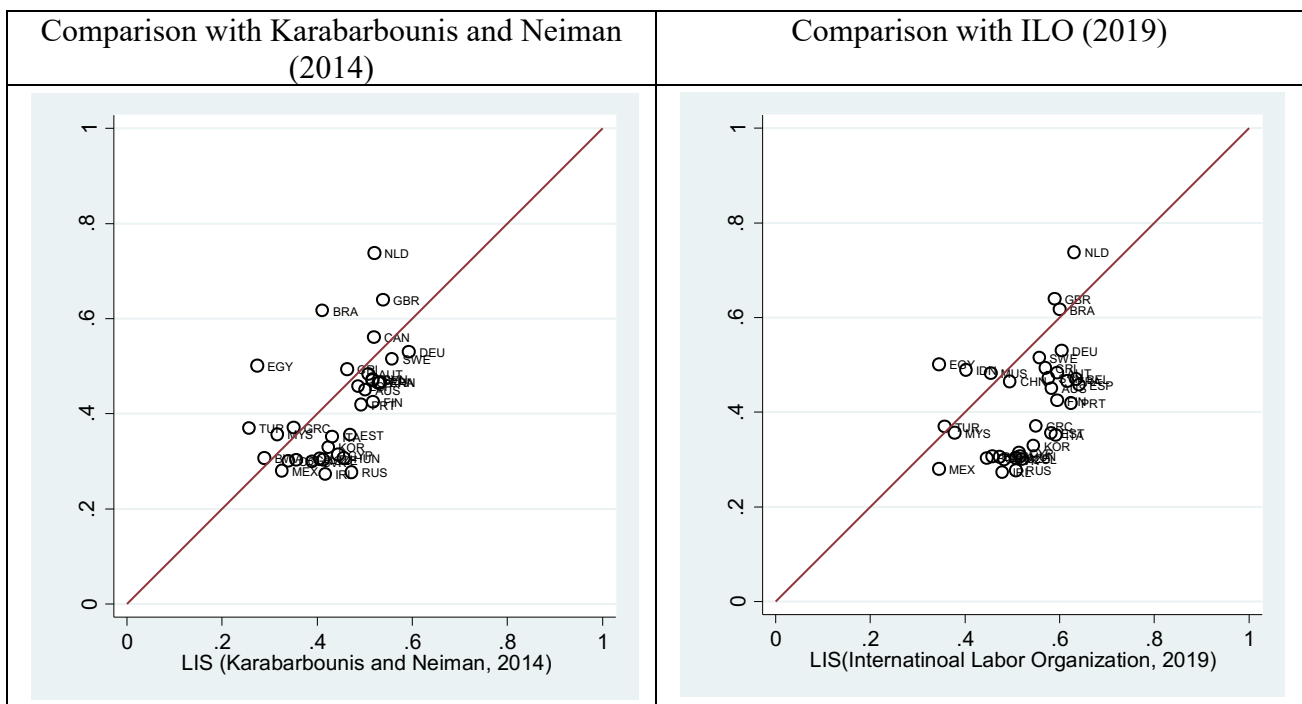
Note: \*indicates the difference is statistically significant at 5%.

**Figure 4.3. Productivity-adjusted labor income shares (Aggregate and Agriculture)**



Source: Authors' calculations using a newly constructed sectoral labor income dataset, the productivity, and value-added data from Gollin, Lagakos and Waugh (2017).

**Figure 4.4. Comparison with Karabarbounis and Neiman (2014), and ILO (2019)**



Source: Authors' calculations using a newly constructed sectoral labor income dataset, the productivity, and value-added data from Gollin, Lagakos and Waugh (2017), and data from Karabarbounis and Neiman (2014), and ILO (2019).

**Table 5.1. The correlation between productivity-based and estimated LIS ratios**

	AGR	MIN	MAN	PU	CON	WRT	TRA	FIRE	GOV	OTH
AGR		0.32	0.21	-0.04	0.67*	0.52	0.20	0.46	0.70	0.99
MIN	0.26		0.84*	0.75*	0.96*	0.97*	0.95*	0.28	0.79*	0.95
MAN	-0.35	0.92*		0.74*	-0.12	-0.36	0.42	0.03	0.66	0.99
PU	-0.40	0.94*	0.78*		-0.26	0.19	0.70*	0.55	0.55	0.95
CON	0.06	0.93*	0.41	0.01		0.68*	0.67*	0.35	0.72*	0.99*
WRT	-0.03	0.92*	-0.40	0.40	0.52		.66*	-0.05	0.89*	0.92
TRA	0.09	0.92*	0.22	0.31	0.58*	0.73*		-0.07	0.93*	0.98*
FIRE	-0.16	0.96*	0.70*	0.78*	0.50	0.60	0.74*		0.82*	0.99
GOV	0.71	0.92*	0.93*	0.79*	0.83*	0.97*	0.95*	0.66		0.94
OTH	0.94	0.99*	0.99*	0.99	0.99*	0.97*	0.99*	0.99*	0.94	

Note: Correlations are noted with an asterisk. Correlations of 0.60 or more are shaded in light gray. High degree of correlations of 0.90 or more are shaded in dark gray.

**Figure 6.1 Self-employment rates and unadjusted labor income share trends across key sectors in Japan, 1970-2002**

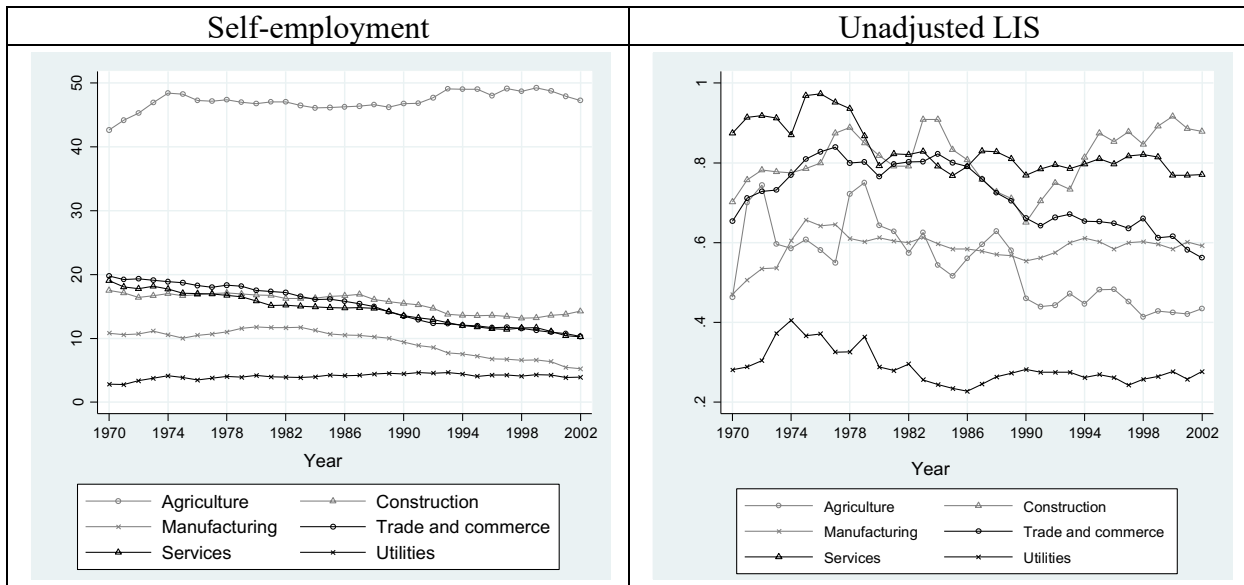
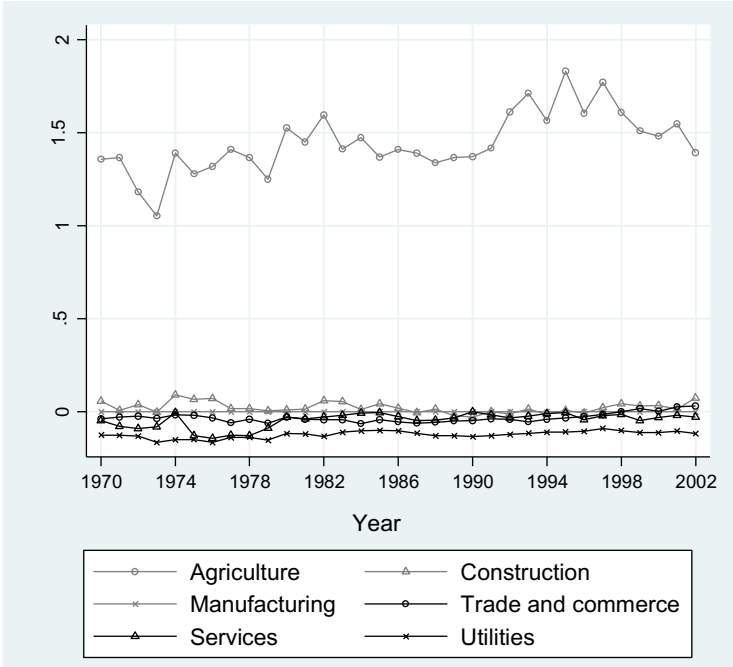




Figure 6.2. Labor income share gap across sectors, 1970-2002



**Table 6.1 Regression outcomes on the labor income share and the labor income share gap in Japan**

	Dependent variable: Labor income share				Dependent variable: Labor income share gap			
	Model 1: Full sample		Model 2: Non-agricultural sample		Model 3: Full sample		Model 4: Non-agricultural sample	
	<b>coef</b>	<b>se</b>	<b>coef</b>	<b>se</b>	<b>coef</b>	<b>se</b>	<b>coef</b>	<b>se</b>
Self-employment	1.041***	(0.264)	1.493***	(0.232)	0.221	(0.251)	-0.446***	(0.117)
Constant	0.246***	(0.013)	0.227***	(0.012)	-0.132***	(0.011)	-0.105***	(0.006)
Observations	165		132		165		132	
Sector fixed effects	Yes		Yes		Yes		Yes	
R2	0.896		0.940		0.984		0.790	

Source: Authors' calculation based on (1) Regional Japan Industrial Productivity (R-JIP) databases compiled by RIETI, and (2) Table 19-08-a, the Statistical Survey Department, Statistics Bureau, Ministry of Internal Affairs and Communications, Japan.

Note: Full sample include five sectors agriculture, construction, trade and commerce, services, and utilities). The labor income share gap is calculate as the difference between productivity-adjusted labor income share and unadjusted labor income share.

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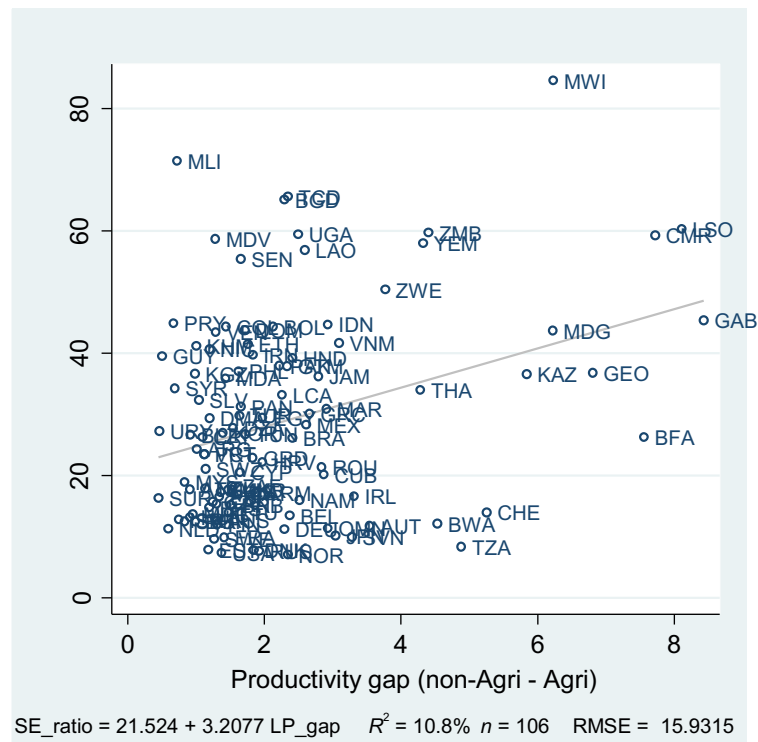
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## Appendix 1. Self-employment and agricultural productivity gap



## Appendix 2: Notes on Employment Data

### Part 1: Covered by ILO data

#### Employment by Sex and Economic Activity (thousands)

The employed comprise all persons of working age who, during a specified brief period, were in the following categories: a) paid employment (whether at work or with a job but not at work); or b) self-employment (whether at work or with an enterprise but not at work). The data is disaggregated by economic activity according to the latest version of the International Standard Industrial Classification of All Economic Activities (ISIC) available for that year. Economic activity refers to the main activity of the establishment in which a person worked during the reference period and depends not on the specific duties or functions of the person's job but on the characteristics of the economic unit in which this person worked.

#### Argentina

**Source:** Permanent Household Survey (Urban) [Encuesta Permanente de Hogares (Urban)]  
**Period:** 1991–2010

**Notes:** Methodology revised every year from 1991 to 2002. Break in series in 2003.  
The data reference period is annual or annual average values in 1991–1995; incomplete years in 1996–2010.  
Age coverage—minimum age: 10 years from 1996 to 2003.  
Notes on total in 2007: “Nonstandard age group: including 10–14.”  
The survey covers only metropolitan areas and main cities.  
Warning on the use of statistical series: researchers should use statistical series published after January 2007 and before December 2015 with caution. The INDEC, based on the statement in decrees 181/15 and 55/16, is undertaking the investigations required to ensure the regularity of data collection and processing.

#### Bolivia

**Source:** Household Survey [Encuesta de Hogares]

**Period:** 1999 and 2005–2009

**Notes:** Methodology revised in 2005.

The Data reference period of 1999 is November.

B in 2008 and 2009 is unreliable according to the ILO's note.

Q in 2009 is unreliable according to the ILO's note.

### Botswana (1/2)

**Source:** Labor Force Survey

**Period:** 1996, 1998, 2000, 2003, and 2006

**Notes:**

The data reference period is the annual or annual average for the years 1996, 1998, 2000, 2003, and 2006.

Population coverage: including armed forces and/or conscripts in 1996, 1998, 2000, 2003, and 2006.

Age coverage—minimum age: 12 years in 1996, 1998, 2000, 2003, and 2006.

Note on A for 1996, 1998, 2000, 2003, and 2006: “Nonstandard economic activity: excluding B.”

### Botswana (2/2)

**Source:** Botswana Core Welfare Indicators (Poverty) Survey

**Period:** 2009

**Notes:** Q in 2009 is unreliable according to the ILO's note.

### Brazil (1/2)

**Source:** Annual Labor Force Survey [Pesquisa Nacional por Amostra de Domicílios]

**Period:** 1995–1999, 2001–2009, and 2011

**Notes:** Q in 1996, 1999, 2002, 2006–2009, and 2011 is unreliable according to the ILO's notes.

c.f. Another source, the “Monthly Employment Survey” [Pesquisa Mensal de Emprego], is available for the years 2004–2013. This covers only metropolitan areas and main cities.

### Chile (1/3)

**Source:** Population census [Censos de población]

**Period:** 2002

**Notes:** The reference period is April.

### Chile (2/3)

**Source:** National Survey on Socio-Economic Conditions [Encuesta de Caracterización Socioeconómica Nacional]

**Period:** 2011 (2013 is available)

### Chile (3/3)

**Source:** National Employment Survey [Encuesta Nacional de Empleo]

**Period:** 2009 and 2010 (2011–2013 are also available)

**Notes:** B-I in 2009 is quite different from that in 2010.

### The People's Republic of China

**Source:** Employment and wage statistics based on enterprises' reports

**Period:** 1986–2008

**Notes:** The reference period is annual or the annual average in 1995, 1996, and 1998–2008. The definition of “working time” is “hours actually worked” in 1995, 1996, and 1998–2008. Note on A for 1986–2008: “Nonstandard economic activity: including B.” Note on C for 1986–2008: “Nonstandard economic activity: mining only.” Note on G for 1986–2002 and 2005–2008: “Nonstandard economic activity: including H.” Note on I for 2003: “Nonstandard economic activity: excluding communication.” Note on L for 1986–2008: “Nonstandard economic activity: state organs, social organizations.” Note on L for 1986–2002: “Nonstandard economic activity: including sporting activities and activities of membership organizations not elsewhere classified.”

### Columbia

**Source:** Integrated Household Survey [Gran Encuesta Integrada de Hogares]

**Period:** 2002–2011 (2012 and 2013 are available)

**Notes:** Methodology revised in 2010.

Age coverage—minimum age: 10 years in rural areas and 12 years in urban areas in 2004, 2008, and 2009.

The data reference period is annual or annual average values in 2009.

Population coverage: excluding both institutional population and armed forces and/or conscripts in 2009.

Note on A for 2004 and 2008: “Nonstandard economic activity: including B.”

Note on G for 2004 and 2008: “Nonstandard economic activity: including H.”

Note on L for 2004 and 2008: “Nonstandard economic activity: including M-O.”

## Costa Rica

**Source:** National Household Survey [Encuesta Nacional de Hogares]

**Period:** 1996–2008 (the ILO’s metadata description is available from 1997)

**Notes:** The reference period is July in 1997–2008.

Age coverage—minimum age: 12 years in 1997–2008.

Note on L for 1996–2000: “Nonstandard economic activity: including O.”

## Denmark

**Source:** EU Labour Force Survey

**Period:** 1992–2007

**Notes:** Methodology revised in 2005.

The data reference period is annual or annual average values.

B in 1996–2007 is unreliable according to the ILO’s notes.

C in 1992–2004 is unreliable according to the ILO’s notes.

P in 1995 and 1997–2006 is unreliable according to the ILO’s notes.

Q in 1993, 1999, 2000, 2003, 2006, and 2007 is unreliable according to the ILO’s notes.

X in 1995, 1996, 1998, 2001–2005, 2006, and 2007 is unreliable according to the ILO’s notes.

## Egypt (1/2)

**Source:** Population Census

**Period:** 1996

**Notes:** The reference period is November.

Note on A for 1996: “Nonstandard economic activity: including B.”

Note on J for 1996: “Nonstandard economic activity: including K.”

Note on O for 1996: “Nonstandard economic activity: including P-Q.”

## Egypt (2/2)

**Source:** Labour Force Sample Survey

**Period:** 1997–2008



**Notes:** Data reference periods: incomplete year.  
Population coverage: excluding armed forces and/or conscripts.  
Age coverage—maximum age: 64 years.  
Q in 2008 is unreliable according to the ILO’s note.

## Ethiopia

**Source:** National Labor Force Survey  
**Period:** 1999 and 2005

## France

**Source:** EU Labour Force Survey  
**Period:** 1992–2007

**Notes:** The methodology changed in 2003 and 2005.  
The data reference period is annual or annual average values.  
B in 2004 and 2007 is unreliable according to the ILO’s note.  
C in 2004 is unreliable according to the ILO’s note.  
Q in 1992–2002, 2004, 2006, and 2007 is unreliable according to the ILO’s note.  
X in 1994–2002 is unreliable according to the ILO’s note.

## Ghana

**Source:** Living Standards Survey [Déclaration annuelle de Données Sociales]  
**Period:** 2006

## India

**Source:** National Sample Survey  
**Period:** 2000, 2005, and 2010

**Notes:** The data reference period is non-calendar year.  
Q in 2000 and 2005 is unreliable according to the ILO’s note.  
c.f. Another resource, the “Employment–Unemployment Survey,” is available for 2005 and 2010.  
The values are larger than those of the National Sample Survey, especially for activity A-E.

## Indonesia

**Source:** National Labour Force Survey  
**Period:** 2000–2010

**Notes:** Methodology revised in 2000.  
Q in 2003, 2005, and 2010 is unreliable according to the ILO's note.

### Italy

**Source:** EU Labour Force Survey  
**Period:** 1992–2007

**Notes:** The methodology changed in 1992 and 2005.  
Unemployment definition: two criteria (not in employment and seeking).  
The data reference period is annual or annual average values.

### Japan

**Source:** Labour Force Survey  
**Period:** 2003, 2004, and 2007

**Notes:** The data reference period is annual or annual average values in 2003 and 2004.

### Kenya

**Source:** Labour Force Survey  
**Period:** 1999

### Republic of Korea

**Source:** Economically Active Population Survey  
**Period:** 1992–2008

**Notes:** Break in series in 1999.  
c.f. Another source, "Population Census," is available for the year 2000. Its reference period is November.

### Malaysia

**Source:** Labor Force Survey  
**Period:** 2001–2009

**Notes:** The data reference period is annual or annual average values.  
Population coverage: excluding armed forces and/or conscripts.

### Mauritius (1/2)

**Source:** Continuous Multi-Purpose Household Survey  
**Period:** 1995 and 2001–2010

**Notes:** The methodology changed in 2001 and 2003.  
The data reference period is annual or annual average values in 1995.  
Population coverage: excluding armed forces and/or conscripts in 1995.  
Age coverage—minimum age: 12 years in 1995 and 16 years after 2001.  
Note on A for 1995: “Nonstandard economic activity: including B.”  
Note on J for 1995: “Nonstandard economic activity: including K.”  
Note on M for 1995: “Nonstandard economic activity: including N.”  
Note on O for 1995: “Nonstandard economic activity: including P-Q.”  
C in 2002, 2004, 2005, and 2010 is unreliable according to the ILO’s note.  
Q in 2004–2010 is unreliable according to the ILO’s note.  
X in 2002 is unreliable according to the ILO’s note.

### Mauritius (2/2)

**Source:** Population Census  
**Period:** 2000

**Notes:** Data reference period iJuly.  
Age coverage—minimum age: 12 years.  
c.f. Another source, “Official Estimation,” is available for the years 2000–2008. Its Data reference period is annual or annual average values.

### Mexico

**Source:** National Occupation and Employment Survey [Encuesta Nacional de Ocupación y Empleo]  
**Period:** 1991, 1993, and 1995–2004

**Notes:** The methodology changed in 1991, 1993, and 2004.  
c.f. Another source, the Population Census [Censos de población], is available for 2000. Its data reference period is February and its lowest age coverage is 12 years.

### Morocco

**Source:** The National Employment Survey [Enquête nationale sur l’emploi]  
**Period:** 2000, 2002–2008, and 2011–2013

### The Netherlands

**Source:** EU Labour Force Survey

**Period:** 1992–2007

**Notes:** Methodology revised in 2005.

B in 1992–1996 and 1998–2007 is unreliable according to the ILO’s note.

P in 2000–2002 and 2004 is unreliable according to the ILO’s note.

Q in 1992, 1994–1999, 2002–2004, and 2005–2007 is unreliable according to the ILO’s note.

## Nigeria

**Source:** Official estimates?

**Period:** 2005-2009

## Peru

**Source:** National Household Survey [Encuesta Nacional de Hogares]

**Period:** 2002–2011 (2012 and 2013 are also available)

**Notes:** An alternative source, the Permanent Employment Survey (Urban) [Encuesta permanente de Empleo (Urban)], is available for the period 1996–2009, though it covers only main cities or metropolitan areas.

## The Philippines (1/2)

**Source:** Employment, Hours, and Earnings Survey

**Period:** 1996–1999, 2001, 2003, 2005, 2006, and 2008

**Notes:** Break in series: unspecified type of break in 1999.

Establishment size coverage: all establishments with at least 10 employees

in 1996–1998 and at least 20 employees in 1999, 2001, 2003, 2005, 2006, and 2008.

The data reference period is annual or annual average values in 1996–1999, 2001, 2003, 2005, 2006, and 2008.

Note on M for 1996–1999, 2001, 2003, 2005, 2006, and 2008: “Nonstandard economic activity: private education only.”

Note on N for 1996–1999, 2001, 2003, 2005, 2006, and 2008: “Nonstandard economic activity: excluding public medical, dental and other health services.”

## The Philippines (2/2)

**Source:** Labour Force Survey

**Period:** 2002

**Notes:** The data reference period is annual or annual average values.

Population coverage: excluding armed forces and/or conscripts.

The values are quite different (sometimes values are more than 10 times bigger than those of source (1/2))

## Senegal

**Source:** The Survey to Monitor Poverty in Senegal [Enquête de Suivi de la Pauvreté au Sénégal]  
**Period:** 2006

## Singapore

**Source:** Comprehensive Labour Force Survey  
**Period:** 1985–1989, 1991–1999, and 2001–2005

**Notes:** Methodology revised in 2001.

The data reference period is June for 1994–2005.

Population coverage: nationals and residents for 1994–2005.

Notes on A for 1985–1989 and 1991–1996: “Nonstandard economic activity: including B”; 1997–1999 and 2001–2005: “Including B-C, E, X.”

Note on G for 1997: “Nonstandard economic activity: including H.”

Note on J for 1997: “Nonstandard economic activity: including K.”

Notes on L for 1997: “Nonstandard economic activity: including M-Q”; for 1998, 1999, and 2001–2005: “Including M.”

Note on M for 1985–1989 and 1991–1996: “Nonstandard economic activity: including N.”

c.f. An alternative source, “Population Census,” is available in 2000.

## South Africa

**Source:** The Quarterly Labour Force Survey  
**Period:** 2000 to 2013

## Spain

**Source:** EU Labor Force Survey  
**Period:** 1992–2007

**Notes:** Methodology revised in 1993, 2001, and 2005.

The data reference period is annual or annual average values.

Q in 1992, 1994–1996, 1998–2000, 2003, and 2007 is unreliable according to the ILO’s note.

## Sweden

**Source:** EU Labour Force Survey  
**Period:** 1995–2007

**Notes:** Methodology revised in 2005.  
 The data reference period is annual or annual average values.  
 B is unreliable in 1995–2004, 2006, and 2007 according to the ILO’s note.  
 C is unreliable in 1995, 1996, and 1999 according to the ILO’s note.  
 P is unreliable in 1998, 1999, 2001, and 2005–2007 according to the ILO’s note.  
 Q is unreliable in 2001–2002, 2004, and 2006–2007.  
 X is unreliable in 1996–2000, 2004, and 2005.  
 c.f. The Labour Force Survey is available in 1987–1989.

### Tanzania

**Source:** Labour Force Survey  
**Period:** 2006  
**Notes:** Methodology revised in 2006

### Thailand

**Source:** Labour Force Survey  
**Period:** 2002–2010  
**Notes:** Methodology revised in 2010.  
 The data reference period is third quarter in the years 2002 and 2003.  
 Population coverage: excluding armed forces and/or conscripts in 2002 and 2003.  
 Nonstandard economic activity: including repair and installation services for all activities in 2004–2008.

### United Kingdom

**Source:** EU Labour Force Survey  
**Period:** 1992–2007  
**Notes:** Methodology revised in 2005.  
 The data reference period is annual or annual average values for the years 1992–2007.  
 B in the years 1995–1997, 1999–2001, 2003, and 2004 is unreliable according to the ILO’s note.  
 Q in the years 1999, 2003, and 2004 is unreliable according to the ILO’s note.  
 c.f. An alternative source, “Official Estimates,” is available from 1996 to 2005.

## Part Two: Countries covered by the Socio-Economic Account

### Australia

**Source:** Labour Force Survey

**Period:** 1990–2008

**Notes:** Break in series in 1994 and 2006.

### Austria

**Source:** EU Labour Force Survey

**Period:** 1995–2007

**Notes:** Break in series in 2005.

The data reference period is annual or annual average values.

B in 1998, 2000, and 2004–2007 is unreliable according to the ILO's note.

Q in 1994–2004 is unreliable according to the ILO's note.

### Belgium

**Source:** EU Labour Force Survey

**Period:** 1992–2007

**Notes:** Break in series in 1999, 2001, and 2005.

The data reference period is annual or annual average values.

B in 1992, 1994, 1996, 1997, 2006, and 2007 is unreliable according to the ILO's note.

Q in 2002 and 2003 is unreliable according to the ILO's note.

c.f. Another source, "Official Estimates [Estimations officielles]," is available for 1994–1999.

### Bulgaria

**Source:** EU Labour Force Survey

**Period:** 2000–2007

**Notes:** Break in series in 2001, 2003, and 2005.

The data reference period is annual or annual average values.

B in 1992, 1994, 1996, 1997, 2006, and 2007 is unreliable according to the ILO's note.

P in 2000, 2002, 2004, 2006, and 2007 is unreliable according to the ILO's note.

Q in 2004, 2006, and 2007 is unreliable according to the ILO's note.

X in 2002 and 2004 is unreliable according to the ILO's note.

c.f. Another source, "Official Estimates," is available for 1996–2006. (The number of employees in the agriculture sector has the largest difference among all the sectors. The number reported here is almost double to triple to that of the EU LFS). In addition, the Population Census is available for 2001.

### Canada

**Source:** Labour Force Survey

**Period:** 2016

## Cyprus

**Source:** EU Labour Force Survey

**Period:** 2000–2007

**Notes:** Break in series in 2005.

B in 2001–2004 and 2006–2007 is unreliable according to the ILO's note.

C in 2001–2004 and 2006–2007 is unreliable according to the ILO's note.

## Czech Republic

**Source:** EU Labour Force Survey

**Period:** 1993–2007

**Notes:** B in 1997 to 2004 is unreliable according to the ILO's note.

P in 1997 to 2004 and 2007 is unreliable according to the ILO's note.

Q in 1997 to 2004, 2006, and 2007 is unreliable according to the ILO's note.

X in 1997 to 2001, 2004, 2006, and 2007 is unreliable according to the ILO's note.

## Estonia (1/2)

**Source:** Labour Force Survey

**Period:** 1989–1996

**Notes:** The data reference period is annual or annual average values.

Population coverage: including armed forces and/or conscripts.

Age coverage—maximum age: 69 years.

## Estonia (2/2)

**Source:** EU Labour Force Survey

**Period:** 1997–2007

**Notes:** The data reference period is annual or annual average values.

B in 1997, 1999, 2000, 2002–2004, 2006, and 2007 is unreliable according to the ILO's note.

C in 1997, 2000, and 2002–2004 is unreliable according to the ILO's note.

J in 1997, 2000, and 2002–2004 is unreliable according to the ILO's note.

P in 1997–1999 and 2004–2006 is unreliable according to the ILO's note.

Q in 2007 is unreliable according to the ILO's note.

X in 2005–2007 is unreliable according to the ILO's note.

## Finland (1/2)



**Source:** Labour Force Survey

**Period:** 1989

**Notes:** The data reference period is annual or annual average values.

### Finland (2/2)

**Source:** EU Labour Force Survey

**Period:** 190–2007

**Notes:** Break in series in 2000 and 2005.

The data reference period is annual or annual average values.

B in 1995, 1996, 1998, 1999, 2001–2004, 2006, and 2007 is unreliable according to the ILO's note.

C in 1997 and 2001 is unreliable according to the ILO's note.

P in 1995, 1996, 2004, 2006, and 2007 is unreliable according to the ILO's note.

X in 1995 is unreliable according to the ILO's note.

### Germany

**Source:** EU Labour Force Survey

**Period:** 1992–2007

**Notes:** Break in series in 2005.

The data reference period is annual or annual average values.

B in 1997, 2003, and 2004 is unreliable according to the ILO's note.

### Greece

**Source:** EU Labour Force Survey

**Period:** 1992–2007

**Notes:** Methodology revised in 1998, 2001, 2004, and 2005.

Q in 1992–1997, 1999, 2002, 2006, and 2007 is unreliable according to the ILO's note.

### Hungary (1/2)

**Source:** Labour Force Survey

**Period:** 1992–1995

**Notes:** The data reference period is annual or annual average values.

Population coverage: excluding armed forces and/or conscripts.

Age coverage—maximum age: 74 years.

Note on A for 1992–1995: “Nonstandard economic activity: including B.”

## Hungary (2/2)

**Source:** EU Labour Force Survey

**Period:** 1996–2007

**Notes:** Methodology change in 2001 and 2005.

The data reference period is annual or annual average values.

B in 1996–2000, 2002–2004, 2006, and 2007 is unreliable according to the ILO's note.

P in 1996–2000, 2002–2004, 2006, and 2007 is unreliable according to the ILO's note.

Q in 1996–2000, 2002–2004, 2006, and 2007 is unreliable according to the ILO's note.

## Ireland

**Source:** EU Labour Force Survey

**Period:** 1992–2007

**Notes:** Methodology change in 2005.

The data reference period is annual or annual average values.

B in 1998–2004, 2006, and 2007 is unreliable according to the ILO's note.

Q in 1992–1997, 2006, and 2007 is unreliable according to the ILO's note.

X in 1992, 1993, 1997, and 2004 is unreliable according to the ILO's note.

## Latvia (1/2)

**Source:** Labour Force Survey

**Period:** 1996 and 1997

**Notes:** The data reference period is annual or annual average values.

Population coverage: excluding armed forces and/or conscripts.

## Latvia (2/2)

**Source:** EU Labour Force Survey

**Period:** 1998–2007

**Notes:** Methodology revised in 2002 and 2005.

The data reference period is annual or annual average values.

B in 1998, 2000, 2001, 2003, 2004, and 2006 is unreliable according to the ILO's note.

C in 1998–2001, 2003, and 2004 is unreliable according to the ILO's note.

J in 2001 and 2003 is unreliable according to the ILO's note.

Q in 1998–2001, 2003, and 2004 is unreliable according to the ILO's note.

X in 2006 and 2007 is unreliable according to the ILO's note.

## Lithuania (1/2)

**Source:** Labour Force Survey

**Period:** 1997

**Notes:** The data reference period is annual or annual average values.  
Population coverage: excluding armed forces and/or conscripts.  
Age coverage—minimum age: 14 years.  
Note on A for 1997: “Nonstandard economic activity: including B.”

## Lithuania (2/2)

**Source:** EU Labour Force Survey  
**Period:** 1998–2007

**Notes:** Methodology change in 2002 and 2005.  
The data reference period is annual or annual average values.  
B in 1998–2001, 2003–2004, 2006, and 2007 is unreliable according to the ILO’s note.  
C in 1998–2001, 2003–2004, 2006, and 2007 is unreliable according to the ILO’s note.  
J in 2001 and 2003–2007 is unreliable according to the ILO’s note.  
P in 1998–2001, 2003–2004, 2006, and 2007 is unreliable according to the ILO’s note.  
c.f. Another source, the “Population Census,” is available in 2001.

## Luxembourg

**Source:** EU Labour Force Survey  
**Period:** 1992–2007

**Notes:** Methodology revised in 2003, 2005, and 2007.  
The data reference period is annual or annual average values.  
C in 1992–1999, 2004, and 2006 is unreliable according to the ILO’s note.  
E in 1993–2002 and 2004 is unreliable according to the ILO’s note.  
K in 1992 is unreliable according to the ILO’s note.  
X in 1993–2002, 2004, and 2006 is unreliable according to the ILO’s note.  
c.f. Another resource, “Official Estimates [Estimations officielles],” is available for 1995–2008.  
The total employment is almost 30% higher than that of the EU Labour Force Survey. Note that its  
Data reference period is annual or annual average values. The geographical coverage is  
nonstandard. The population coverage includes armed forces and/or conscripts. The institutional  
sector coverage is nonstandard.

## Malta

**Source:** EU Labour Force Survey  
**Period:** 2000–2007

**Notes:** Methodology revised in 2005.  
The data reference period is annual or annual average values.  
A in 2000–2002 and 2004 is unreliable according to the ILO’s note.  
B in 2000–2004, 2006, and 2007 is unreliable according to the ILO’s note.  
E in 2000 and 2002 is unreliable according to the ILO’s note.  
P in 2006 and 2007 is unreliable according to the ILO’s note.  
Q in 2002, 2006, and 2007 is unreliable according to the ILO’s note.

### Poland (1/2)

**Source:** Labour Force Survey

**Period:** 1995–1996

**Notes:** The data reference period is annual or annual average values.  
Population coverage: excluding armed forces and/or conscripts.

### Poland (2/2)

**Source:** EU Labour Force Survey

**Period:** 2000–2007

**Notes:** Methodology revised in 2005.  
The data reference period is annual or annual average values.  
B in 2000–2004, 2006, and 2007 is unreliable according to the ILO's note.  
P in 2000–2004 and 2006 is unreliable according to the ILO's note.  
X in 2006 and 2007 is unreliable according to the ILO's note.  
c.f. Another source, "Population Census," is available for 2002. Its Data reference period is May.

### Portugal

**Source:** EU Labour Force Survey

**Period:** 1992–2007

**Notes:** Methodology revised in 2005.  
The data reference period is annual or annual average values.  
B is unreliable in 2000–2004, 2006, and 2007 according to the ILO's note.  
P is unreliable in 2000–2004 and 2006 according to the ILO's note.  
X in 2006 and 2007 is unreliable according to the ILO's note.  
c.f. Another data source, Population censuses [Recensements de population], is available in 2001.  
Its reference period is March.

### Romania (1/2)

**Source:** Household Labour Force Survey

**Period:** 1994–1996

**Notes:** The data reference period is March.  
Age coverage—minimum age: 14 years.  
Note on O for 1994–1996: "Nonstandard economic activity: including P-Q."

### Romania (2/2)

**Source:** EU Labour Force Survey

**Period:** 1997–2007

**Notes:** Methodology revised in 2002, 2003, and 2005.

The data reference period is annual or annual average values.

B in 1997–2001, 2004, 2006, and 2007 is unreliable according to the ILO’s note.

Q in 2004, 2006, and 2007 is unreliable according to the ILO’s note.

### Russian Federation (1/2)

**Source:** Official Estimates

**Period:** 1990–1997 (2005, 2012, and 2013 are also available)

**Notes:** The data reference period is annual or annual average values.

Note on G for 1990–1996: “Nonstandard economic activity: including H.”

Note on J for 1990–1996: “Nonstandard economic activity: including K.”

Note on P for 1990–1996: “Nonstandard economic activity: including P and X.”

### Russian Federation (2/2)

**Source:** Population Survey on Employment Problems

**Period:** 1998–2016

**Notes:** Methodology revised in 2010.

The data reference period is annual or annual average values in 1997–2009.

Geographical coverage: total national, excluding some areas in 1997–2009.

Population coverage: excluding institutional population in 1997–2009.

Age coverage—maximum age: 72 years in 1997–2009.

Q in 2011, 2013, and 2014 is unreliable according to the ILO’s note.

A, J, L, O, and P show a huge difference between (1/2) and (2/2).

### Slovakia

**Source:** EU Labour Force Survey

**Period:** 1994–2007

**Notes:** Methodology change in 2005.

B in 2004, 2006, and 2007 is unreliable according to the ILO’s note.

P in 1998–2001 is unreliable according to the ILO’s note.

Q in 2003, 2006, and 2007 is unreliable according to the ILO’s note.

X in 2003, 2006, and 2007 is unreliable according to the ILO’s note.

c.f. Another source, “Labour Costs,” is available in 2001. Its Data reference period is May.

### Slovenia (1/2)

**Source:** Labour Force Survey

**Period:** 1993–1995

**Notes:** The data reference period is May.

### Slovenia (2/2)

**Source:** EU Labour Force Survey

**Period:** 1996–2007

**Notes:** Methodology revised in 2005.

The data reference period is annual or annual average values.

B in 1998, 1999, 2004, 2006, and 2007 is unreliable according to the ILO's note.

C in 1996–2004 is unreliable according to the ILO's note.

E in 1998–2000, 2003, and 2004 is unreliable according to the ILO's note.

P in 1996–1999, 2001, 2002, 2004, 2006, and 2007 is unreliable according to the ILO's note.

Q in 2007 is unreliable according to the ILO's note.

X in 1996–2004 is unreliable according to the ILO's note.

### Turkey

**Source:** EU Labour Force Survey

**Period:** 2006–2007

**Notes:** The data reference period is annual or annual average values.

## Appendix 3: Notes on Earnings Data

### Part 1: Countries Covered by the GGDC 10-sector Database

#### Argentina

**Source:** Permanent Household Survey (Urban) [Encuesta Permanente de Hogares (Urban)]  
**Period:** 2004–2006 and 2008–2010

**Notes:** The survey covers only metropolitan areas and main cities.  
Warning on the use of statistical series: researchers should use the statistical series published after January 2007 and before December 2015 with caution. The INDEC, based on the statement in decrees 181/15 and 55/16, is undertaking the investigations required to ensure the regularity of data collection and processing.

#### Bolivia

**Source:** Household Survey [Encuesta de Hogares]  
**Period:** 2005–2009

**Notes:** B in 2006 is unreliable according to the ILO’s note.

#### Botswana

**Source:** Survey of Employment and Employees  
**Period:** 1997–2011

**Notes:** The reference period is March in 1998, 2003, and 2005; September in 1999–2002, 2004, and 2006–2008; and annual or annual average in 2009–2011.

The population coverage in 1999–2005 is nationals and residents.

The definition of the “working time” concept used in 1999–2011 is “hours actually worked.”

Note on A for 1997–2005: “Nonstandard economic activity: including B.”

Note on A for 2006–2008: “Nonstandard economic activity: excluding hunting and forestry.”

Note on E for 2006–2008: “Nonstandard economic activity: excluding gas.”

Note on total: “Nonstandard economic activity: public sector only.”

#### Brazil

**Source:** : Other administrative records and related sources [Otros registros administrativos y fuentes relacionadas]

**Period:** 1994–2002

**Notes:** Break in series: new or revalued currency in 1995.  
 Working time concept: hours actually worked in 1995 and 1998–2002.  
 The data reference period is December for the years 1998–2002.  
 Note on A for 1994–2002: “Nonstandard economic activity: including B.”  
 Note on I for 1994–2002: “Nonstandard economic activity: services.”  
 c.f. The Annual Labour Force Survey [Pesquisa Nacional por Amostra de Domicílios] is available for 2003–2009 (and for 1995–1999, 2001–2009, and 2011). However, the data require careful handling, as the differences among sectors are substantial. For example, the values of B in 2005 and 2006 and X in 2005 are three digits, Q in 2004, 2005, 2007, and 2008 is four digits, while other values are 9–11 digits.

### Chile (1/2)

**Source:** Index for Remuneration and Labour Cost [Índice de Remuneraciones y Costo de la Mano de Obra]  
**Period:** 2006–2008

**Notes:** The reference period is April.  
 The definition of “working time” is “hours actually worked.”  
 Note on C for 2006–2008: “Nonstandard economic activity: including D-Q.”

### Chile (2/2)

**Source:** National Survey on Socio-Economic Conditions [Encuesta de Caracterización Socioeconómica Nacional]  
**Period:** 2011 (2013 is available)

### The People’s Republic of China

**Source:** Employment and wage statistics based on enterprises’ reports  
**Period:** 1986–2008

**Notes:** The reference period is annual or annual average values in 1995, 1996, and 1998–2008.  
 The definition of “working time” is “hours actually worked” in 1995, 1996, and 1998–2008.  
 Note on A for 1986–2008: “Nonstandard economic activity: including B.”  
 Note on C for 1986–2008: “Nonstandard economic activity: mining only.”  
 Note on G for 1986–2002 and 2005–2008: “Nonstandard economic activity: including H.”  
 Note on I for 2003: “Nonstandard economic activity: excluding communication.”  
 Note on L for 1986–2008: “Nonstandard economic activity: state organs, social organizations.”  
 Note on L for 1986–2002: “Nonstandard economic activity: including sporting activities and activities of membership organizations not elsewhere classified.”

### Colombia



**Source:** Integrated Household Survey [Gran Encuesta Integrada de Hogares]  
**Period:** 2002–2007, 2010, 2011 (2012 and 2013 are available)

**Notes:** The Data reference period of 2002–2007 is the fourth quarter.  
Population coverage: excluding armed forces and/or conscripts.  
Age coverage—minimum age: 10 years.  
The definition of “working time” is “hours actually worked” in 2002–2007.  
Note on C for 2002–2007: “Nonstandard economic activity: including D-Q.”

## Costa Rica

**Source:** National Household Survey [Encuesta Nacional de Hogares]  
**Period:** 1998–2001, 2004, 2005, and 2008

**Notes:** Methodology revised in 2008.  
The reference period is July in 1998–2001, 2004, 2005, and 2008.  
Job coverage: the main job currently held in 1998–2001, 2004, 2005, and 2008.  
The definition of “working time” is “hours actually worked” in 1998–2001, 2004, 2005, and 2008.  
Note on A for 1998–2001, 2004, 2005, and 2008: “Nonstandard economic activity: including B.”  
Note on C for 1998–2001, 2004, 2005, and 2008: “Nonstandard economic activity: including D-Q.”

## Denmark

**Source:** Monthly Survey of Industrial Employment and Labour Costs  
**Period:** 1995–2007 and 2009–2011 (2012 and 2013 are available)

**Notes:** Methodology revised in 2007.  
Time unit: per hour in 1995–2007 and 2009–2011.  
The data reference period is annual or annual average values in 1995–2007 and 2009–2011.  
Institutional sector coverage: private sector only in 1995–2007 and 2009–2011.  
Age coverage—minimum age: nonstandard minimum age in 1996–2006.  
Working time concept: hours actually worked in 1995–2007 and 2009–2011.  
Note on C for 1995–2007: “Nonstandard economic activity: including D-Q.”

## Denmark (Weekly Working Hours)

**Source:** EU Labour Force Survey  
**Period:** 1992–2007

**Notes:** Methodology revised in 2005.  
B in 1994–2004, 2006, and 2007 is unreliable according to the ILO’s note.  
C in 1992–2004, 2006, and 2007 is unreliable according to the ILO’s note.  
P in 1995, 1997–2004, and 2007 is unreliable according to the ILO’s note.  
Q in 1993, 1999, 2000, 2003, 2004, and 2007 is unreliable according to the ILO’s note.  
X in 1995, 1996, 1998, 2001–2004, 2006, and 2007 is unreliable according to the ILO’s note.

## Egypt (1/2)

**Source:** Employment, Wages, and Hours of Work Survey  
**Period:** 1996–2007

**Notes:** Time unit: per week.  
The definition of “working time” is “hours actually worked.”  
The reference period is October.  
Reference group coverage: wage earners/blue collar/production workers.  
Establishment size coverage: all establishments with at least 10 employees.  
Note on A for 1996–2007: “Nonstandard economic activity: including B.”  
Note on C for 1996–2007: “Nonstandard economic activity: including D-Q.”  
E and F in 2000 and A in 2004 have hikes.

## Egypt (2/2)

**Source:** Labour Force Sample Survey  
**Period:** 2008

**Notes:** Q in 2008 is unreliable according to the ILO’s note.  
The values are smaller than the weekly payment in source (1/2).

## Ethiopia

**Source:** National Labor Force Survey  
**Period:** 2005

**Notes:** B in 2005 is unreliable according to the ILO’s note.

## France

**Source:** Employment Survey [Enquête Emploi]  
**Period:** 1999–2002

**Notes:** The data reference period is annual or annual average values.  
Working time concept: hours actually worked.  
Note on C for 1999–2002: “Nonstandard economic activity: including D-Q.”  
cf. Alternatively, the Quarterly Survey on the Economic Activity and Working Conditions of the Labour Force [Enquête trimestrielle sur l’activité et les conditions d’emploi de la main-d’oeuvre (ACEMO)] is available for the years 1997–1998 and the Annual Statement of Social Data [Déclaration annuelle de Données Sociales] for the years 2005–2006. However, the value of the former source is almost 10 times and the latter is about 40–70% of that of the Employment Survey.

## Ghana

**Source:** Living Standards Survey [Déclaration annuelle de Données Sociales]  
**Period:** 2006

**Notes:** Denomination in 2007: 1 new Ghana cedi=1/10000 cedi.

## Indonesia

**Source:** National Labour Force Survey  
**Period:** 2000–2010

**Notes:** Methodology revised in 2000.  
Q in 2003, 2005, and 2010 is unreliable according to the ILO's note.  
X in 2004–2006 is unreliable according to the ILO's note.

## Italy

**Source:** Labour-Related Establishment Survey  
**Period:** 1995

**Notes:** The data reference period is annual or annual average values

## Republic of Korea

**Source:** Survey on Labor Conditions by Employment Type  
**Period:** 1993–1996 and 1999–2008

**Notes:** The data reference period is annual or annual average values.  
Establishment size coverage in 1993–1996: all establishments with at least 10 employees.  
Establishment size coverage in 1999–2008: all establishments with at least 5 employees.  
Working time concept: hours actually worked in 1993–1996 and 1999–2008.

## Malaysia

**Source:** Survey of Manufacturing Industries  
**Period:** 2000–2001

**Notes:** The survey covers only D.

## Mauritius (1/2)

**Source:** Survey of Employment and Earnings

**Period:** 1999–2008

**Notes:** Note on A for 1999–2008: “Nonstandard economic activity: including B.”

Note on C for 1999–2008: “Nonstandard economic activity: including D-Q.”

### Mauritius (2/2)

**Source:** Continuous Multi-Purpose Household Survey

**Period:** 2009–2010 (2001–2008 are also available)

**Notes:** C in 2010 is unreliable according to the ILO’s note.

Q in 2009–2010 is unreliable according to the ILO’s note.

The ILO notes that most of the values in C and Q are unreliable.

Break in series in 2001 and 2003.

### Mexico

**Source:** National Occupation and Employment Survey [Encuesta Nacional de Ocupación y Empleo]

**Period:** 1991, 1993, and 1995–2004

**Notes:** Methodology change in 1995.

The data reference period is second quarter in 1991, 1993, and 1995–2004.

Age coverage—minimum age: 14 years for 1995–2004.

Working time concept: hours actually worked for 1991, 1993, and 1995–2004.

Note on A for 1991, 1993, and 1995–2004: “Nonstandard economic activity: including B.”

Note on C for 1991, 1993, and 1995–2004: “Nonstandard economic activity: including D-Q.”

### The Netherlands

**Source:** Annual Earnings Survey

**Period:** 1994–2005

**Notes:** Break in series: new or revalued currency in 2001.

The reference period is October in 1994 and December in 1995–2005.

Working time arrangement coverage: full-time workers in 1994–2005.

Working time concept: hours actually worked in 1994–2005.

Note on A for 2001–2005: “Nonstandard economic activity: including B.”

Note on C for 2001–2005: “Nonstandard economic activity: including D-Q.”

### Peru

**Source:** National Household Survey [Encuesta Nacional de Hogares]

**Period:** 2002–2011 (2012 and 2013 are also available)

**Notes:** The values in 2002 and 2003 are very high, especially for C in 2003.

c.f. An alternative source, “Permanent Employment Survey (Urban) [Encuesta permanente de Empleo (Urban)]” is available from 2003 to 2009, though it covers only main cities or metropolitan areas.

## The Philippines

**Source:** Employment, Hours, and Earnings Survey

**Period:** 1996–1999, 2001, 2003, 2005, 2006, and 2008

**Notes:** Break in series: unspecified type of break in 1999.

Establishment size coverage: all establishments with at least 10 employees in 1996–1998.

Establishment size coverage: all establishments with at least 20 employees in 1999, 2001, 2003, 2005, 2006, and 2008.

Working time concept: hours actually worked in 1996–1999, 2001, 2003, 2005, 2006, and 2008.

The data reference period is annual or annual average values in 1996–1999, 2001, 2003, 2005, 2006, and 2008.

Note on A for 1996–1999, 2001, 2003, 2005, 2006, and 2008: “Nonstandard economic activity: including B.”

Note on C for 1996–1999, 2001, 2003, 2005, 2006, and 2008: “Nonstandard economic activity: including D-Q.”

c.f. An alternative data source, the “Integrated Survey,” is available for 1998–2000. It has a break in series in 2000.

## Singapore

**Source:** Records of the Central Provident Fund

**Period:** 1998–2008

**Notes:** Methodology revised in 2005.

Working time concept: hours actually worked.

Note on L for 1998–2008: “Nonstandard economic activity: including M-Q.”

## Spain

**Source:** Survey of Wages in Industry and the Services [Encuesta de Salarios en la Industria y los Servicios]

**Period:** 1999–2008

**Notes:** Time unit: per hour.

Working time concept: hours actually worked.

The data reference period is annual or annual average values.

Note on C for 1999: “Nonstandard economic activity: including D-Q and excluding L-Q.”

Note on C for 2000–2008: “Nonstandard economic activity: including D-Q.”

### Spain (Weekly Working Hours)

**Source:** EU Labour Force Survey  
**Period:** 1992–2007

**Notes:** Methodology revised in 1993, 2001, and 2005.  
Q in 1992, 1994, 1999, 2000, 2002, 2003, and 2007 is unreliable according to the ILO's note.

### Sweden

**Source:** Survey of Wages and Employment in Mining, Quarrying, and Manufacturing  
**Period:** 1993–2007

**Notes:** Time unit: per hour in 1994–2007.  
Break in series in 1997: unspecified type of break.  
The data reference period is September for 1994–2007.  
Institutional sector coverage: private sector only in 1994–2007.  
Reference group coverage: adults in 1994–2007.  
Reference group coverage: wage earners/blue collar/production workers in 1994–2007.  
Notes on A for 1993–2007: “Nonstandard economic activity: including B.”  
No notes exist on 1993 but most of the descriptions also apply to 1993.

### Sweden (Weekly Working Hours)

**Source:** EU Labour Force Survey  
**Period:** 1995–2007

**Notes:** Methodology revised in 2005.  
B in 1995–1999, 2001–2004, 2006, and 2007 is unreliable according to the ILO's note.  
C in 1995, 1996, and 1998–2000 is unreliable according to the ILO's note.  
P in 1997–2001, 2006, and 2007 is unreliable according to the ILO's note.

### Taipei, China

**Source:** Labour-Related Establishment Survey  
**Period:** 1983–1985 and 2004–2008

**Notes:** The data reference period is annual or annual average values for the years 2004–2008.  
 Working time concept: hours actually worked for the years 2004–2008.  
 Notes on C for 1983–1985 and 2004–2008: “Nonstandard economic activity: including D-Q.”  
 Notes on E for 1983–1985 and 2004–2008: “Nonstandard economic activity: excluding water supply.”  
 Notes on I for 1983–1985 and 2004–2008: “Nonstandard economic activity: excluding communications.”  
 Notes on K for 1983–1985 and 2004–2008: “Nonstandard economic activity: excluding business services.”

### Tanzania

**Source:** Labour Force Survey  
**Period:** 2006

**Notes:** Methodology revised in 2006.

### Thailand

**Source:** Labour Force Survey  
**Period:** 2010

**Notes:** Methodology revised in 2010.

### United Kingdom

**Source:** Labour Force Survey  
**Period:** 1995–2008

**Notes:** Time unit: per week.  
 Working time arrangement coverage: full-time workers.  
 Working time concept: hours actually worked.  
 The data reference period is annual or annual average values.  
 Notes on A for 1995–2008: “Nonstandard economic activity: including B.”  
 Notes on C for 1995–2008: “Nonstandard economic activity: including E.”  
 Notes on G for 1995–2008: “Nonstandard economic activity: including H.”  
 Notes on J for 1995–2008: “Nonstandard economic activity: including K.”  
 Notes on L for 1995–2008: “Nonstandard economic activity: including M-N.”  
 Notes on O for 1995–2008: “Nonstandard economic activity: including P-Q.”  
 c.f. An alternative source, Short-Term (Monthly and Quarterly) Employment Statistics, is available for 1998–2007. The unit of the term is weeks, converted into monthly figures through multiplication by 4.33. Its reference period is April. It covers full-time workers.

## United States

**Source:** Current Population Survey  
**Period:** 1969–1970, 2000–2003, and 2005–2008

**Notes:** Time unit: per week.  
Central tendency measure: median.  
Working time concept: hours actually worked.  
The data reference period is annual or annual average values.  
The values in 1969 and 1970 are very small (less than 1/90 of the ones after 2000).  
Part 2: Countries covered by the Socio-Economic Account

## Part 2: Countries covered by the Socio-Economic Account

### Australia (1/2)

**Source:** Labour Force Survey  
**Period:** 1985–1995 and 1997–2000

**Notes:** Time unit: per week for the years 1997–2000.  
Job coverage: main job currently held for the years 1997–2000.  
Working time concept: hours actually worked for the years 1997–2000.  
The data reference period is annual or annual average values for the years 1997–2000.  
Note on A for 1985–2000: “Nonstandard economic activity: including D-Q.”  
Note on A: “Nonstandard economic activity: including B.”  
The first to fourth notes only apply to the years 1997–2000, but they seem to be applicable to the data for 1985–1995.

### Australia (2/2)

**Source:** Survey of Employee Earnings and Hours  
**Period:** 1996, 1998, 2000, 2002, 2004, and 2006

**Notes:** Time unit: per hour.  
Working time arrangement coverage: full-time workers.  
Working time concept: hours actually worked.  
The data reference period is May.  
Reference group coverage: adults.  
Age coverage—minimum age: adults.  
Note on C for 1996, 1998, 2000, 2002, 2004, and 2006: “Nonstandard economic activity: including D-Q.”



### Australia (Weekly Working Hours)

**Source:** Labour Force Survey

**Period:** 1987–1990

**Notes:** Note on A for 1987–1990: “Nonstandard economic activity: including B.”

Note on C for 1987–1990: “Nonstandard economic activity: including D-Q.”

The ILO provides no full data description.

### Austria (1/2)

**Source:** Insurance Records

**Period:** 1995–2003

**Notes:** New currency introduced in 2000.

Working time concept: hours actually worked.

Note on C for 2001–2003: “Nonstandard economic activity: including D-Q.”

### Austria (2/2)

**Source:** Industrial Production Statistics

**Period:** 2004–2007 (1996–1998 and 2001–2003 are also available)

**Notes:** Time unit: per hour.

New currency introduced in 2000.

Working time concept: hours actually worked.

Note on D for 2001–2003: “Nonstandard economic activity: including C.”

### Austria – Weekly Working Hours

**Source:** EU Labour Force Survey

**Period:** 1995–2007

**Notes:** Methodology revised in 2005.

Job coverage: main and second job currently held in 1995–2007.

The data reference period is annual or annual average values in 1995–2007.

B in 2002 and 2003 is unreliable according to the ILO’s note.

C in 2003–2005 is unreliable according to the ILO’s note.

X in 2004 is unreliable according to the ILO’s note.

B in 1995–2001, 2004–2007 are missing.

X in 1995–2003, 2005–2007 are missing.

## Belgium

**Source:** Labour Cost Survey  
**Period:** 1995–2007

**Notes:** New currency introduced in 1999.  
Unspecified type of break of the series in 1998.  
The data reference period is October 1995–2007.  
Reference group coverage: salaried employed/white collar/office workers in 1995–1998.

## Bulgaria

**Source:** Employed Persons and Wage and Salary Census  
**Period:** 1996–2008

**Notes: Notes:**  
New currency introduced in 1999.  
Note on A for 1996–2008: “Nonstandard economic activity: including B.”  
Note on C for 1996–2008: “Nonstandard economic activity: including D-Q.”

## Canada

**Source:** Survey of Employment, Payrolls, and Hours  
**Period:** 1994–2008

**Notes:** Time unit: per week.  
Methodology revised in 1991.  
Working time concept: hours actually worked from 1994 to 2008.  
The data reference period is annual or annual average values.  
Note on A: “Nonstandard economic activity: excluding 11.”  
Note on C for 1999–2008: “Nonstandard economic activity: including D-Q.”  
According to the ILO’s note, the time unit is per week only for 1994–2008, but this also seems to be applicable to the prior years.

## Cyprus

**Source:** Employment Survey  
**Period:** 1998–2006

**Notes:** The data reference period is October.  
Reference group coverage: adults.  
Reference group coverage: salaried employed/white collar/office workers.  
Age coverage—minimum age: adults.  
Working time concept: hours actually worked.  
Note on A for 2001–2006: “Nonstandard economic activity: including B.”  
Note on C for 2001–2006: “Nonstandard economic activity: including D-Q.”

## The Czech Republic

**Source:** Report on Employment and Wages  
**Period:** 1996–2007

**Notes:** The data reference period is annual or annual average values.  
Working time concept: hours actually worked.  
Note on A for 1996–2007: “Nonstandard economic activity: including B.”  
Note on C for 1996–2007: “Nonstandard economic activity: including D-Q.”  
Note on D for 1996–2007: “Nonstandard economic activity: including C, E.”  
The values in the year 2007 are estimates.

## Germany

**Source:** Establishment Survey  
**Period:** 1996–2008

**Notes:** Time unit: per hour.  
New currency introduced from 2001.  
Unspecified break in series in 2006.  
Working time concept: hours actually worked.  
The data reference period is annual or annual average values.  
Reference group coverage: wage earners/blue collar/production workers in 1996–2006.

## Germany (Weekly Working Hours)

**Source:** EU Labour Force Survey  
**Period:** 1995–2007

**Notes:** Change in methodologies in 2005.  
The data reference period is annual or annual average values.  
B in 1997, 2001, 2003, 2004, and 2007 is unreliable according to the ILO’s note.

## Estonia

**Source:** Survey of Wages and Salaries  
**Period:** 1992–2008

**Notes:** New or revalued currency from 1992.  
The data reference period is annual or annual average values.  
Working time concept: hours actually worked.  
Note on A for 1992–2005: “Nonstandard economic activity: including B.”  
Note on C for 1992–2005: “Nonstandard economic activity: including D-Q.”

## Finland

**Source:** Survey on Wages of Industrial Workers and Salaries of Industrial Employees  
**Period:** 1996–2008

**Notes:** New currency in 2001.  
The data reference period is fourth quarter.  
Working time arrangement coverage: full-time workers.  
Working time concept: hours actually worked.  
Excluding overtime and/or irregular bonuses in 2002–2008.  
Working time concept: hours actually worked in 2002–2008.  
Note on C: “Nonstandard economic activity: including D-Q.”

### Greece

**Source:** Quarterly Payroll Survey in Selected Industries  
**Period:** 2000, 2002, and 2006

### Hungary

**Source:** Employment and Earnings Survey  
**Period:** 1992–2008

**Notes:** Unspecified break in series in 1999.  
Note on A for 1992–2008: “Nonstandard economic activity: including B.”  
Note on C for 1992–2008: “Nonstandard economic activity: including D-Q.”

### Ireland

**Source:** Earnings Hours and Employment Costs Survey  
**Period:** 1996–2006

**Notes:** Time unit: per week.  
Working time concept: hours actually worked.  
The data reference period is annual or annual average values.  
Establishment size coverage: all establishments with at least 10 employees

### Latvia

**Source:** Survey of Economically Active Commercial Companies, Individual Merchants, Peasant or Fishermen Farms, Budgetary Institutions, Foundations, Associations, or Funds, as well as Administrative Data  
**Period:** 1990–2008

**Notes:** The data reference period is first quarter.  
 Working time concept: hours actually worked.  
 Note on A, C, D, E, G, H, I, J, K, L, N, O, and total in 1990 and 1991: “Nonstandard economic activity: private sector only.”  
 Note on A in 1995–2008: “Nonstandard economic activity: including B.”  
 Note on C in 1995–2008: “Nonstandard economic activity: including D-Q.”  
 Significant differences exist between 1991 and 1992.

## Lithuania

**Source:** Monthly Earnings Survey  
**Period:** 1993–2008

**Notes:** Working time arrangement coverage: full-time workers in 1993–1996.  
 Working time concept: hours actually worked in 1993–2008.  
 The data reference period is annual or annual average values in 1993 and 1997–2008; July in 1994 and 1995; and April in 1996.  
 Establishment size coverage: all establishments with at least two employees in 1993.  
 Note on A: “Nonstandard economic activity: including B” in 1993–2008.  
 Notes on C: “Nonstandard economic activity: including D-Q” in 1993–2008; “Nonstandard economic activity: excluding mining and quarrying” in 1993–1996.

## Luxembourg

**Source:** Semi-annual survey of earnings and average hours of work offered [Enquête semestrielle sur les gains et la durée moyenne du travail offerte]  
**Period:** 1995–2008

**Notes:** Break in series: new or revalued currency in 1999.  
 The data reference period is October 1995–2008.  
 Reference group coverage: salaried employed/white collar/office workers in 1997–2008.  
 Working time concept: hours actually worked in 1995–2008.

## Malta

**Source:** Labour Force Survey  
**Period:** 2000–2008

**Notes:** Time unit: per hour in 2000–2008.  
 Break in series: new or revalued currency in 2008.  
 Working time concept: hours actually worked.  
 The data reference period is annual or annual average values.  
 Note on A: “Nonstandard economic activity: including B” in 2000 and 2004–2008.  
 Note on C: “Nonstandard economic activity: including D-Q” in 2000–2006 and 2008.

## Malta (Weekly Working Hours)

**Source:** EU Labour Force Survey

**Period:** 1995–2007

**Notes:** Methodologies are revised in 2005.

The data reference period is annual or annual average values.

Job coverage: main and second job currently held.

A in 2000–2002 and 2004 is unreliable according to the ILO's note.

B in 2000–2004 is unreliable according to the ILO's note.

C in 2000–2003, 2006, and 2007 is unreliable according to the ILO's note.

E in 2000 and 2002 is unreliable according to the ILO's note.

## Poland

**Source:** Establishment Statistical Surveys

**Period:** 1993–2006

**Notes:** Revalued currency in 1993.

The data reference period is annual or annual average values in 1993–2006.

Working time concept: hours actually worked in 1993–2006.

Note on A for 1993–2004: “Nonstandard economic activity: including B.”

Note on C for 1993–2006: “Nonstandard economic activity: including D-Q.”

## Portugal

**Source:** Enquête sur les Gains et la Durée du Travail

**Period:** 1998–2008

**Notes:** New currency introduced in 2002.

The data reference period is annual or annual average values in 1998–2008.

Working time concept: hours actually worked in 1998–2008.

Note on C: “Nonstandard economic activity: including D-Q.”

## Romania

**Source:** Enquête sur le Coût de la Main-d'oeuvre

**Period:** 1992–2007

**Notes:** Revaluation of the currency in 2005.

The data reference period is annual or annual average values in 1992–2007.

Working time concept: hours actually worked in 1992–2007.

Note on A: “Nonstandard economic activity: including B.”

Note on C: “Nonstandard economic activity: including D-Q.”

## Russian Federation

**Source:** Establishment Sample Survey on Employees' Wages by Occupation  
**Period:** 1995–1998 and 2005–2016

**Notes:** Break in series: new or revalued currency in 1997.  
The data reference period is annual or annual average values in 1997–1998.  
The data reference period is October in 2005–2016.  
Geographical coverage: total national, excluding some areas in 2005–2016.  
Working time concept: hours actually worked in 1997, 1998, and 2005–2016.  
Central tendency measure: weighted mean in 2005–2016.  
Job coverage: main job currently held in 2005–2016.  
Working time arrangement coverage: full-time workers in 2005–2016.  
Note on A for 1995–1998, 2005, and 2006: “Nonstandard economic activity: including B.”  
Note on C for 1995–1998, 2005, and 2006: “Nonstandard economic activity: including D-Q.”

### Slovakia

**Source:** Labour-Related Establishment Survey  
**Period:** 1991–2008

**Notes:** Break in series: other or unspecified type of break in 1997.  
The data reference period is annual or annual average values.  
Establishment size coverage: all establishments with at least 25 employees in 1991–1996 and 20 employees in 1997–2008.  
Working time concept: hours actually worked.  
Note on A for 1991–2008: “Nonstandard economic activity: including B.”

### Slovenia

**Source:** Monthly Reporting on Earnings and Persons in Paid Employment in Enterprises, Companies, and Organizations  
**Period:** 1985–2008

**Notes:** New currency introduced in 2007.  
Methodology revised in 2005.  
The data reference period is annual or annual average values in 1994–2008.  
Working time concept: hours actually worked in 1994–2008.  
Components of earnings/wages: nonstandard components of earnings or wages in 2005–2008.

### Turkey

**Source:** Annual Survey of Manufacturing Industry  
**Period:** 1983–1989 and 1993–2005

**Notes:** Unspecified break in series in 1989.  
 Introduction of new currency in 2005.  
 The data reference period is first semester in 1983–2001; annual or annual average in 2002–2005.  
 Establishment size coverage: nonstandard establishment size coverage from 1983–1988; and all establishments with at least 10 employees in 1989 and 1993–2001.  
 Working time concept: hours actually worked in 1983–1989 and 1993–2005.  
 Note on C for 2002–2005: “Nonstandard economic activity: including D-Q.”

### Description of Weekly Working Hours (ILO)

Indicator:	Mean weekly hours worked per employed person by sex and economic activity
Description:	<p>We present data on hours of work, whenever possible, on the basis of the mean number of hours of work per week and with reference to hours worked in all jobs of employed persons and in all types of working time arrangements (e.g., full time and part time). Hours actually worked include (a) direct hours or the time spent carrying out the tasks and duties of a job; (b) related hours or the time spent maintaining, facilitating, or enhancing productive activities; (c) down time or time when a person in a job cannot work due to machinery or process breakdown, accident, lack of supplies or power or Internet access; and (d) resting time or time spent in short periods of rest, relief, or refreshment, including tea, coffee, or prayer breaks, generally practiced by custom or contract according to established norms and/or national circumstances. Hours actually worked exclude time not worked during activities such as: (a) annual leave, public holidays, sick leave, parental leave or maternity/paternity leave, and other leave for personal or family reasons or civic duty; (b) commuting time between work and home when no productive activity for the job is performed; for paid employment, even when paid by the employer;</p> <p>(c) time spent on certain educational activities; for paid employment, even when authorized, paid, or provided by the employer; and</p> <p>(d) longer breaks distinguished from short resting time when no productive activity is performed (such as meal breaks or natural repose during long trips); for paid employment, even when paid by the employer. The employed comprise all persons of working age who, during a specified brief period, were in the following categories:</p> <p>a) paid employment (whether at work or with a job but not at work); or b) self-employment (whether at work or with an enterprise but not at work).</p> <p>Data are disaggregated by economic activity according to the latest version of</p>



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the International Standard Industrial Classification of All Economic Activities (ISIC) available for that year. Economic activity refers to the main activity of the establishment in which a person worked during the reference period and depends not on the specific duties or functions of the person's job but on the characteristics of the economic unit in which this person works.

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#### Appendix 4. Ambiguous and Unambiguous Labor Income Share

Assume that “ambiguous” income ( $Y^a$ ), which consists of proprietors’ income and indirect taxes less subsidies, is allocated to capital and labor in the same ratio as that of the rest of the sector; then, we decompose total labor income ( $Y^l$ ) as follows:

$$Y^l = Y^{ul} + LIS \times Y^a$$

where

$Y^{ul}$ : Unambiguous labor income (compensation of employees)

LIS: Labor income share

We express the above equation using national income ( $Y$ ):

$$Y^l = LIS \times Y = LIS \times (Y^{ul} + Y^{uk} + Y^a)$$

where

$Y^{uk}$ : Unambiguous capital income (corporate profits, rental income, net interest income, and depreciation)

The above two equations enable us to express LIS using unambiguous elements:

$$LIS = \frac{Y^{ul}}{Y^{ul} + Y^{uk}}$$

### Appendix 5. Data Coverage (Region, Country, Year)

Region	Country	Starting Year	Ending Year	# Years (N)
East Asia and Pacific	Australia	1995	2006	9
	People's Republic of China	1986	2008	23
	Indonesia	2000	2010	11
	Korea, Rep. of	1993	2008	14
	Malaysia	2000	2001	2
	Philippines	1996	2008	9
	Singapore	1998	2008	11
	Taipei, China	1983	2008	8
	Thailand	2010	2010	1
Europe and Central Asia	Austria	1995	2007	13
	Belgium	1995	2007	13
	Bulgaria	1996	2008	13
	Cyprus	1998	2006	9
	Czech Republic	1996	2007	12
	Denmark	1995	2011	16
	Estonia	1995	2008	14
	Finland	1995	2008	14
	France	1997	2006	8
	Germany	1996	2008	13
	Greece	2000	2006	3
	Hungary	1995	2008	14
	Ireland	1996	2006	11
	Italy	1995	1995	1
	Latvia	1995	2008	14
	Lithuania	1995	2008	14
	Luxembourg	1995	2008	14
	Netherlands	1994	2005	12
	Poland	1995	2006	12
	Portugal	1998	2008	11
Russian Federation	1995	2009	9	
Slovak Republic	1995	2008	14	
Slovenia	1995	2008	14	
Spain	1999	2008	10	
Sweden	1993	2007	15	
Turkey	1995	2005	11	
United Kingdom	1995	2008	14	
Latin America and Caribbean	Argentina	2004	2010	6
	Bolivia	2005	2009	5
	Brazil	1994	2011	17
	Chile	2006	2011	4
	Colombia	2002	2011	8
	Costa Rica	1998	2008	7
	Mexico	1991	2004	12
	Peru	2002	2011	10
Middle East and North Africa	Egypt, Arab Rep.	1996	2007	12
	Malta	2000	2008	9
North America	Canada	1995	2008	14
	United States	1969	2008	10
Sub-Saharan Africa	Botswana	1997	2010	14
	Ethiopia (excludes Eritrea)	2005	2005	1
	Ghana	2006	2006	1
	Mauritius	1999	2010	12
	Tanzania	2006	2006	1

Source: Authors' own calculations.

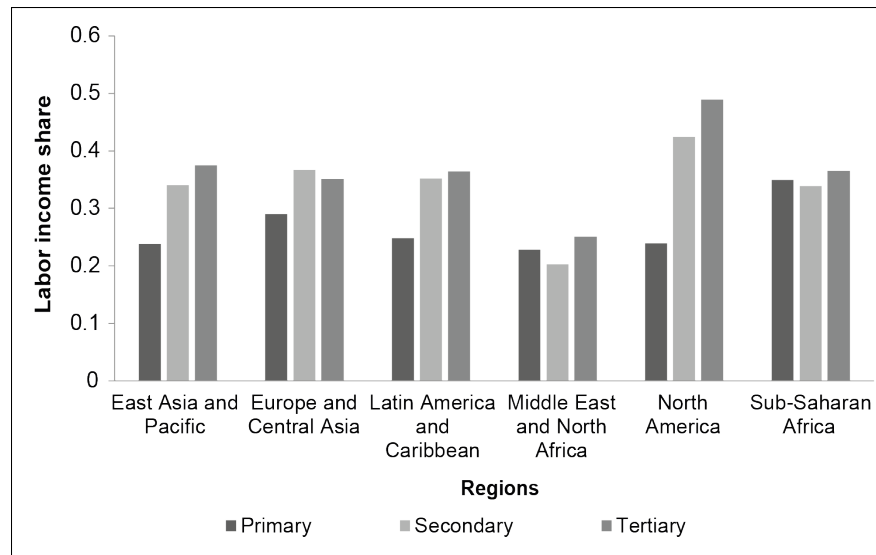
## Appendix 6. Data Coverage (Region, Country, 10 Sectors)

Region	Country	Years	AGR	MIN	MA	PU	CON	WRT	TRA	FIRE	GOV	OTH
East Asia and Pacific	Australia	9	5	6	6	6	6	6	6	6	6	0
	PR of China	23	0	23	23	23	0	21	23	23	23	0
	Indonesia	11	11	11	11	11	11	11	11	11	11	11
	Korea, Rep. of	14	0	14	14	14	14	0	13	0	0	0
	Malaysia	2	0	0	2	0	0	0	0	0	0	0
	Philippines	9	9	9	9	9	9	9	9	9	0	0
	Singapore	11	0	0	11	0	11	11	10	10	0	0
	Taipei, China	8	0	8	8	8	0	5	8	8	8	0
	Thailand	1	1	1	1	1	1	1	1	1	1	1
Europe and Central Asia	Austria	13	0	0	13	13	13	9	9	9	9	9
	Belgium	13	0	9	13	9	13	9	9	9	1	0
	Bulgaria	13	13	13	13	13	13	13	13	13	13	0
	Cyprus	9	6	9	9	9	9	9	9	9	9	0
	Czech Republic	12	12	12	12	12	12	12	12	12	12	0
	Denmark	16	0	16	0	16	0	0	16	0	0	0
	Estonia	14	14	14	14	14	14	14	14	14	14	0
	Finland	14	0	14	14	14	14	14	14	14	14	0
	France	8	0	4	4	4	4	4	4	4	4	4
	Germany	13	11	13	13	13	13	2	2	2	0	0
	Greece	3	0	3	3	3	3	1	3	3	0	0
	Hungary	14	14	14	14	14	14	14	14	14	14	0
	Ireland	11	0	11	11	11	0	0	0	0	0	0
	Italy	1	0	1	1	1	1	1	1	0	0	0
	Latvia	14	14	14	14	14	13	14	14	14	14	0
	Lithuania	14	14	14	12	14	14	14	14	14	14	0
	Luxembourg	14	0	14	14	14	14	14	1	1	0	0
	Netherlands	12	5	12	12	12	12	12	12	12	12	0
	Poland	12	12	12	12	12	12	12	12	12	12	0
	Portugal	11	0	0	0	11	11	11	0	11	1	0
Russian Federation	9	9	9	9	9	9	9	9	9	9	0	
Slovak Republic	14	14	14	14	14	14	14	14	14	14	0	
Slovenia	14	14	14	14	14	14	14	14	14	14	0	
Spain	10	0	10	10	10	10	10	10	0	0	0	
Sweden	15	15	15	15	15	15	15	15	15	0	8	0
Turkey	11	6	11	11	11	5	4	4	4	0	0	0
United Kingdom	14	14	14	14	0	14	0	14	0	0	0	0
Latin America and Caribbean	Argentina	6	6	6	6	6	6	6	6	6	6	6
	Bolivia	5	0	5	5	5	0	0	5	5	0	5
	Brazil	17	0	9	9	9	9	9	8	9	9	0
	Chile	4	1	4	4	4	4	4	4	4	0	1
	Colombia	8	8	8	8	8	8	2	8	8	0	2
	Costa Rica	7	7	6	6	5	6	6	6	6	1	3
	Mexico	12	12	12	12	12	12	12	12	12	12	12
	Peru	10	7	9	8	9	9	8	8	9	0	8
Middle East and North Africa	Egypt, Arab Rep.	12	11	12	12	11	0	11	12	12	2	2
	Malta	9	6	8	9	9	9	9	9	9	9	0
North America	Canada	14	14	14	14	14	14	14	14	14	14	14
	United States	10	10	0	0	0	0	0	0	0	0	0
Sub Saharan Africa	Botswana	14	8	14	14	11	14	14	14	11	2	0
	Ethiopia (excludes Eritrea)	1	1	1	1	1	1	1	1	1	1	1

Ghana	1	1	1	1	1	1	1	1	1	1	1
Mauritius	12	12	12	12	12	12	12	12	12	12	2
Tanzania	1	0	1	1	1	1	1	1	1	1	0

Note: Each column under disaggregated sector headings represents the number of years for which labor income share data are available for a country. The column “# of years” shows the total number of years for which data are available for a country in at least one sector.

## Appendix 8. Labor Income Share (primary, secondary, tertiary) across Regions



Source: Authors' own calculations.

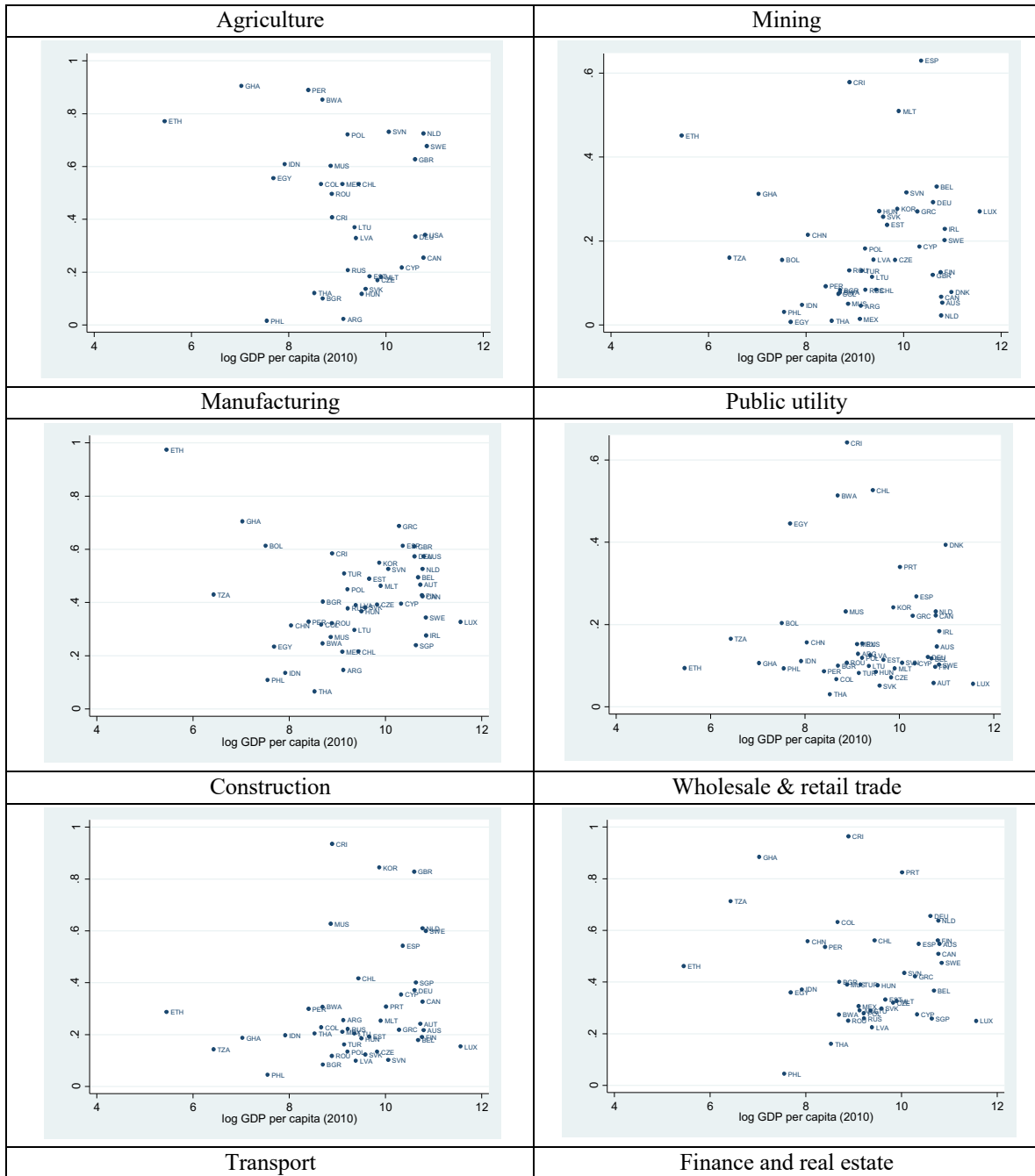
## Appendix 8. Labor Income Share (Broad Sectors) across Countries

Region	Country	Primary	Secondary	Tertiary (1)	Tertiary (2)
East Asia and Pacific	Australia	0.137	0.343	0.359	0.404
	People's Republic of China	0.287	0.290	0.375	0.409
	Indonesia	0.363	0.160	0.322	0.354
	Korea, Rep. of	0.264	0.637	0.513	0.513
	Malaysia		0.363		
	Philippines	0.018	0.115	0.121	0.121
	Singapore		0.291	0.328	0.328
	Taipei, China	0.260	0.563	0.382	0.417
	Thailand	0.097	0.075	0.145	0.151
Europe and Central Asia	Austria		0.466	0.263	0.262
	Belgium	0.287	0.380	0.267	0.273
	Bulgaria	0.090	0.249	0.175	0.216
	Cyprus	0.190	0.368	0.236	0.272
	Czech Republic	0.170	0.273	0.214	0.248
	Denmark	0.094		0.702	0.702
	Estonia	0.185	0.323	0.254	0.283
	Finland	0.124	0.337	0.379	0.416
	France	0.380	0.371	0.432	0.411
	Germany	0.346	0.515	0.166	0.166
	Greece	0.323	0.340	0.278	0.278
	Hungary	0.124	0.301	0.240	0.268
	Ireland	0.191	0.269	0.203	0.203
	Italy	0.286	0.446	0.353	0.353
	Latvia	0.345	0.251	0.206	0.238
	Lithuania	0.353	0.261	0.208	0.251
	Luxembourg	0.299	0.286	0.274	0.274
	Netherlands	0.151	0.545	0.674	0.756
	Poland	0.541	0.307	0.244	0.296
	Portugal		0.302	0.630	0.632
	Russian Federation	0.119	0.293	0.245	0.270
	Slovak Republic	0.171	0.272	0.192	0.230
	Slovenia	0.633	0.346	0.319	0.363
	Spain	0.644	0.581	0.511	0.511
Sweden	0.571	0.439	0.418	0.459	
Turkey	0.439	0.434	0.174	0.174	
United Kingdom	0.290	0.661	0.553	0.553	
Latin America and Caribbean	Argentina	0.030	0.168	0.294	0.325
	Bolivia	0.155	0.613	0.520	0.374
	Brazil	0.239	0.586	0.453	0.487
	Chile	0.102	0.286	0.355	0.337
	Colombia	0.293	0.284	0.320	0.295
	Costa Rica	0.438	0.422	0.535	0.547
	Mexico	0.245	0.213	0.220	0.268
	Peru	0.334	0.325	0.403	0.340
	Egypt, Arab Rep.	0.269	0.216	0.310	0.324

Middle East and North Africa	Malta	0.174	0.184	0.128	0.154
North America	Canada	0.182	0.424	0.500	0.489
	United States	0.320			
Sub-Saharan Africa	Botswana	0.092	0.266	0.294	0.314
	Ethiopia (excludes Eritrea)	0.768	0.622	0.313	0.363
	Ghana	0.855	0.520	0.389	0.420
	Mauritius	0.589	0.390	0.352	0.406
	Tanzania	0.160	0.286	0.516	0.531

Note: The primary sector is composed of AGR and MIN; the secondary sector consists of MAN and CON. We use two definitions of the tertiary sector: the tertiary (1) sector consists of PU, WRT, TRA, and FIRE; the tertiary (2) sector consists of PU, WRT, TRA, FIRE, GOV, and OTH.

## Appendix 9. Sectoral LIS and GDP per capita







Rica show the highest LIS. The finance and real estate sector LIS has a reduced positive correlative trend at 0.04. Luxembourg is an outlier with a particularly low finance LIS and high GDP per capita. There is a cluster of countries between 9 to 11 log GDP per capita and a sector LIS of around 0.20. Costa Rica again has the highest LIS, closely followed by the Netherlands.

In our examination of how each sector LIS interacts with GDP per capita, we see no outstanding relationship in general. There is a slight positive trend between the sector LIS and GDP per capita, but this is non-existent in sectors such as agriculture. Other notable findings are that the LIS in Costa Rica is exceptionally high for most of the sectors, and the slight positive correlation in some sectors is usually offset by African nations with a low GDP per capita and a high LIS.

## Appendix 10. Productivity-based LIS ratio

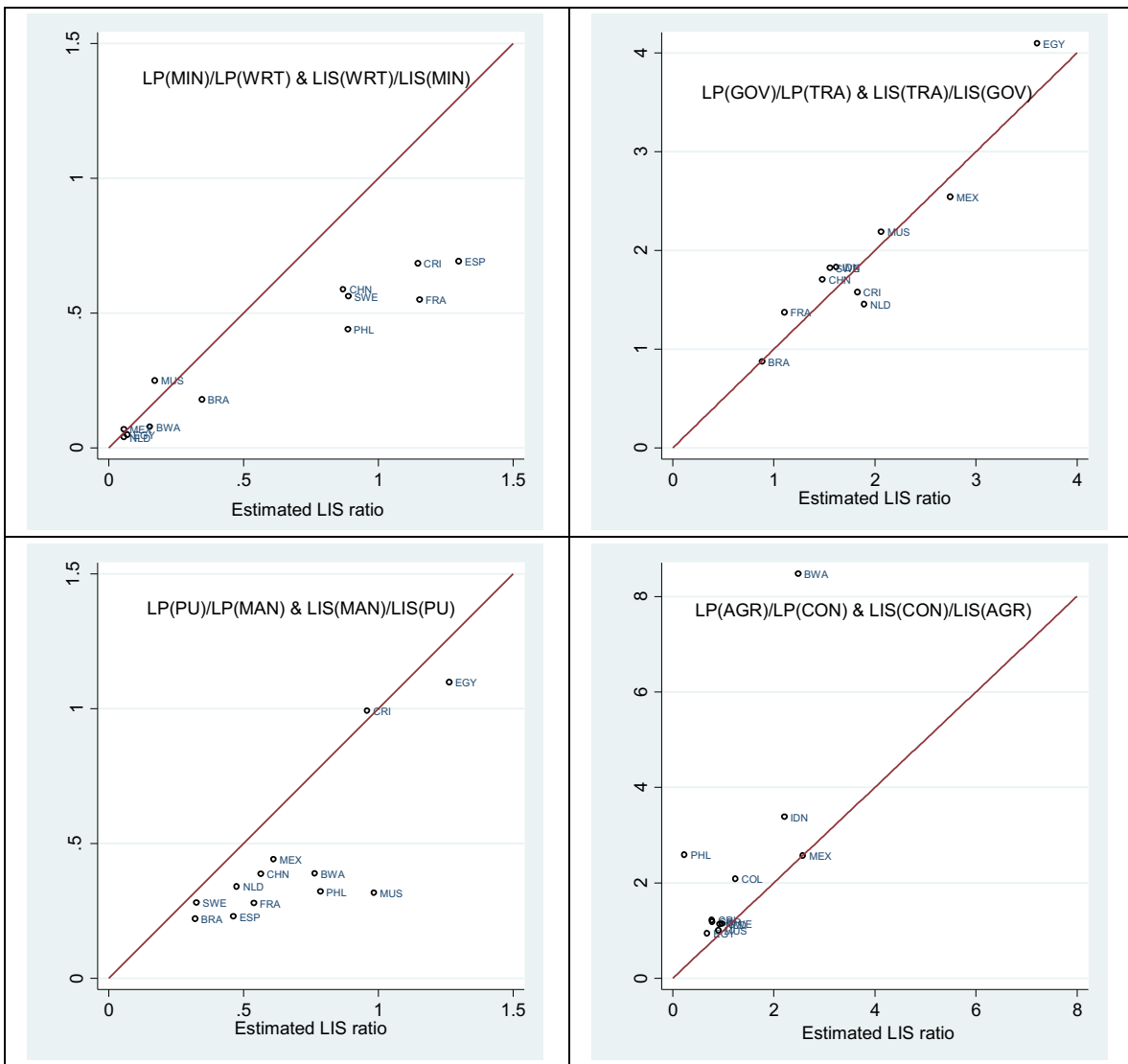
		Sector in the numerator of the LIS ratio									
		AGR	MIN	MAN	PU	CON	WRT	TRA	FIRE	GOV	OTH
Sector in the denominator of the LIS ratio	AGR	1	23.56	3.47	10.90	2.24	2.41	3.72	5.30	2.28	1.82
	MIN	0.23	1	0.66	2.26	0.36	0.47	0.67	0.83	0.29	0.31
	MAN	0.43	6.65	1	3.09	0.67	0.69	1.12	1.25	0.68	0.56
	PU	0.16	3.00	0.39	1	0.23	0.29	0.43	0.52	0.25	0.19
	CON	0.63	12.06	1.63	4.78	1	1.10	1.70	2.19	1.03	0.84
	WRT	0.63	9.32	1.59	4.66	1.07	1	1.53	1.85	0.95	0.91
	TRA	0.42	6.27	1.05	3.30	0.71	0.69	1	1.31	0.64	0.58
	FIRE	0.75	8.61	1.33	4.45	0.98	0.94	1.45	1	0.99	0.85
	GOV	0.75	14.62	1.71	4.48	1.09	1.25	1.79	2.25	1	0.90
	OTH	0.86	13.21	2.74	9.09	1.62	1.70	2.73	4.51	1.89	1

Data for 1990-2010.

**Appendix 11. Unadjusted LIS ratio from our novel data**

		Sector in the numerator of the LIS ratio									
		AGR	MIN	MAN	PU	CON	WRT	TRA	FIRE	GOV	OTH
Sector in the denominator of the LIS ratio	AGR	1	11.59	1.76	3.07	1.25	1.27	1.52	2.23	0.88	1.99
	MIN	0.72	1	0.58	1.16	0.46	0.57	0.51	0.51	0.37	0.49
	MAN	1.36	4.42	1	2.04	0.87	0.87	0.94	1.14	0.58	0.92
	PU	1.02	2.94	0.61	1	0.50	0.55	0.53	0.71	0.34	0.79
	CON	1.26	6.67	1.38	2.59	1	1.10	1.27	1.55	0.84	1.86
	WRT	1.36	6.64	1.28	2.23	1.01	1	1.14	1.61	0.75	1.35
	TRA	1.67	5.49	1.19	2.43	1.00	0.98	1	1.46	0.63	1.23
	FIRE	1.91	5.83	1.13	2.18	1.10	0.98	1.02	1	0.70	1.26
	GOV	1.30	13.23	2.22	3.53	1.39	1.53	1.88	2.47	1	2.83
	OTH	0.65	10.36	1.43	2.19	1.11	0.99	1.43	1.55	0.70	1

## Appendix 12. Productivity-based LIS Ratio versus Unadjusted LIS Ratios



**Appendix 13. The actual versus counterfactual labor productivity in Agriculture, 1970-2012**

