

# **Employment Strategy Papers**

Imputation, estimation and prediction using  
the Key Indicators of the Labour Market  
(KILM) data set

**Gustavo Crespi Tarantino**

Employment Trends Unit  
Employment Strategy Department

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**Gustavo Crespi Tarantino**

Science and Technology Policy Research (SPRU)

University of Sussex

United Kingdom

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## Preface

This paper was prepared as background research for the *World Employment Report 2004-05, Employment, Productivity and Poverty Reduction*. The topic of this year's *Report* was chosen based on the observation that it is not simply the lack of employment that leads to poverty, but rather the lack of *decent and productive* employment. In many parts of the developing world the poor are in fact employed, but employed in such poorly paid conditions that they and their families live on less than US\$1 a day per person. Thus, unemployment is only the 'tip' of the iceberg of the decent work deficit. The *Report* concludes that not only do we need more jobs, but more *productive jobs* – jobs that allow workers to lift themselves and their families out of the vicious cycle of poverty.

The background papers commissioned for this *Report* provide an overview of the important aspects involved in the links between employment, productivity and poverty reduction in both developing and developed economies. The papers were commissioned from experts in the field as well as various departments within the ILO and discuss different avenues through which poverty can be reduced, as well as the trade-offs that must be made in order to strike the right balance between productivity, employment and income growth. The research involves macroeconomic, sectoral and case study analysis that has helped form the basis of the chapters in the *Report*.

Based on the research from these background papers the *Report* concludes that increasing the opportunity for decent and productive work is an important channel towards achieving a fairer globalization, and is vital for poverty reduction.

Duncan Campbell  
Director a.i.  
Employment Strategy Department



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## 1. Introduction

Almost all empirical analysis has the problem of missing data, especially survey analysis, market studies and social science research.<sup>1</sup> This issue is so persistent, and its consequences so serious, that a large and growing literature has emerged on how to deal with the problem.<sup>2</sup> The Key Indicators of the Labour Market (KILM) data set<sup>3</sup> produced by the ILO is a timely and significant advance in coordinating data and improving comparability on a large set of indicators on labour market conditions in ILO member countries. This information is highly relevant for policy-makers and researchers alike, on issues that include employment, education, productivity, economic growth, poverty and gender discrimination. It is essential to generate such information at the micro (country) level, not only to produce consistent aggregated statistics, but also because an in-depth understanding of labour market issues necessitates the study of the individual structural characteristics of each national economy. To achieve this goal, the Employment Trends Team of the ILO's Employment Strategy Department has made an intensive effort to collect information on labour market conditions from all sources in ILO member countries, to analyse these data and to produce comparable cross-country statistics. Given its complexity and ever-increasing geographical range, it is not surprising that the KILM data set is affected by the problem of missing data. Large gaps exist in the information submitted, particularly from developing countries. The ideal solution is that all countries collect and submit the same data, but this is a learning and investment process that will take time to happen. Meanwhile, the question is whether it is possible, in the short-term, to use the available information in order to monitor trends in labour market conditions – at least at global and regional levels.

The aim of the present report is to apply methods that make use of the data already collected by the ILO to estimate current labour market indicators for those countries where information is not yet available and to predict future trends for world labour markets. This report describes the main methodological approaches used in the research, summarizes the procedures applied to the data set and presents the results of the projections corresponding to unemployment, the employment-to-population ratios and the distribution of employment by economic sectors.

## 2. Labour market indicators

The methods described and applied in this paper aim to generate statistics for the following labour market indicators:

- 1) Total unemployment (both rate and count).
- 2) Total unemployment stratified by sex and, within sex, stratified by age (both rates and counts). Unemployment by age will be decomposed using two broad categories: individuals of 15-24 years old – or the closest available – and individuals of +25-64 years old. Data are presented on both rates and counts.
- 3) Total employment (computed as the residual between labour force and total unemployment).

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<sup>1</sup> Missing data are questions without answers, variables without observations, or units that refuse to respond.

<sup>2</sup> For a summary see LITTLE, R., and D. RUBIN (1987) and SCHAFFER, J. (1997).

<sup>3</sup> See ILO (2003): *Key Indicators of the Labour Market*, 3<sup>rd</sup> edition, for more details.

- 4) The allocation of total employment across different economic sectors. (using 1 digit ISIC, which corresponds to the following activities: agriculture, manufacturing and services – both shares and counts).

The sample framework for the estimations is given by the labour force projections (total, by sex and age) generated by the ILO Bureau of Labour Statistics (the LABPROJ files).<sup>4</sup> Hence, it is not part of the current methodology to predict the labour force; this is taken as given by the team responsible for KILM. The time frames for the predictions are the periods 2002-2003-2004 and 2015.

### 3. Methodology

#### 3.1 Preliminary considerations

In order to predict the future conditions of world labour markets, some statistical correlation between the different labour market indicators and the macroeconomic context must be identified. Broadly speaking, three different information sets need to be assembled: labour force figures, macroeconomic conditions and unemployment data. In this exercise, the information about labour force figures was taken as given in the LABPROJ data set, while the historical and projected values for economic growth were taken from the International Monetary Fund<sup>5</sup> and the World Bank.<sup>6</sup> The focus here is on the statistical procedures applied to the incomplete unemployment figures in the KILM data set.

Some preliminary work identified three different issues with the reported unemployment figures. First, not all countries submitted the information with the detail required for analysis.<sup>7</sup> Second, a large group of countries do not report unemployment figures.<sup>8</sup> Third, even if a complete data set were available, the issue of the heterogeneity among reporting countries persists – not only in terms of the idiosyncrasies of their labour market conditions, but also in terms of how they collect and process the raw information.<sup>9</sup> If the results of the statistical analysis are to be fully representative of the world labour market situation, these points must be accounted for.

The methodology applied in this research is developed in three steps. First, the issue of incomplete information for the unemployment sub-components is treated by using ad hoc country-specific imputation techniques. This makes it possible to preserve intact the richness provided by the heterogeneity of the data set and also to maintain consistency where country-level statistics exist. Second, the ‘missingness’ data mechanism of the full data set is analysed. This approach not only tests whether non-reporting countries are statistically different from reporting ones (these latter cannot be considered a simple random sample of

<sup>4</sup> See SCHAIBLE, W. and R. MAHADEVAN-VIJAYA (2002): "World and Regional Estimates for Selected Key Indicators of the Labour Market," *Employment Paper No. 2002/36*, for a description of the labour force projections conducted at the ILO.

<sup>5</sup> <http://www.imf.org/external/pubs/ft/weo/2003/02/data/index.htm>.

<sup>6</sup> World Development Indicators, various years.

<sup>7</sup> Information was required not only for total (male and female) unemployment rates but also for each micro component according to sex and age (two different age categories were used: youth workers – under 25 years – and adult workers – over 25 years).

<sup>8</sup> For total unemployment rates the response rate is slightly higher than 50 per cent but for some of its sub-components the rate is only about 30 per cent.

<sup>9</sup> Some countries report information from household surveys or population censuses, while other countries report information generated by official employment agencies. Some countries refer to the total labour force, others only to the civil labour force.

the total population), it also builds different weights in order to balance the sample of reporting countries and to generate a working sample that looks closer to a random selection of the whole population. The third and final step in the methodology is to apply panel data techniques to the observed sample in order to estimate and predict future labour market conditions. Panel data estimation techniques control for the massive heterogeneity underlying the data.

In order to keep consistency between total unemployment and its different sub-components, it was decided to follow a *bottom up* strategy. This means that the primary unit of analysis is the lowest possible disaggregated sub-components of unemployment: Youth Male Unemployment, Adult Male Unemployment, Youth Female Unemployment and Adult Female Unemployment. This strategy is very demanding in terms of data availability for the different countries, but it produces more consistent information between strata.

### 3.2 Ad hoc country-level imputations

As outlined above, the first step in the methodology was to address the issue of lack of ‘complete’ information for the unemployment sub-components within the set of reporting countries. Although many countries report total unemployment rate figures for several of the years, unemployment rates for the different sub-components are not reported for all these years. There is some implicit statistical correlation between total unemployment rate and its components at country level that can be exploited in order to recover the basic information.

Imputation of missing unemployment sub-components followed two procedures:

- 1) A panel data set of roughly ten years of information for each country was first assembled. Where information on unemployment sub-components was missing for some years, information from complete years was used to fill the gaps. More specifically, for the observed year(s) different sub-components to total ratios were computed and the median of these ratios was used to impute for the years with missing sub-components.
- 2) When information on sub-components was missing for all the years in one reporting country (but not the information for total unemployment) the gaps were imputed using a similar procedure, but with the ratios now computed at regional and subregional levels.

It is important to note that simple linear interpolations do not work very well in this case. The dependent variable under analysis, the unemployment rate, is censored at the interval  $[0, 1]$ ; as a consequence simple linear interpolations can potentially generate *out of range* imputed values. In order to control for this, the different unemployment rates were transformed using a logistic function and the adjustment factors described in 1) and 2) above were defined in terms of differences. These adjustment factors were then added to the (logistically transformed) total unemployment rates in order to obtain (transformed) imputed values for the missing unemployment sub-components. Finally, the inverse transformation was applied and the original unemployment rates were recovered.

More formally, we can define a transformed dependent variable as follows:

$$Y_{itk}^T = \ln\left(\frac{y_{itk}}{1-y_{itk}}\right) \quad (1)$$

where  $y_{itk}$  is the observed unemployment rate for sub-component  $k$  in country  $i$  and period  $t$ . There are four sub-components (youth male unemployment, adult male unemployment, youth

female unemployment and adult female unemployment). Let us also define a transformed independent variable such as:

$$Y_{it}^T = \ln\left(\frac{y_{it}}{1-y_{it}}\right) \quad (2)$$

Where  $y_{it}$  is the observed total unemployment rate in country  $i$  and period  $t$ , the adjustment factor is then defined as:

$$AF_i = Med(Y_{itk}^T - Y_{it}^T) \quad (3)$$

It is then possible to recover the missing unemployment rate for the  $k$  sub-component with the condition that the total unemployment rate is observed as follows:

$$\tilde{Y}_{itk}^T = AF_i + Y_{it}^T \quad \forall Y_{itk}^T = missing \quad (4)$$

When a country reported only total unemployment rates, but not sub-components, we used subregional level adjustment factors.

### 3.3 Analysing the ‘missingness’ mechanism

A large proportion of the countries included in the KILM data set do not report unemployment figures, which raises some concern about the lack of representativeness of the sample. Are the reporting countries sufficiently similar to be used to impute the incomplete unemployment figures?

Following Horowitz and Manski (1998), each country in the KILM data set can be characterized by a vector  $(y_{it}, x_{it}, w_{it}, r_{it})$ , where  $y$  is an outcome of interest (the unemployment rate),  $x$  is a set of covariates that determines the value of the outcome and  $w$  is a set of covariates that affects the probability of the outcome being observed. Finally,  $r$  is a binary variable indicating a missing response as follows:

$$r_{it} = \begin{cases} 1 & \text{if } i \text{ reports} \\ 0 & \text{if } i \text{ is missing} \end{cases} \quad (5)$$

The focus of the problem is estimating conditional expectations for unemployment rates of the form  $E[g(y_{it}) | x_{it} \in A]$  where  $g(\cdot)$  is a specified real-valued function of outcome  $y_{it}$  and  $A$  is a specified set of values of the covariates  $x_{it}$ . Following from (5),  $r_{it}=1$  indicates that the set  $(y_{it}, x_{it})$  is fully observed and  $r_{it}=0$  that data on  $y_{it}$  are missing. The vector of covariates  $w_{it}$ , which is always observed, is used to balance the observed sample of countries by computing weights. These covariates include a set of country-specific characteristics such as economic growth, per capita GDP, population and membership in the Heavily Indebted Poor Countries Initiative.<sup>10</sup>

More specifically, by conditioning on the given set of covariates  $w_{it}$  and using logistic regression, it is possible to estimate each country’s probability of reporting unemployment

<sup>10</sup>The principal objective of this UN programme is to bring the debt burden of the HIPC countries to sustainable levels, subject to satisfactory policy performance, so as to ensure that adjustment and reform efforts are not put at risk by continued high debt and debt service burdens. One by-product of the initiative is that national statistics offices in HIPC countries are required to collect fuller information and to strengthen their data capabilities.

figures. Let us assume that there is a linear function connecting some unobserved index value of reporting unemployment figures with the set of covariates:

$$r_{it}^* = w_{it}'\delta + \varepsilon_{it} \quad (6)$$

where each country reports if this index value is positive ( $r_{it}^* > 0$ ). From (6) and using (5) it is possible to model the probability of reporting unemployment figures as:

$$\begin{aligned} P_i &= P(r_{it} = 1) = P(\varepsilon_{it} > -w_{it}'\delta) \\ &= 1 - F(-w_{it}'\delta) \end{aligned} \quad (7)$$

where  $F$  is the cumulative distribution function of  $\varepsilon_{it}$ . If this distribution function is symmetric, (7) can be rewritten as:

$$P_i = F(w_{it}'\delta) \quad (8)$$

Since the observed  $r_{it}$  are just realizations of a binomial process with probabilities given by (8), the likelihood function of this problem is given by:

$$L = \prod_{r_{it}=1} P_i \prod_{r_{it}=0} (1 - P_i) \quad (9)$$

The functional form for  $F$  in (9) will depend on the assumption made about the error term  $\varepsilon_{it}$ . In this application we assume that the cumulative distribution of this term is a logistic (a logit model is thus estimated). That is:

$$F(w_{it}'\delta) = \frac{\exp(w_{it}'\delta)}{1 + \exp(w_{it}'\delta)} \quad (10)$$

After estimating (10) we can compute the predicted response probabilities for each individual country in the data set. These predicted probabilities are then used to compute weights defined as:

$$s_{it}(w) = \frac{P(r_{it} = 1)}{P(r_{it} = 1 | w_{it}, \hat{\delta})} \quad (11)$$

*The key point here is that according to (11), the weights are computed as the ratio between the proportion of non-missing observations in the sample and the reporting probability attached to each country in each year. In this way, the influence in the sample of those 'reporting' countries that are more similar (according the covariates  $w_{it}$ ) to the 'missing' ones is inflated, while the importance of those that are quite different is diminished. As a result the weighted sample looks more similar to the theoretical population framework than the unweighted sample of reporting countries. After computing the weights, the results of interest  $E[g(y_{it}) | x_{it} \in A]$  are estimated by the weighted average  $\sum_{i \in N_I} s(w_{it})g(y_{it})$  where  $N_I$  is*

the set of reporting countries.

### 3.4 Estimation and prediction of unemployment figures

This section deals with the specification of the function  $E[g(y_{it}) | x_{it} \in A]$ . Here the critical issue is the treatment of the unobserved heterogeneity of the various countries. Panel data techniques, which take the unobserved heterogeneity into consideration, are used. In order to apply these techniques, a data set containing information for each country over a ten-year period (with gaps filled as described in section 3.2) was built. All regressions were estimated using fixed-effect methods with the sample of the reporting countries weighted to consider the non-response bias. That is, we estimated the following linear model:

$$Y_{it}^T = \ln\left(\frac{y_{itk}}{1-y_{itk}}\right) = \alpha_i + x_{it}'\beta + \mu_{it} \quad (12)$$

where  $y_{itk}$  is the observed unemployment rate for sub-component  $k$  in country  $i$  and period  $t$  and  $x_{it}$  is a set of covariates explaining the unemployment rate. In this research this set of covariates is based only on GDP growth rates – and some time dummies (but only for regions where there is clear evidence of structural change). The constant  $\alpha_i$  is country-specific, capturing all the persistent idiosyncratic factors governing the unemployment rate in each country. This model can be estimated using the sample of respondent countries by introducing a set of country-level dummy variables as follows:

$$Y^T = X\beta + d_1\alpha_1 + d_2\alpha_2 + \dots + d_{N_1}\alpha_{N_1} + \mu \quad (13)$$

Model (13) is estimated by weighted least-square methods, the weights being those computed in section 3.2. These weights are first normalized using the expression:

$$s(w_{it})^* = \frac{s(w_{it})}{\sum s(w_{it})} N_1 \quad (14)$$

After estimation the model can also be used for imputation and prediction. Although it is not strictly necessary to carry out imputations for the non-respondent countries, doing so can be useful to produce a ‘complete data set’ that can be used to compute additional statistics about labour market conditions or to generate different regional and subregional aggregations. However, it is not straightforward to use a fixed-effect model for imputing missing countries and whatever fixed effect is predicted for the non-respondent countries would be arbitrary. An intuitive approach in the context of this study is to impute a fixed effect for the non-respondent countries based on the weighted average of the fixed effects for respondent countries. That is, given  $N_I$  mutually exclusive and exhaustive country dummies, we identify a ‘weighted average’ fixed effect by choosing the intercept that makes the prediction calculated at the (weighted) means of the independent variables equal to the (weighted) mean of the dependent variable:

$$\bar{Y} = \bar{X}\beta + \bar{\alpha} \quad (15)$$

This newly complete data set was used in order to create the subregional and regional aggregates.<sup>11</sup> All the models were estimated at subregional level.

<sup>11</sup> The standard errors were also computed. However, these are also underestimated because they do not take account of the uncertainty associated with the estimation of the fixed effects.

## 4. Results

Three different sets of results are obtained from the methodological approach followed in this paper: the results related to country-level interpolations for the respondent countries; the results of identification of the ‘missingness’ mechanism; and, finally, the statistics from the panel data model. We present each in turn.

### 4.1 Country-level interpolations

Table 4.1 summarizes the response rates by subregion. The subregions are as defined in the KILM data set and a ‘complete’ response means that the country has reported both total unemployment rates and the four corresponding sub-components. Table 4.1 shows that the global response rates are quite low, averaging 30 per cent for the entire period. The global response rate is higher in the middle of the time frame, but deteriorates very quickly towards the end of the period – suggesting serious lags in how member countries collect, process and report their raw information. The response rate varies even more across subregions. Response rates are near 100 per cent for the developed world but are much lower for the other subregions. South America is the second highest subregion, with an average response rate of 60 per cent. Relatively high response rates are also found in Eastern Europe and Asian countries, in contrast to the low response rates observed in the poorest subregions of Africa.

**Table 4.1: Response rates by subregion**

KILM Subregion	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Major Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Major Non-Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Other Europe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.00	0.08
Eastern Europe	0.00	0.17	0.42	0.42	0.50	0.50	0.50	0.58	0.42	0.50	0.67	0.42	0.42
Baltic States	0.00	0.00	0.00	0.00	0.00	0.33	1.00	1.00	0.67	1.00	0.67	0.00	0.39
CIS	0.00	0.08	0.00	0.00	0.17	0.08	0.00	0.08	0.25	0.17	0.08	0.00	0.08
Melanesia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eastern Asia	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.14	0.43	0.43	0.14	0.38
South-Central Asia	0.13	0.25	0.25	0.25	0.25	0.13	0.13	0.25	0.13	0.38	0.00	0.00	0.18
South-Eastern Asia	0.09	0.18	0.18	0.27	0.18	0.36	0.27	0.27	0.18	0.27	0.09	0.00	0.20
Central America	0.47	0.37	0.47	0.42	0.68	0.63	0.53	0.63	0.53	0.37	0.21	0.05	0.45
South America	0.58	0.67	0.67	0.67	0.75	0.75	0.58	0.75	0.67	0.58	0.50	0.00	0.60
Eastern Africa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.01
Middle Africa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Southern Africa	0.00	0.00	0.00	0.20	0.00	0.00	0.40	0.20	0.20	0.00	0.00	0.00	0.08
Western Africa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Middle East	0.07	0.07	0.07	0.07	0.13	0.13	0.07	0.07	0.07	0.07	0.07	0.00	0.07
North Africa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40	0.00	0.00	0.00	0.07
Total	0.26	0.28	0.30	0.31	0.35	0.35	0.34	0.38	0.34	0.34	0.29	0.17	0.31

Source: ILO, *KILM*, 3<sup>rd</sup> edition.

The definition of response used in Table 4.1 is rather precise in that it requires each country to report information for all the unemployment sub-components. Some countries report information for total unemployment for all the years, but report on sub-components for

only some years. As explained in Section 3 on methodology, we use country-level ratios in order to recover the sub-components for the missing years in a given country. This procedure, which makes more efficient use of the reported information, increases the number of reporting countries. The results of these adjustments on the response rates are summarized in Table 4.2.

**Table 4.2: Response rates by subregion, after interpolations**

KILM Subregion	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Major Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Major Non-Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Other Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Eastern Europe	0.75	0.75	0.83	0.83	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.88
Baltic States	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97
CIS	0.33	0.67	0.75	0.75	0.75	0.75	0.75	0.67	0.67	0.67	0.67	0.67	0.67
Melanesia	0.33	0.33	0.33	0.33	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
Eastern Asia	0.71	0.71	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.83
South-Central Asia	0.25	0.25	0.25	0.25	0.25	0.38	0.25	0.25	0.38	0.38	0.13	0.13	0.26
South-Eastern Asia	0.27	0.36	0.36	0.36	0.36	0.45	0.45	0.45	0.45	0.55	0.55	0.36	0.42
Central America	0.79	0.74	0.79	0.79	0.79	0.79	0.79	0.84	0.84	0.68	0.63	0.53	0.75
South America	0.75	1.00	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.75	0.75	0.58	0.85
Eastern Africa	0.13	0.25	0.19	0.25	0.19	0.25	0.19	0.13	0.19	0.06	0.00	0.00	0.15
Middle Africa	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Southern Africa	0.20	0.20	0.20	0.20	0.40	0.40	0.60	0.60	0.60	0.60	0.20	0.00	0.35
Western Africa	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.01
Middle East	0.20	0.13	0.13	0.13	0.33	0.33	0.40	0.33	0.47	0.53	0.47	0.27	0.31
North Africa	0.40	0.40	0.40	0.40	0.40	0.40	0.60	0.60	0.60	0.60	0.20	0.20	0.43
Total	0.47	0.52	0.54	0.54	0.56	0.58	0.58	0.57	0.59	0.56	0.51	0.46	0.54

Source: Author's calculations.

On this basis, global response rates are much higher – reaching a value of 54 per cent for the whole period. The response rates for each subregion also increase. However, response rates are still very low for some of the sub-Saharan Africa subregions. Therefore, in the following sections all these subregions are merged and no attempt is made to report results for individual subregions. Similarly, the Melanesia subregion is merged with the South-Eastern Asia subregion.

#### 4.2 Determinants of the response rates

Table 4.3 shows the results of the logit regressions on the determinants of reporting information. The different countries have been allocated to the different subregional groups established previously. It is important to note that there are no results for the developed countries as the same ones reported full information. Four explanatory variables were used in each case: the (log) per capita income; the gross domestic product growth rate; the size of the country measured by total population; and membership in the HIPC programme.<sup>10</sup>

The last two rows Table 4.3 summarize goodness-of-fit of the different models. In general, when according the pseudo-R<sup>2</sup>, the models predict relatively well. More important are the likelihood ratio tests on global significance of the model. If these tests suggest that the explanatory variables are (jointly) non-significant in explaining the response rates, it would

be possible to infer that countries are missing randomly (at least within particular subregions). In this case, it would be valid to consider the reporting countries as being a random sample of the total. The values of the tests suggest that this hypothesis can be strongly rejected for all subregions except Central Asia where it was not rejected (but only marginally). As a consequence it is possible to infer that the four explanatory variables used in the analysis are correlated with the probability of response.

Indeed, in five of the nine regions a growth in the per capita income of countries increases the response probabilities: in three subregions the GDP growth rates were negatively correlated with the response rates; in five subregions the more populous countries were among those with the highest response rates and, finally, HIPC programme membership was significant for only three subregions (positively associated with the response probabilities in CIS countries and negatively correlated for Africa and South America).

**Table 4.3: Determinants of the response probability**

	Eastern Europe	CIS	Eastern Asia	Central Asia	South Central Asia	Central America	South America	Sub-Saharan Africa	North Africa Middle East
PCGDP	0.267 (0.220)	0.749 (0.920)	29.367 (.)	2.488 (2.74)**	1.402 (3.87)**	0.000 (3.71)**	0.000 (0.050)	0.001 (6.80)**	0.000 (4.07)**
Growth	-0.328 (3.42)**	0.013 (0.360)	3.239 (0.000)	-0.581 (2.33)*	-0.142 (2.49)*	0.085 (1.360)	0.205 (0.650)	-0.011 (0.580)	-0.030 (1.240)
Size	0.718 (1.700)	3.586 (4.75)**	3.577 (0.010)	0.238 (1.750)	0.573 (5.61)**	0.001 (3.54)**	0.002 (2.28)*	0.000 (5.35)**	0.000 (5.33)**
HIPC		2.485 (2.61)**	80.155 (0.010)		0.496 (0.750)		-7.650 (2.53)*	-0.912 (2.68)**	-1.543 (1.410)
Constant	-8.958 (0.710)	-36.835 (3.94)**	-312.24 (.)	-20.304 (2.74)**	-15.961 (4.69)**	-2.067 (2.02)*	3.006 (0.600)	-2.668 (4.89)**	-2.653 (3.96)**
N	156	144	72	84	168	204	132	528	240
Pseudo-R2	0.34	0.37	0.99	0.21	0.26	0.18	0.83	0.28	0.22
LR Chi2	37.1**	39.1**	70.9**	18.51	58.8**	34.4**	67.1**	137.5**	74.5**

Notes: Absolute value of the Z statistic is in parenthesis. (\*) significant at 5%, (\*\*) significant at 1%. N = No. of observations.

In sum, the largest and wealthiest countries show the highest response rates, although not necessarily the highest growth rates. This means that the responding countries cannot be considered to be a random sample of the total subregions. A simple imputation that ignored this issue would bias the results. We therefore decided to use the results of the logit models to predict the response probability for each country and to use this probability to create weights in order to re-balance the sample.

### 4.3 Imputation and prediction of the unemployment figures

This section focuses on the results of the imputation and prediction models. All the models are weighted fixed-effect regressions estimated for each subregion as defined in Section 3 on methodology. Complete results are presented in Appendix tables A.1-A.15. The world-level trends are summarized below. Long-run trends were estimated on the assumption

that each country would continue to grow during the forecast period at its 1990s median growth rate.

Table 4.4 presents total unemployment figures for the total labour force and its four different sub-components. The model produces a total of 185 million unemployed in 2003; this number is predicted to increase to 206 million by 2015. An important share in this grand total is youth unemployment, which in 2003 accounted for about 40 per cent of total unemployment.

**Table 4.4: Total unemployment figures at world level**

Year	MFU	Sd	YMU	Sd	AMU	Sd	YFU	Sd	AFU	Sd
1995	153402	1388	44265	816	45500	841	29902	560	33735	492
1996	158310	1332	45103	758	47309	835	30519	509	35379	494
1997	159479	984	44430	503	47815	682	30788	334	36446	372
1998	168592	939	46889	485	50647	645	32371	322	38685	356
1999	176304	1033	49382	559	53032	678	33519	369	40371	399
2000	171825	956	48380	476	51229	674	33428	310	38789	371
2001	173624	975	48917	498	52188	673	33734	332	38785	374
2002	181558	1012	50948	499	54670	706	34927	336	41013	404
2003	184828	1653	51805	617	55666	1146	35583	474	41775	902
2004	185304	1655	52315	621	55633	1147	35522	473	41834	902
2015	206097	1693	56323	597	64974	1227	37379	421	47420	909

Note: MFU (male/female unemployment), Sd (standard deviation); YMU (youth male unemployment); AMU (adult male unemployment); YFU (youth female unemployment); AFU (adult female unemployment).

Table 4.5 summarizes the world-level results of unemployment rates. During the second half of the 1990s global unemployment rates show an upward trend. Indeed, the world unemployment rate of 5.9 per cent in 1995 reached a peak of 6.3 per cent in 1999. This is a consequence of the accumulated impact of the Asian and Russian crises. There is a decline in this indicator during the next two years with unemployment rates dropping to 6.0 per cent in 2001. From 2001 onwards, and as a consequence of the slowdown in growth rates in developed economies, unemployment rates again rose, to 6.2 per cent in 2003. The long-run prediction is that if all the countries manage to grow at their 1990s medium growth rate, the global unemployment rate will decline to 5.9 per cent.

The various sub-components of unemployment figures yield two interesting results. First, while adult (both male and female) unemployment rates move according to global trends, the youth strata show ever-increasing unemployment rates. This finding suggests that growth rates are not sufficient to absorb new cohorts of workers into the labour markets, leading to a worsening of the employment situation for these population groups. The prospects are worse for the female than for the male youth strata. By comparing across the different sub-components it is possible to demonstrate the persistence in the gaps in the unemployment rates between youth and adult cohorts. The ratio of youth unemployment rates to adult unemployment rates is, on average, about 3 to 1 and slightly growing over time.

**Table 4.5: Total unemployment rates at world level**

Year	MFU	Sd	YMU	Sd	AMU	Sd	YFU	Sd	AFU	Sd
1995	5.9	0.1	13.0	0.2	3.7	0.1	12.1	0.2	4.2	0.1
1996	6.0	0.1	13.3	0.2	3.8	0.1	12.4	0.2	4.3	0.1
1997	5.9	0.0	13.1	0.1	3.8	0.1	12.6	0.1	4.3	0.0
1998	6.2	0.0	13.8	0.1	3.9	0.1	13.3	0.1	4.5	0.0
1999	6.3	0.0	14.3	0.2	4.0	0.1	13.8	0.2	4.6	0.0
2000	6.1	0.0	14.0	0.1	3.8	0.1	13.6	0.1	4.3	0.0
2001	6.0	0.0	14.0	0.1	3.8	0.0	13.7	0.1	4.2	0.0
2002	6.2	0.0	14.4	0.1	4.0	0.1	14.1	0.1	4.4	0.0
2003	6.2	0.1	14.4	0.2	4.0	0.1	14.1	0.2	4.4	0.1
2004	6.1	0.1	14.3	0.2	3.9	0.1	13.9	0.2	4.3	0.1
2015	5.9	0.0	14.4	0.2	3.8	0.1	14.0	0.2	4.2	0.1

Note: MFU (male/female unemployment), Sd (standard deviation); YMU (youth male unemployment); AMU (adult male unemployment); YFU (youth female unemployment); AFU (adult female unemployment).

It is important to note that while all tables include the corresponding standard deviations for the predictions, these statistics are severely underestimated. This is because the only uncertainty included in the predictions is that related to the unknown slope parameter in the regressions (that is, the partial correlation between unemployment rates and economic growth). There are, obviously, other important sources of uncertainty related to the estimation of country-level fixed effects and the possible errors involved in within-country interpolations. These standard errors should be considered inferior limits of uncertainty.

One question remaining is how to evaluate the predictions generated by this methodology. This issue is not trivial, because whatever method is used to generate imputations and predictions should be compared with some complete data – but this benchmark for the total world clearly does not exist. However, we can advance further if we restrict our analysis to a subset of cross-sections with relatively complete information: the developed countries.

#### 4.4 Model evaluation

This section summarizes the results of different exercises (carried out by simulation) aimed to evaluate the methodology applied during this research. The analysis starts by defining the set of developed countries as our ‘complete information’ data set. Using this information several missing values are first generated. Different methodologies based on the remaining observed part of the data set are then used to impute the missing portions. The imputed data set is compared with the ‘complete information’ data set in order to evaluate the different methodologies.

Evaluation requires a definition of both the missing-value generating process and the approaches to be used during the imputations. With regard to the former, one significant result from section 4.3 is that, in many regions of the world, one important predictor of the missing-value patterns has been the per capita income of each country. Indeed, the poorest countries have a lower response probability. Using this result it is possible to specify the following hypothetical missing-values mechanism for developed countries:

$$P(y_{it} = \text{missing} | w_{it}) = \begin{cases} 0.95 & \text{if } w_{it} \leq Q_{25}(w_{it}) \\ 0.60 & \text{if } Q_{25}(w_{it}) < w_{it} \leq Q_{50}(w_{it}) \\ 0.35 & \text{if } Q_{50}(w_{it}) < w_{it} \leq Q_{75}(w_{it}) \\ 0.20 & \text{if } Q_{75}(w_{it}) \end{cases} \quad (16)$$

where  $y_{it}$  means the total unemployment rate of country  $i$  at time  $t$  and  $w_{it}$  is the corresponding per capita income. Equation (16) indicates that in any given year, countries in the 1<sup>st</sup> quartile of per capita income distribution will have a response probability of 5 per cent, countries in the 2<sup>nd</sup> quartile will show a response probability of 40 per cent, and those in the 3<sup>rd</sup> quartile a 65 per cent response probability. The response probability of the wealthiest countries will be 80 per cent. This missing-value generating process reproduces the previous result – that the response probability is positively correlated with the per capita income. In addition, the probabilities were allocated in such a way as to produce a global response rate of about 50 per cent – similar to the response rate in the real data.

The now incomplete data set produced with equation (16) will be used in order to evaluate four different imputation approaches. The first two approaches are the two common methodologies already applied to the KILM data set.<sup>12</sup> The first method is imputation using mean replacement. Here, the missing values in each year are replaced by the mean of the reported data in that year. The second approach is based on regression. Here, an unweighted least-square regression of the (transformed) unemployment rates on growth rates is used in order to impute the missing values.

In addition to these two approaches, two other methods were tested. The third model evaluated also uses a least-square regression, but this time the observed part of the data set is weighted in order to take into account the response probabilities of the different countries. The weights are computed as in section 3.3. The fourth and final method to be evaluated is the one applied in this paper where not only are different weights used, but also fixed effects are introduced in the observed part of the data set. The results of these different methodologies can be seen in Table 4.6.

**Table 4.6: Imputed unemployment rates according to different methodologies:  
Population average**

Method	Average	Bias	Inferior Limit	Superior Limit
Mean Replacement	6.25	13.0%	5.94	6.54
Unweighted Regression	5.89	18.0%	5.61	6.16
Weighted Regression	6.27	12.7%	5.94	6.59
Weighted Fixed Effects	6.91	3.8%	6.41	7.33
Complete Data	7.18			

The results in Table 4.6 compare the averages over 1,000 simulations for the different imputation methodologies with the true (average) unemployment rates for developing countries. This true figure was 7.18 per cent over the entire period 1990-2002. All the methodologies tend to underestimate this number. Using mean replacement the imputed

<sup>12</sup> See SCHAIBLE, W. (2000): "Methods for Producing World and Regional Estimates for Selected Key Indicators of the Labour Market," *Employment Paper* for a description.

average is 6.26 per cent (a bias of 13 per cent), while pooled regression produces even worse results of average unemployment at 5.89 per cent (an 18 per cent underestimation). However, weighting significantly improves the performance of the pooled regression, leading to an average of 6.27 per cent (a bias of 12.7 per cent). However, the combination of weights plus fixed effects clearly produces the best results. Indeed, this approach produces an average of 6.91 per cent – a bias of only 3.8 per cent.

Inspection of the 10 per cent significance confidence intervals also confirms the advantage of using weights in combination with fixed effects: this is the only methodology where the true population parameter can be included within the confidence intervals, indicating that the imputed average is not statistically different from the true population average or that the bias is not statistically significant.

**Table 4.7: Imputed unemployment rates according to different methodologies:  
Population standard deviation**

Method	Average	Bias	Inferior limit	Superior limit
Mean Replacement	2.36	0.39	2.11	2.62
Unweighted Regression	2.27	0.41	2.03	2.52
Weighted Regression	2.25	0.42	2.02	2.50
Weighted Fixed Effects	3.30	0.15	2.69	4.17
Complete Data	3.87			

Table 4.7 summarizes the results regarding the spreads of different imputed distributions. As expected, all the approaches tend to underestimate the true data variability. However, the method that includes fixed effects performs much better. The standard deviation underestimation is only 15 per cent and the average imputed standard deviation is not statistically different from the true population parameter.

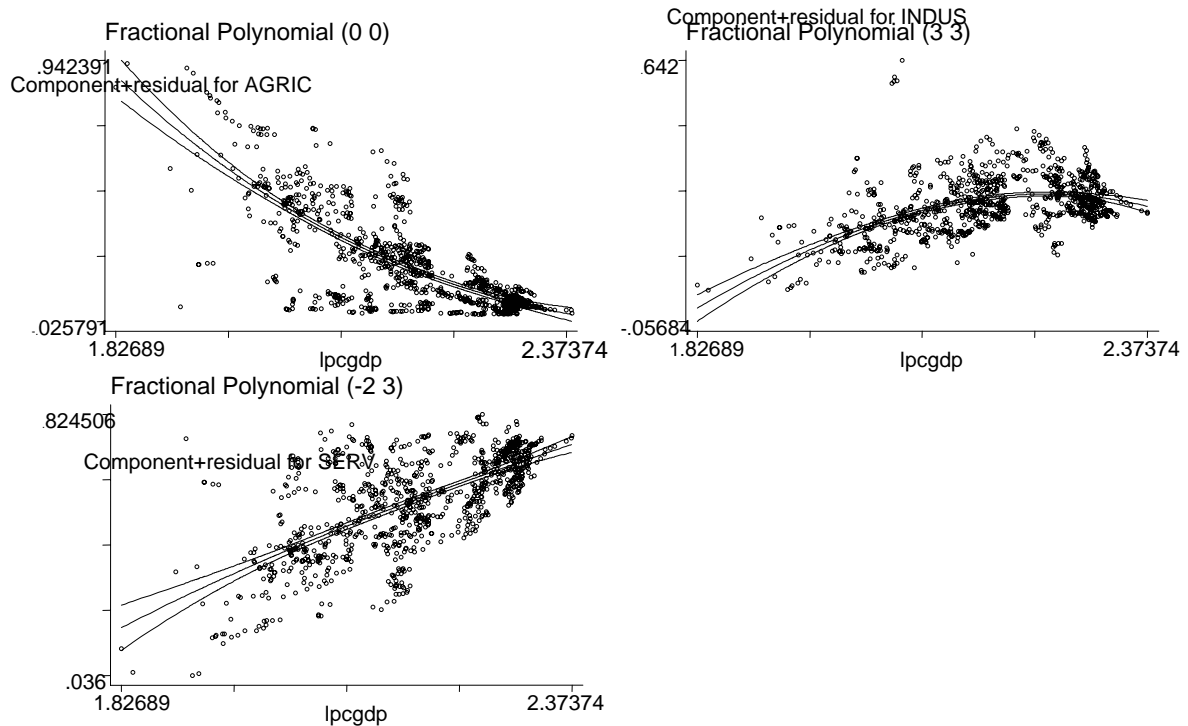
In sum, these simulation results clearly indicate that there are important pay-offs from including both weights and fixed effects in the imputation routines of the KILM data set. In terms of average unemployment rates, the weighting scheme reduces the bias for about 50 per cent, the remaining 50 per cent reduction is due to the operation of fixed effects. In addition, the estimation of country-level fixed effects also helps to preserve an important proportion of the real variability.

## 5. Employment distribution by economic activity

In this section, the methodology is generalized in order to impute and predict the evolution of employment in different economic sectors. Some empirical evidence suggests a strong correlation between per capita income and the share of GDP of various economic sectors. Similar correlation was found by Schaible and Mahadevan-Vijaya (2002) for a cross-section of countries in the KILM data set. In a very well-known study Fuchs (1980) suggested that the relationship between the importance of the different economic sectors and the per capita income is far from linear. Indeed, when per capita income increases, the share of employment in agriculture exponentially declines; the share of employment in industry

initially increases, then reaches a plateau and decreases; and the share of employment in services increases exponentially. In order to determine the best specification in the case of the KILM data set, several semi-parametric regressions between the share of employment in each economic sector and the per capita income were run. The results of this exercise are depicted in Figure 5.1.

**Figure 5.1: Employment shares and per capita income by economic sector**



The top left panel in Figure 5.1 shows the relationship between income and the employment share in agriculture; the top right for industry; the bottom left panel for the service sector. Overall, it is possible to say that these relationships reproduce the pattern found by Fuchs (1980) more than 20 years ago. These findings confirm that per capita GDP is a key predictor of economic structure. In what follows, the methodology applied above is adapted in order to deal with employment distribution by sector and the results of the predictions are described.

Table 5.1 summarizes the response rates for employment by sector data across the different subregions. The global response rate is 44 per cent (slightly higher than for unemployment figures). Response rates of over 50 per cent apply to almost every subregion except sub-Saharan Africa, whose response rates are very low. This means we need to collapse this subregion with the Middle East and North Africa into one macro region. Several interpolation techniques were used to boost the response rates by filling the gaps between reported years for the respondent countries. Table 5.2 shows that the response rates increase very little.

**Table 5.1: Response rates by subregion before interpolation**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Major Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.00	0.91
Major Non-Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.92
Other Europe	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.50	1.00	1.00	0.00	0.42
Eastern Europe	0.33	0.33	0.42	0.58	0.58	0.67	0.67	0.67	0.67	0.67	0.67	0.00	0.52
Baltic States	0.67	0.67	0.67	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	0.00	0.75
CIS	0.58	0.58	0.67	0.67	0.67	0.58	0.67	0.67	0.75	0.42	0.33	0.00	0.55
Melanesia	0.67	0.67	0.67	0.33	0.33	0.33	0.33	0.33	0.00	0.00	0.00	0.00	0.31
Eastern Asia	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.71	0.71	0.71	0.43	0.00	0.71
South-Central Asia	0.50	0.50	0.50	0.50	0.63	0.38	0.25	0.25	0.13	0.38	0.00	0.00	0.33
South-Eastern Asia	0.55	0.73	0.82	0.64	0.64	0.55	0.64	0.55	0.45	0.36	0.18	0.00	0.51
Central America	0.74	0.74	0.74	0.79	0.79	0.79	0.79	0.84	0.68	0.53	0.53	0.16	0.68
South America	0.67	1.00	0.92	0.83	0.92	0.83	0.75	0.83	0.92	0.67	0.75	0.08	0.76
Eastern Africa	0.19	0.13	0.06	0.19	0.13	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.07
Middle Africa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Southern Africa	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.20	0.20	0.40	0.00	0.00	0.08
Western Africa	0.00	0.06	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Middle East	0.13	0.13	0.13	0.13	0.20	0.20	0.13	0.13	0.20	0.20	0.13	0.00	0.14
North Africa	0.40	0.40	0.40	0.20	0.40	0.20	0.40	0.40	0.40	0.20	0.00	0.00	0.28
Total	0.48	0.51	0.51	0.51	0.54	0.48	0.49	0.50	0.49	0.43	0.37	0.02	0.44

Source: ILO, *KILM*, 3<sup>rd</sup> edition.

From Table 5.1 it can be concluded that there are missing values in every subregion (or region) and thus it is necessary to impute in every single geographic group. The estimation and imputation phase is similar to that applied for the unemployment rates. First, a missing values mechanism is estimated by running several logit regressions where the dependent variable is 1 if the country reports on distribution of employment by sector and 0 if the report is missing. The explanatory variables are those used in the case of unemployment rates. Several response probabilities are then predicted and country-level weights computed for the respondent countries. The results of this sequence of probit regressions are shown in Table 5.3. In eight out of the ten geographical groups, the assumption that missing values are missing completely at random is demonstrably rejected. Again, the per capita income and the size of the country are two important predictors of response probability. This implies that respondent countries are clearly different from non-respondent ones and that some gains can be obtained by weighting the sample of respondent countries.

**Table 5.2: Response rates by subregion after interpolation**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Major Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.00	0.91
Major Non-Europe	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.92
Other Europe	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.00	1.00	0.00	0.54
Eastern Europe	0.33	0.33	0.42	0.58	0.58	0.67	0.67	0.67	0.67	0.67	0.67	0.00	0.52
Baltic States	0.67	0.67	0.67	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	0.00	0.75
CIS	0.58	0.58	0.67	0.67	0.67	0.67	0.67	0.67	0.75	0.42	0.33	0.00	0.56
Melanesia	0.67	0.67	0.67	0.33	0.33	0.33	0.33	0.33	0.00	0.00	0.00	0.00	0.31
Eastern Asia	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.71	0.71	0.71	0.43	0.00	0.71
South-Central Asia	0.50	0.50	0.50	0.50	0.63	0.50	0.50	0.50	0.38	0.38	0.00	0.00	0.41
South-Eastern Asia	0.55	0.73	0.82	0.73	0.73	0.64	0.64	0.55	0.45	0.36	0.18	0.00	0.53
Central America	0.74	0.74	0.79	0.79	0.79	0.79	0.79	0.84	0.79	0.63	0.58	0.16	0.70
South America	0.67	1.00	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.83	0.75	0.08	0.81
Eastern Africa	0.19	0.19	0.19	0.25	0.13	0.06	0.06	0.06	0.06	0.00	0.00	0.00	0.10
Middle Africa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Southern Africa	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20	0.40	0.40	0.00	0.00	0.13
Western Africa	0.00	0.06	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Middle East	0.13	0.13	0.13	0.13	0.20	0.27	0.20	0.20	0.27	0.20	0.13	0.00	0.17
North Africa	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.20	0.00	0.00	0.32
Total	0.48	0.52	0.53	0.53	0.54	0.53	0.53	0.53	0.52	0.46	0.38	0.02	0.46

Source: Author's calculations.

**Table 5.3 Determinants of response probability:  
Employment distribution by economic sector**

	Developed Europe	Developed Non-Europe	Eastern Europe	CIS	Eastern Asia	Central Asia	South-East Asia	Central America	South America	Africa and Middle East
PCGDP	4.513 (3.55)**	-20.073 (2.29)*	0.206 (0.27)	-0.714 (1.15)	3.036 (3.62)**	2.16 (3.09)**	2.254 (4.54)**	2.443 (5.30)**	-1.807 (1.35)	1.216 (6.13)**
GROWTH	-0.096 (0.61)	0.282 (0.84)	-0.094 (2.47)*	-0.003 (0.11)	0.226 (1.75)	-0.211 (1.12)	-0.115 (1.65)	-0.057 (0.94)	0.033 (0.29)	0.014 (0.68)
SIZE	1.282 (4.19)**	2.116 (2.04)*	0.33 (1.40)	1.158 (3.90)**	0.52 (2.22)*	0.294 (2.32)*	0.916 (5.25)**	0.837 (4.97)**	1.386 (3.65)**	0.705 (6.29)**
HIPC				1.722 (2.57)*	8.269 (3.49)**		-0.249 (0.3)	3.881 (3.64)**	-4.71 (3.36)**	0.642 (1.43)
Constant	-49.203 (3.66)**	182.056 (2.32)*	-5.451 (0.74)	-4.566 (0.8)	-29.145 (3.36)**	-17.711 (3.14)**	-24.726 (5.09)**	-25.646 (5.42)**	4.963 (0.46)	-17.867 (7.86)**
N	231	60	143	132	77	80	154	228	132	715
Pseudo-R2	0.46	0.2	0.15	0.17	0.59	0.15	0.51	0.32	0.71	0.21
LR Chi2	40.8**	6.4	26.4*	30.6**	48.3**	15.8	109.6**	90.24**	93.7**	101.6**

Notes: Absolute value of the Z statistic is in parenthesis. (\*) significant at 5%, (\*\*) significant at 1%. N = No. of observations.

After estimating the weights, the final step is to run a sequence of subregional weighted regressions. The prediction model is built on the basis of the empirical evidence summarized in Figure 5.1. That is, for each economic sector the following model for employment shares is estimated:

$$Y_{itk}^T = \ln\left(\frac{y_{itk}}{1-y_{itk}}\right) = \alpha + x_{it}'\beta + \mu_{it} \quad (17)$$

where  $y_{itk}$  is the observed employment participation for economic sector  $k$ , country  $i$  and period  $t$  and  $x_{it}$  is a set of covariates explaining this share. In this section this set of covariates includes both the level of the per capita income and its square value. One important difference here is that  $\alpha$  is no longer country-specific. We proceeded in this way because, on the one hand, the inclusion of a fixed effect did not greatly affect the estimated correlations and, on the other, it did generate some implausible imputations in some subregions. One notable constraint to model (17) is that the add of the employment shares across all the economic sector should always add 1, that is:

$$\sum_k y_{itk} = 1 \quad \forall i, t \quad (18)$$

As a consequence, model (17) was estimated as a system of equations for two sectors: agriculture and industry. The default sector is services, whose shares are computed as:

$$\hat{y}_{itk} = 1 - \hat{y}_{it,agr} - \hat{y}_{it,ind} \quad \forall i, t \quad (19)$$

After estimation this model can be used for imputation and prediction. Although it is not strictly necessary to carry out imputations for non-respondent countries, doing so is useful to produce a “complete data set” that can be used in order to compute additional statistics of labour market conditions or to generate different regional and subregional aggregations.

Tables 5.4 and 5.5 show the estimates and projections for the distribution of total employment by sector. One important point is that the model is able to impute ‘shares’ only; hence, to recover a total, some information about total employment will be needed. This figure is derived from the results on unemployment rates shown in previous sections. A negative side-effect of this approach is that the standard errors reported in Tables 5.4 and 5.5 will clearly be underestimated because they take as true a total employment value that was predicted with some error.

In terms of the results, Table 5.5 suggests a reduction in employment, accounted for by the agricultural sector, from 42 per cent in 1996 to 20 per cent by 2015. This is a very significant drop and, as a consequence, agriculture is the only sector where a reduction in the absolute number of workers is expected. This fall for agriculture allows for a marginal increase in the participation of industry (from 22 per cent to 26 per cent) and, more remarkably, for a substantial increase in the service sector (from 37 per cent to 53 per cent). Therefore, although across the entire period it is expected that the total number of workers in industry will increase by about 300 million, the increased employment in services will be two times larger.

Appendix tables A.16-A.21 present the same results by subregions. The pattern of change is always similar. Although a decrease in the participation of agriculture is confirmed for every subregion, important differences are observed across subregions. At one extreme are the countries of Eastern Asia where significant structural change is expected and where

the share of agriculture will fall from 57 per cent to 13 per cent by 2015, and at the other is the sub-Saharan African region, which is the most stable subregion and where a decrease from 48.5 per cent to just 47.2 per cent is expected.

For the manufacturing sector, the patterns vary depending on the initial condition of the countries. We expect a fall in industrial employment in developed countries (Europe and Non-Europe), a rather stable situation in the middle-income countries of Central and South America and an increase in manufacturing employment in the rest of the world. This increase is expected to be relatively significant in South Central Asia (15 per cent to 28 per cent). As a consequence of these compensating trends, the world levels for manufacturing look fairly stable.

Finally, all the countries will show growth in the participation of the service sector, particularly in East Asia where it is predicted to rise from 17 per cent in 1996 to 55 per cent by 2015), and also in South-Eastern Asia (37 per cent to 56 per cent). The remaining subregions will also show an increase but movements will be less dramatic.

**Table 5.4: Employment distribution by economic sector ('000)**

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Agriculture	993981.5	1016692.2	1031457.9	1017261.3	1014201.0	948482.1	920249.8	911250.7	899601.8	651098.2
Standard deviation	46914.3	47111.0	47317.5	47428.2	47619.6	47828.1	48151.5	48384.1	48650.6	30328.1
Industry	566703.4	564464.8	552916.7	562826.4	585472.0	621052.5	642225.4	661169.6	681875.9	876295.6
Standard deviation	6845.7	6961.9	7130.4	7677.3	8134.3	8421.6	8874.9	9398.5	10100.2	18421.8
Services	922831.9	949289.7	983401.2	1028806.1	1058839.8	1132319.4	1176714.3	1211930.9	1250697.2	1752359.0
Standard deviation	47411.2	47622.6	47851.7	48045.6	48309.4	48563.8	48962.6	49288.4	49688.0	35484.6

**Table 5.5: Employment distribution by economic sector (%)**

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Agriculture	40.0	40.2	40.2	39.0	38.1	35.1	33.6	32.7	31.8	19.9
Standard deviation	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.7	1.7	0.9
Industry	22.8	22.3	21.5	21.6	22.0	23.0	23.4	23.7	24.1	26.7
Standard deviation	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.6
Services	37.2	37.5	38.3	39.4	39.8	41.9	43.0	43.5	44.2	53.4
Standard deviation	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.1

## 6. Conclusions

This report has proposed an integrated methodological approach aimed at generating imputations and projections from the KILM data set, which is a substantial undertaking designed by the ILO to collect and improve the coordination of data on various labour market indicators submitted by its member countries. The team responsible for KILM has concentrated first on widening geographical coverage and improving the timeliness of the information for the core indicators and, second, on expanding the set of indicators to further meet demand for realistic coverage of the world's labour markets. The scope and complexity of the current data set affect the comparability of statistics among countries and regions.

Three shortcomings were detected: not all countries report information; many reporting countries report incomplete data; and, finally, not all the reported information is comparable across countries due to different methodological approaches.

Improving the KILM data set will require more standardization of the different methodologies involved in data collection and processing than are currently being implemented by member countries. It will also necessitate achieving higher response rates. This entails a prolonged process of continuous investment, the results of which can only be looked for in the long term. Meanwhile, the methodological approach proposed in this investigation is designed to deal with the three shortcomings detected. The issue of incomplete information is overcome by the use of ad hoc country-level interpolation techniques. This also preserves much of the country-level heterogeneity. In addition, modelling the ‘missingness’ mechanism and weighting the sample of respondent countries deals with the issue of missing countries. The idea of introducing weights is to try to reduce the influence in the sample of those respondent countries that are vastly different. Finally, heterogeneity at country level was controlled for by adopting panel data techniques.

The tests achieved from simulations of this approach are encouraging. A remarkable reduction of the bias in comparison with more standard alternatives is observed – with 50 per cent of bias reduction generated by the introduction of the weighting scheme used in the model, and the remaining 50 per cent resulting from working with fixed effects. Another significant result of the simulation is that this methodology preserves a large proportion of the original data variability.

Of course, research into the consequences and properties of the suggested approach does not end with this investigation. Much still remains to be analysed, in particular how to achieve a more appropriate measurement of uncertainty. The present paper is only a minor step in this direction. A major advance would be to take into account (in the projections) the uncertainties that relate to the estimated fixed effects and, also, the proportion of observations that are imputed – as opposed to true – data. The method described in this report still treats the different dependent variables (such as unemployment sub-components) as single equations. Thus, all the information related to correlation among them is omitted, leading to an additional loss of information. More structural approaches will be necessary to deal with such issues. These alternative approaches would also require more highly sophisticated estimation techniques (such as maximum likelihood for incomplete data), and are beyond the scope of the present research. However, they must form part of the future research agenda.

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## Appendix

**Table A.1: Total Male and Female Unemployment ('000)**

MFU	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	20258 0	20339 0	20181 0	19158 0	18278 0	16448 0	15354 0	16504 0	16542 313	16442 312	16428 314
Major Non-Europe	12052 0	12182 0	11577 0	11420 0	11286 0	10941 0	12324 0	14287 0	14496 328	14009 313	14782 338
Eastern Europe + Baltic	6957 17	6703 218	6179 70	6153 26	6902 13	7615 7	7958 6	8366 6	8262 172	8363 182	7764 174
CIS	9183 24	9972 11	10957 15	12350 13	13581 18	10640 20	9768 23	9342 15	9142 1174	9136 1167	8190 1085
Eastern Asia	21134 1002	22475 935	23754 875	26403 805	27442 769	25570 833	27071 796	26151 853	27537 832	27893 843	27164 974
South Central Asia	25127 916	25438 892	23421 380	24275 427	26401 659	26027 394	25012 520	26233 419	27249 416	28898 497	33693 500
South-Eastern Asia	9307 195	9264 26	9301 23	11426 20	12301 24	12425 29	14335 24	16866 42	17178 260	17410 261	19933 276
Central America	4462 7	4042 4	3782 4	3608 3	3142 3	3123 5	3384 7	3465 23	3469 68	3424 67	3967 81
South America	9409 1	12318 1	12653 1	14544 1	17184 1	17107 1	15954 1	16528 160	16005 244	14658 220	17262 254
Sub-Saharan Africa	22706 206	23358 235	24777 220	25482 216	26047 181	27482 250	27991 212	29019 296	29663 328	29364 235	37816 282
Middle East	12807 64	12219 28	12899 67	13772 68	13740 82	14447 36	14474 34	14798 64	15284 119	15707 122	19097 144
Total	153402 1388	158310 1332	159479 984	168592 939	176304 1033	171825 956	173624 975	181558 1012	184828 1653	185304 1655	206097 1693

Note: The standard deviation is given below unemployment estimates

**Table A.2: Total Youth Male Unemployment ('000)**

YMU	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	3129 0	3024 0	2870 0	2732 0	2657 0	2328 0	2285 0	2510 0	2510 68	2477 67	2351 65
Major Non-Europe	2163 0	2203 0	2133 0	2095 0	2059 0	1966 0	2170 0	2382 0	2422 94	2352 92	2472 101
Eastern Europe + Baltic	1261 5	1140 34	1023 14	1019 6	1160 3	1221 1	1295 2	1341 2	1144 54	1135 55	821 38
CIS	1448 6	1524 5	1631 6	1791 7	1977 10	1542 10	1482 11	1367 8	1174 263	1185 263	821 162
Eastern Asia	6090 523	6283 469	6417 420	6815 371	6907 342	6379 365	6687 344	6455 370	6809 362	6954 370	6264 383
South Central Asia	10638 599	10645 580	9426 240	9971 270	10950 418	10625 246	10067 324	10637 263	11111 261	11901 313	13135 299
South-Eastern Asia	2990 136	3047 14	3062 12	3569 11	4192 13	4112 15	4717 12	5427 22	5489 180	5518 180	5733 181
Central America	1256 3	1129 2	1009 2	930 1	748 1	809 2	857 3	882 6	875 32	853 30	900 32
South America	2441 1	3176 0	3168 0	3646 1	4239 0	4117 1	3979 1	4096 76	3982 102	3599 94	3791 94
Sub-Sharan Africa	8608 113	8882 129	9438 129	9778 153	10084 134	10604 179	10727 154	11143 187	11444 219	11391 137	14845 178
Middle East	4240 38	4050 19	4254 41	4543 42	4409 51	4677 24	4650 20	4708 30	4845 67	4951 67	5191 61
Total	44265 816	45103 758	44430 503	46889 485	49382 559	48380 476	48917 498	50948 499	51805 617	52315 621	56323 597

Note: The standard deviation is given below unemployment estimates

**Table A.3: Total Adult Male Unemployment ('000)**

AMU	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	7518 0	7739 0	7670 0	7179 0	6836 0	6117 0	5873 0	6560 0	6599 227	6581 226	6858 232
Major Non-Europe	4586 0	4614 0	4275 0	4287 0	4271 0	4156 0	4845 0	5765 0	5843 257	5633 243	5958 263
Eastern Europe + Baltic	2429 14	2384 186	2169 60	2219 22	2554 11	2794 6	2928 5	3101 5	3156 122	3221 129	3264 129
CIS	3534 17	3877 7	4254 10	4772 8	5268 11	3961 13	3660 15	3501 10	3495 821	3487 816	3480 792
Eastern Asia	7055 696	7747 666	8435 637	9832 598	10415 580	9722 631	10383 607	9985 648	10463 632	10549 639	11033 767
South Central Asia	4819 452	4931 445	4638 193	4816 218	5202 338	5179 206	5129 278	5371 222	5556 220	5840 260	7367 282
South-Eastern Asia	1885 37	1873 12	1924 11	2547 10	2584 12	2690 15	2973 12	3589 23	3694 78	3786 80	4897 104
Central America	1354 3	1179 2	998 2	977 1	895 1	874 2	951 3	982 5	985 42	973 41	1240 53
South America	2473 0	3250 0	3231 0	3663 1	4514 0	4555 1	4223 1	4256 57	4066 137	3610 118	4739 147
Sub-Saharan Africa	5557 122	5685 142	5970 127	5944 95	5961 82	6488 113	6524 86	6731 152	6805 156	6783 130	8869 154
Middle East	4290 44	4031 16	4253 44	4411 43	4532 51	4695 20	4700 18	4827 48	5003 83	5170 86	7269 115
Total	45500 841	47309 835	47815 682	50647 645	53032 678	51229 674	52188 673	54670 706	55666 1146	55633 1147	64974 1227

Note: The standard deviation is given below unemployment estimates

**Table A.4: Total Youth Female Unemployment ('000)**

YFU	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	2730 0	2619 0	2575 0	2350 0	2234 0	1975 0	1772 0	1760 0	1742 44	1717 43	1559 39
Major Non Europe	1736 0	1740 0	1697 0	1635 0	1611 0	1527 0	1623 0	1802 0	1828 60	1802 60	1886 65
Eastern Europe + Baltic	999 3	935 22	858 8	816 3	908 2	947 1	1006 1	1064 1	1061 34	1057 36	755 24
CIS	1325 5	1396 4	1464 6	1579 4	1620 6	1482 7	1352 8	1325 5	1335 273	1340 274	875 166
Eastern Asia	4235 339	4302 300	4365 267	4552 233	4582 213	4255 227	4414 212	4285 229	4483 222	4563 226	4050 231
South Central Asia	5421 416	5362 399	5101 178	5115 193	5517 288	5762 175	5496 232	5636 182	5826 181	6090 210	6798 201
South-Eastern Asia	2657 129	2625 15	2534 13	3057 11	3310 12	3331 13	3908 11	4453 16	4500 155	4524 155	4686 155
Central America	953 4	860 2	850 2	820 2	712 2	681 3	779 4	796 15	799 26	790 26	824 28
South America	2206 0	2932 0	3021 0	3592 0	3995 0	4003 0	3823 0	3937 91	3817 107	3558 102	3748 100
Sub-Saharan Africa	5254 88	5407 94	5795 87	6069 107	6232 80	6541 117	6622 105	6894 134	7123 154	6940 98	8951 116
Middle East	2386 22	2343 10	2529 26	2787 27	2798 34	2924 14	2939 14	2976 17	3069 40	3141 41	3248 37
Total	29902 560	30519 509	30788 334	32371 322	33519 369	33428 310	33734 332	34927 336	35583 474	35522 473	37379 421

Note: The standard deviation is given below unemployment estimates

**Table A.5: Total Adult Female Unemployment ('000)**

AFY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	6882 0	6958 0	7066 0	6896 0	6551 0	6028 0	5424 0	5673 0	5691 200	5668 201	5660 198
Major Non-Europe	3567 0	3625 0	3472 0	3404 0	3345 0	3292 0	3685 0	4338 0	4403 171	4222 164	4466 176
Eastern Europe + Baltic	2267 8	2245 105	2129 33	2100 12	2281 6	2654 3	2730 3	2861 3	2902 103	2950 110	2923 107
CIS	2876 15	3175 5	3609 7	4209 6	4715 8	3655 9	3274 11	3149 7	3138 748	3123 742	3014 704
Eastern Asia	3753 362	4142 348	4537 334	5204 314	5539 306	5214 333	5587 321	5425 345	5782 335	5827 338	5818 401
South Central Asia	4250 319	4500 319	4255 131	4374 158	4731 252	4462 149	4320 184	4589 154	4756 155	5067 192	6393 201
South-Eastern Asia	1775 37	1720 11	1781 10	2252 9	2215 11	2293 14	2736 12	3398 22	3495 71	3583 73	4618 94
Central America	899 4	875 2	925 2	882 2	787 2	759 3	797 4	805 16	810 35	808 35	1004 44
South America	2289 0	2960 0	3233 0	3644 0	4436 0	4432 1	3929 0	4239 90	4140 136	3891 124	4985 155
Sub-Saharan Africa	3287 85	3384 97	3575 90	3690 52	3771 44	3850 64	4118 50	4251 107	4291 108	4250 98	5152 103
Middle East	1892 13	1796 7	1863 15	2031 14	2001 17	2150 9	2186 16	2286 26	2367 36	2446 38	3388 50
Total	33735 492	35379 494	36446 372	38685 356	40371 399	38789 371	38785 374	41013 404	41775 902	41834 902	47420 909

Note: The standard deviation is given below unemployment estimates

**Table A.6: Male - Female Unemployment Rates (%)**

MFUR	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	10.1 0	10.1 0	10 0	9.4 0	8.9 0	7.9 0	7.4 0	7.9 0	7.9 0.1	7.8 0.1	7.7 0.1
Major Non-Europe	5.2 0	5.2 0	4.9 0	4.8 0	4.7 0	4.5 0	5.1 0	5.8 0	5.9 0.1	5.6 0.1	5.7 0.1
Eastern Europe + Baltic	11.6 0	11.3 0.4	10.4 0.1	10.4 0	11.7 0	12.9 0	13.3 0	14 0	13.8 0.3	13.9 0.3	13.2 0.3
CIS	7 0	7.6 0	8.4 0	9.4 0	10.6 0	8.3 0	7.6 0	7.3 0	7.1 0.9	7 0.9	6.2 0.8
Eastern Asia	2.8 0.1	2.9 0.1	3 0.1	3.3 0.1	3.4 0.1	3.1 0.1	3.3 0.1	3.1 0.1	3.3 0.1	3.3 0.1	3 0.1
South Central Asia	5.4 0.2	5.3 0.2	4.8 0.1	4.8 0.1	5.1 0.1	4.9 0.1	4.6 0.1	4.8 0.1	4.8 0.1	5 0.1	4.6 0.1
South-Eastern Asia	4.2 0.1	4 0	4 0	4.8 0	5 0	4.9 0	5.5 0	6.3 0	6.3 0.1	6.3 0.1	5.9 0.1
Central America	7.3 0	6.5 0	5.8 0	5.4 0	4.6 0	4.5 0	4.8 0	4.9 0	4.8 0.1	4.6 0.1	4.3 0.1
South America	6.6 0	8.6 0	8.5 0	9.5 0	10.9 0	10.7 0	9.8 0	9.9 0.1	9.4 0.1	8.5 0.1	8.4 0.1
Sub-Saharan Africa	10.3 0.1	10.3 0.1	10.6 0.1	10.6 0.1	10.5 0.1	10.8 0.1	10.7 0.1	10.8 0.1	10.8 0.1	10.4 0.1	10.2 0.1
Middle East	13.3 0.1	12.3 0	12.5 0.1	12.9 0.1	12.3 0.1	12.6 0	12.3 0	12.2 0.1	12.2 0.1	12.2 0.1	11.3 0.1
Total	5.90 0.10	6.00 0.10	5.90 0.00	6.20 0.00	6.30 0.00	6.10 0.00	6.00 0.00	6.20 0.00	6.20 0.10	6.10 0.10	5.90 0.00

Note: The standard deviation is given below unemployment estimates

**Table A.7: Youth Male Unemployment Rates (%)**

YMUR	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	17.8 0	17.5 0	16.9 0	16 0	15.8 0	14 0	14 0	15.7 0	15.7 0.4	15.5 0.4	15.3 0.4
Major Non-Europe	11.4 0	11.7 0	11.3 0	11.1 0	10.9 0	10.4 0	11.6 0	12.7 0	12.8 0.5	12.4 0.5	12.5 0.5
Eastern Europe + Baltic	24.4 0.1	23.1 0.7	21.3 0.3	21.8 0.1	25.4 0.1	27.6 0	29.5 0	31.5 0	27.3 1.3	27.5 1.3	27.3 1.3
CIS	13.9 0.1	15.1 0.1	16 0.1	17.3 0.1	19.2 0.1	16.2 0.1	15.3 0.1	14.5 0.1	12.3 2.8	12.2 2.7	11 2.2
Eastern Asia	6.6 0.6	7 0.5	7.4 0.5	8.1 0.4	8.4 0.4	7.9 0.4	8.2 0.4	7.8 0.5	8.1 0.4	8.1 0.4	7.6 0.5
South Central Asia	14.4 0.8	14.2 0.8	12.4 0.3	12.9 0.3	13.9 0.5	13.2 0.3	12.3 0.4	12.7 0.3	13 0.3	13.6 0.4	12.9 0.3
South-Eastern Asia	9.4 0.4	9.3 0	9.4 0	11.4 0	12.4 0	12.1 0	13.6 0	15.5 0.1	15.5 0.5	15.4 0.5	15.4 0.5
Central America	10.9 0	9.7 0	8.7 0	7.9 0	6.5 0	7 0	7.5 0	7.8 0.1	7.6 0.3	7.4 0.3	7.2 0.3
South America	10.9 0	14.4 0	14 0	15.9 0	18.1 0	17.6 0	17.1 0	17.7 0.3	17.1 0.4	15.4 0.4	16.2 0.4
Sub-Saharan Africa	22.2 0.3	22.2 0.3	22.8 0.3	22.8 0.4	22.8 0.3	23.1 0.4	22.7 0.3	22.8 0.4	22.7 0.4	22 0.3	22.2 0.3
Middle East	24.8 0.2	23.1 0.1	23.4 0.2	24.1 0.2	22.2 0.3	23 0.1	22.6 0.1	22.7 0.1	22.7 0.3	22.7 0.3	22.4 0.3
Total	13.0 0.2	13.3 0.2	13.1 0.1	13.8 0.1	14.3 0.2	14.0 0.1	14.0 0.1	14.4 0.1	14.4 0.2	14.3 0.2	14.4 0.2

Note: The standard deviation is given below unemployment estimates

**Table A.8: Adult Male Unemployment Rates (%)**

AMUR	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	7.4 0	7.6 0	7.5 0	6.9 0	6.6 0	5.8 0	5.6 0	6.2 0	6.2 0.2	6.1 0.2	6.2 0.2
Major Non-Europe	4.2 0	4.1 0	3.8 0	3.8 0	3.7 0	3.6 0	4.2 0	4.9 0	4.9 0.2	4.7 0.2	4.8 0.2
Eastern Europe + Baltic	8.7 0	8.6 0.7	7.8 0.2	8 0.1	9.2 0	10.1 0	10.4 0	11 0	11.1 0.4	11.3 0.5	11.2 0.4
CIS	6 0	6.6 0	7.3 0	8.2 0	9.3 0	7 0	6.4 0	6.1 0	6.1 1.4	6 1.4	5.6 1.3
Eastern Asia	2.1 0.2	2.3 0.2	2.5 0.2	2.8 0.2	2.9 0.2	2.7 0.2	2.8 0.2	2.7 0.2	2.8 0.2	2.8 0.2	2.6 0.2
South Central Asia	1.9 0.2	1.9 0.2	1.7 0.1	1.8 0.1	1.9 0.1	1.8 0.1	1.8 0.1	1.8 0.1	1.8 0.1	1.9 0.1	1.8 0.1
South-Eastern Asia	1.9 0	1.9 0	1.9 0	2.4 0	2.4 0	2.4 0	2.6 0	3.1 0	3.1 0.1	3.1 0.1	3.1 0.1
Central America	4.7 0	3.9 0	3.2 0	3.1 0	2.8 0	2.6 0	2.8 0	2.8 0	2.7 0.1	2.6 0.1	2.6 0.1
South America	3.8 0	4.9 0	4.8 0	5.3 0	6.4 0	6.3 0	5.7 0	5.7 0.1	5.3 0.2	4.6 0.1	4.8 0.1
Sub-Saharan Africa	6.4 0.1	6.4 0.2	6.5 0.1	6.4 0.1	6.2 0.1	6.6 0.1	6.5 0.1	6.5 0.1	6.5 0.1	6.3 0.1	6.1 0.1
Middle East	7.6 0.1	6.9 0	7.1 0.1	7.2 0.1	7.1 0.1	7.2 0	7 0	7 0.1	7 0.1	7 0.1	7.1 0.1
Total	3.7 0.1	3.8 0.1	3.8 0.1	3.9 0.1	4.0 0.1	3.8 0.1	3.8 0.0	4.0 0.1	4.0 0.1	3.9 0.1	3.8 0.1

Note: The standard deviation is given below unemployment estimates

**Table A.9: Youth Female Unemployment Rates (%)**

<b>YFUR</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2015</b>
Europe	20.5 0	20.3 0	20.6 0	18.8 0	17.8 0	16 0	14.8 0	15.2 0	15 0.4	14.8 0.4	14.2 0.4
Major Non-Europe	10.4 0	10.5 0	10.2 0	9.7 0	9.6 0	9 0	9.7 0	10.7 0	10.8 0.4	10.5 0.3	10.7 0.4
Eastern Europe + Baltic	25.7 0.1	25.4 0.6	23.7 0.2	23 0.1	25.9 0	27.6 0	29.6 0	32 0	32.4 1.1	32.9 1.1	32.5 1
CIS	14.3 0	15.4 0	16.3 0.1	17.7 0	19.6 0.1	17.5 0.1	15.9 0.1	15.3 0.1	15.2 3.1	15.1 3.1	13.2 2.5
Eastern Asia	4.8 0.4	5 0.4	5.3 0.3	5.7 0.3	5.9 0.3	5.6 0.3	5.8 0.3	5.6 0.3	5.8 0.3	5.8 0.3	5.5 0.3
South Central Asia	15.7 1.2	15.5 1.2	14.6 0.5	14.5 0.5	15.6 0.8	16 0.5	15.4 0.7	15.7 0.5	15.9 0.5	16.3 0.6	15.9 0.5
South-Eastern Asia	10.9 0.5	10.8 0.1	10.6 0.1	12.8 0	13.8 0	13.5 0.1	15.6 0	17.6 0.1	17.6 0.6	17.6 0.6	17.7 0.6
Central America	16.1 0.1	14.5 0	13.9 0	13 0	11.4 0	10.9 0	12.6 0.1	12.9 0.2	12.8 0.4	12.6 0.4	12.4 0.4
South America	15.5 0	20.4 0	20.4 0	23.5 0	25.1 0	25 0	24 0	24.8 0.6	23.9 0.7	22.1 0.6	23 0.6
Sub-Saharan Africa	17.3 0.3	17.2 0.3	17.8 0.3	18 0.3	17.9 0.2	18.1 0.3	17.7 0.3	17.9 0.3	18 0.4	17 0.2	17.1 0.2
Middle East	34.5 0.3	32 0.1	32.7 0.3	34 0.3	31.4 0.4	32.9 0.2	32.4 0.2	32.5 0.2	32.6 0.4	32.6 0.4	32 0.4
Total	12.1 0.2	12.4 0.2	12.6 0.1	13.3 0.1	13.8 0.2	13.6 0.1	13.7 0.1	14.1 0.1	14.1 0.2	13.9 0.2	14.0 0.2

Note: The standard deviation is given below unemployment/employment estimates

**Table A.10: Adult Female Unemployment Rates (%)**

AFUR	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	10 0	10 0	10.1 0	9.7 0	9 0	8.2 0	7.3 0	7.6 0	7.6 0.3	7.5 0.3	7.5 0.3
Major Non-Europe	4.2 0	4.2 0	4 0	3.8 0	3.7 0	3.6 0	4 0	4.7 0	4.7 0.2	4.5 0.2	4.5 0.2
Eastern Europe + Baltic	9.7 0	9.7 0.5	9.2 0.1	9.1 0.1	9.8 0	11.3 0	11.5 0	11.9 0	12 0.4	12.2 0.5	12 0.4
CIS	5.4 0	6 0	6.8 0	7.8 0	9 0	6.9 0	6.1 0	5.9 0	5.8 1.4	5.8 1.4	5.4 1.3
Eastern Asia	1.5 0.1	1.6 0.1	1.7 0.1	1.9 0.1	1.9 0.1	1.8 0.1	1.9 0.1	1.8 0.1	1.9 0.1	1.9 0.1	1.7 0.1
South Central Asia	4.1 0.3	4.1 0.3	3.8 0.1	3.7 0.1	3.9 0.2	3.5 0.1	3.4 0.1	3.5 0.1	3.5 0.1	3.7 0.1	3.6 0.1
South-Eastern Asia	2.5 0.1	2.3 0	2.4 0	2.9 0	2.8 0	2.7 0	3.2 0	3.9 0	3.9 0.1	3.9 0.1	3.9 0.1
Central America	6.2 0	5.8 0	5.7 0	5.2 0	4.6 0	4.3 0	4.4 0	4.3 0.1	4.2 0.2	4.1 0.2	4 0.2
South America	5.6 0	7.2 0	7.4 0	8 0	9.2 0	9.1 0	7.8 0	8.2 0.2	7.8 0.3	7.1 0.2	7.4 0.2
Sub-Saharan Africa	5.1 0.1	5.1 0.1	5.2 0.1	5.2 0.1	5.2 0.1	5.2 0.1	5.4 0.1	5.4 0.1	5.4 0.1	5.2 0.1	4.8 0.1
Middle East	11.9 0.1	10.7 0	10.6 0.1	11 0.1	10.3 0.1	10.7 0	10.3 0.1	10.4 0.1	10.4 0.2	10.4 0.2	10.3 0.2
Total	4.2 0.1	4.3 0.1	4.3 0.0	4.5 0.0	4.6 0.0	4.3 0.0	4.2 0.0	4.4 0.0	4.4 0.1	4.3 0.1	4.2 0.1

Note: The standard deviation is given below unemployment estimates

**Table A.11: Male - Female Employment-to-Population (%)**

MFUPOP	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	50.4 0	50.1 0	50 0	50.6 0	51 0	51.5 0	51.6 0	51.2 0	51 0.1	51 0.1	48.9 0.1
Major Non-Europe	61.3 0	61.4 0	61.8 0	61.8 0	61.8 0	61.8 0	61.2 0	60.6 0	60.4 0.1	60.4 0.1	58.1 0.1
Eastern Europe + Baltic	52.5 0	51.8 0.2	51.8 0.1	51.3 0	50.4 0	49.4 0	49.3 0	48.8 0	48.8 0.2	48.7 0.2	48.3 0.2
CIS	57.1 0	56 0	55.3 0	54.4 0	52.2 0	53.1 0	53.4 0	53.4 0	53.4 0.5	53.4 0.5	54.2 0.5
Eastern Asia	78 0.1	77.9 0.1	77.8 0.1	77.4 0.1	77.3 0.1	77.2 0.1	77 0.1	76.9 0.1	76.6 0.1	76.4 0.1	74.3 0.1
South Central Asia	56.6 0.1	56.7 0.1	57.2 0	57.2 0.1	57.1 0.1	57.2 0	57.2 0.1	57 0	57 0	56.8 0.1	57.2 0
South-Eastern Asia	67.8 0.1	68.2 0	67.8 0	66.8 0	67.2 0	67.7 0	67.5 0	67 0	67.1 0.1	67.2 0.1	67.8 0.1
Central America	55.9 0	56.5 0	57.7 0	58.1 0	58.1 0	58 0	57.5 0	57.3 0	57.4 0.1	57.5 0.1	57.7 0.1
South America	61.5 0	59.6 0	60.4 0	60 0	59.9 0	59.5 0	60.2 0	59.8 0.1	60.2 0.1	60.8 0.1	60.5 0.1
Sub-Saharan Africa	66 0.1	66.1 0.1	65.9 0.1	66 0.1	66.1 0.1	66.1 0.1	66.1 0.1	66 0.1	66.1 0.1	66.3 0.1	67 0.1
Middle East	45 0	45.5 0	45.6 0	45.6 0	46.4 0	46 0	46 0	45.9 0	45.9 0.1	46 0	47.4 0
Total	63.0 0.0	62.8 0.0	62.9 0.0	62.7 0.0	62.6 0.0	62.7 0.0	62.6 0.0	62.4 0.0	62.3 0.0	62.3 0.0	61.7 0.0

Note: The standard deviation is given below employment estimates

**Table A.12: Youth Male Employment-to-Population (%)**

YMUPOP	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	44.1 0	44 0	44 0	45.1 0	44.8 0	45.5 0	44.6 0	43.2 0	43.1 0.2	43.2 0.2	43.3 0.2
Major Non-Europe	52.8 0	52.3 0	52.4 0	52.4 0	52.4 0	53 0	51.3 0	50.4 0	50.5 0.3	50.9 0.3	51.6 0.3
Eastern Europe + Baltic	37.9 0	36.6 0.3	36.3 0.1	35 0.1	32.7 0	30.8 0	29.9 0	28.5 0	30.1 0.5	29.9 0.5	29.7 0.5
CIS	41 0	38.6 0	38.2 0	37.7 0	36.2 0	34.3 0	34.6 0	33.4 0	34.3 1.1	34.5 1.1	37.4 0.9
Eastern Asia	71.7 0.4	71.1 0.4	70.4 0.4	69.2 0.3	68.4 0.3	68.3 0.3	67.5 0.3	67.4 0.3	67 0.3	67 0.3	69 0.3
South Central Asia	52.2 0.5	52.1 0.5	53 0.2	52.4 0.2	51.7 0.3	52.3 0.2	52.6 0.2	52.3 0.2	52.2 0.2	51.9 0.2	52.8 0.2
South-Eastern Asia	58.2 0.3	59 0	58.1 0	53.9 0	56.7 0	56.4 0	56.1 0	54.9 0	54.9 0.3	55 0.3	55.2 0.3
Central America	62.4 0	62.8 0	63.3 0	63.8 0	63.6 0	62.4 0	60.9 0	59.8 0	59.9 0.2	60.1 0.2	60.7 0.2
South America	63.8 0	59.6 0	60.1 0	58.4 0	57.1 0	56.6 0	56 0	54.8 0.2	55.2 0.3	56.4 0.3	54.9 0.3
Sub-Saharan Africa	56.1 0.2	56.2 0.2	55.8 0.2	55.9 0.3	56 0.2	56.2 0.3	56.4 0.2	56.3 0.3	56.4 0.3	57 0.2	57.4 0.2
Middle East	41.1 0.1	41.6 0.1	41.5 0.1	41.3 0.1	43 0.1	42.2 0.1	41.6 0.1	41 0.1	41.1 0.2	41.2 0.2	42.1 0.1
Total	56.8 0.2	56.2 0.1	56.0 0.1	55.1 0.1	54.9 0.1	54.7 0.1	54.3 0.1	53.8 0.1	53.8 0.1	54.0 0.1	55.0 0.1

Note: The standard deviation is given below employment estimates

**Table A.13: Adult Male Employment-to-Population (%)**

AMUPOP	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	66.5 0	65.9 0	65.8 0	66.2 0	66.1 0	66.5 0	66.4 0	65.8 0	65.7 0.1	65.5 0.1	62.7 0.1
Major Non-Europe	75 0	75 0	75.2 0	75 0	74.8 0	74.6 0	73.8 0	72.9 0	72.7 0.2	72.7 0.2	69.1 0.2
Eastern Europe + Baltic	66.1 0	65.6 0.5	65.6 0.2	65 0.1	63.9 0	62.8 0	62.8 0	62.2 0	62 0.3	61.8 0.3	59.7 0.3
CIS	71.8 0	70.7 0	69.4 0	68 0	65.6 0	66.7 0	67.2 0	67.3 0	67.3 1	67.3 1	66.4 0.9
Eastern Asia	87.7 0.2	87.4 0.2	87.1 0.2	86.7 0.2	86.4 0.1	86.5 0.2	86.2 0.1	86.2 0.2	85.9 0.1	85.8 0.1	83.3 0.2
South Central Asia	88.6 0.2	88.6 0.2	88.7 0.1	88.6 0.1	88.4 0.1	88.4 0.1	88.4 0.1	88.3 0.1	88.3 0.1	88.2 0.1	87.7 0.1
South-Eastern Asia	89.3 0	89.2 0	89 0	88.4 0	88.2 0	88.2 0	88 0	87.5 0	87.5 0.1	87.4 0.1	86.6 0.1
Central America	84.1 0	84.6 0	85.7 0	85.7 0	85.6 0	85.4 0	85 0	84.7 0	84.8 0.1	84.9 0.1	84.2 0.1
South America	83.8 0	82.1 0	82.5 0	82 0	81.1 0	80.8 0	81.3 0	81.1 0.1	81.4 0.2	81.9 0.1	80.5 0.1
Sub-Saharan Africa	87.5 0.1	87.4 0.1	87.1 0.1	87.2 0.1	87.2 0.1	86.8 0.1	86.8 0.1	86.7 0.1	86.7 0.1	86.9 0.1	87 0.1
Middle East	82.1 0.1	82.4 0	82.4 0.1	82.4 0.1	82.6 0.1	82.3 0	82.3 0	82 0.1	82 0.1	82 0.1	81.6 0.1
Total	82.6 0.1	82.4 0.1	82.3 0.0	82.1 0.0	81.8 0.0	81.9 0.0	81.8 0.0	81.6 0.0	81.5 0.1	81.5 0.1	80.5 0.1

Note: The standard deviation is given below employment estimates

**Table A.14: Youth Female Employment-to-Population (%)**

YFUPOP	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	33.7 0	33 0	32.2 0	33.2 0	33.9 0	34.2 0	33.7 0	32.8 0	32.8 0.1	32.9 0.1	32.8 0.1
Major Non-Europe	48.8 0	48.8 0	49.2 0	49.9 0	49.7 0	50.2 0	49.4 0	48.7 0	48.8 0.2	49.1 0.2	49.5 0.2
Eastern Europe + Baltic	29.2 0	27.6 0.2	27.7 0.1	27.4 0	26 0	24.9 0	24.2 0	23.1 0	22.9 0.4	22.6 0.4	22.4 0.3
CIS	37.3 0	35.6 0	34.5 0	33.2 0	29.6 0	30.7 0	30.9 0	31 0	31.1 1.1	31.2 1.1	33.3 1
Eastern Asia	74 0.3	73.4 0.3	72.7 0.2	71.6 0.2	70.8 0.2	70.4 0.2	69.6 0.2	69.4 0.2	69.1 0.2	69.1 0.2	70.6 0.2
South Central Asia	26.1 0.4	25.7 0.4	25.6 0.2	25.4 0.2	24.6 0.2	24.4 0.1	23.8 0.2	23.3 0.1	23.2 0.1	23.1 0.2	22.9 0.1
South-Eastern Asia	44.8 0.3	44.1 0	42.7 0	41.2 0	40.4 0	41.1 0	40.4 0	39.4 0	39.5 0.3	39.5 0.3	39.4 0.3
Central America	30.1 0	30.3 0	31.3 0	32.3 0	32.7 0	32.7 0	31.5 0	31 0.1	31 0.2	31.2 0.1	31.5 0.2
South America	39.1 0	36.4 0	37 0	36 0	36.2 0	36.1 0	36 0	35.2 0.3	35.7 0.3	36.6 0.3	36.4 0.3
Sub-Saharan Africa	46.3 0.2	46.6 0.2	46.5 0.2	46.6 0.2	46.8 0.1	47.1 0.2	47.4 0.2	47.3 0.2	47.3 0.2	47.9 0.1	48.3 0.1
Middle East	15 0.1	16 0	16.1 0.1	16.2 0.1	17.7 0.1	16.7 0	16.7 0	16.5 0	16.5 0.1	16.5 0.1	16.8 0.1
Total	43.7 0.1	42.9 0.1	42.2 0.1	41.5 0.1	40.9 0.1	40.7 0.1	40.1 0.1	39.7 0.1	39.7 0.1	39.8 0.1	39.5 0.1

Note: The standard deviation is given below employment estimates

**Table A.15: Adult Female Employment-to-Population (%)**

AFUPOP	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	40.2 0.1	40.2 0.1	40.1 0.1	40.8 0.1	41.5 0.1	42 0.1	42.5 0.1	42.4 0.1	42.3 0.1	42.1 0.1	39.6 0.1
Major Non-Europe	53 0.1	53.2 0.1	53.8 0.1	53.8 0.1	53.9 0.1	53.9 0.1	53.7 0.1	53.3 0.1	53.1 0.1	53.1 0.1	50.4 0.1
Eastern Europe + Baltic	49.1 0.3	48.7 0.4	48.6 0.3	48.3 0.2	48 0.2	47.2 0.2	47.2 0.2	47 0.2	46.8 0.2	46.5 0.2	44.5 0.2
CIS	53.2 0.4	52.7 0.7	52.5 0.7	52.2 0.7	50.2 0.8	51.8 0.9	52 0.8	52.3 0.8	52.2 0.8	52.1 0.8	50.2 0.7
Eastern Asia	71.5 0.1	71.7 0.1	72 0.1	71.9 0.1	72.1 0.1	71.9 0.1	72 0.1	71.9 0.1	71.6 0.1	71.3 0.1	67.2 0.1
South Central Asia	37.8 0.1	38.3 0.1	39 0	39.6 0.1	40 0.1	40.2 0	40.1 0.1	40 0	39.9 0	39.9 0.1	39.4 0
South-Eastern Asia	61.3 0	62.3 0.1	62.3 0.1	62.1 0.1	62.3 0.1	63.4 0.1	63.3 0.1	62.9 0.1	62.9 0.1	62.9 0.1	62.2 0.1
Central America	38.6 0.1	39.4 0.1	41 0.1	41.1 0.1	41.1 0.1	41.4 0.1	41.3 0.1	41.3 0.1	41.3 0.1	41.3 0.1	40.4 0.1
South America	48.4 0.1	47.4 0.1	48.8 0.1	49.1 0.1	50 0.1	49.4 0.1	50.9 0.1	50.7 0.1	50.9 0.1	51.3 0.1	50.3 0.1
Sub-Saharan Africa	61.7 0.1	62.1 0.1	62.2 0.1	62.5 0.1	62.6 0.1	62.7 0.1	62.7 0.1	62.7 0.1	62.7 0.1	62.8 0.1	63.3 0.1
Middle East	23.1 0.1	23.8 0.1	24.2 0.1	24.5 0.1	25.3 0.1	25.2 0	25.6 0	25.9 0	25.9 0	25.9 0	25.6 0
Total	52.6 0	52.9 0.1	53.3 0.1	53.4 0.1	53.6 0.1	53.8 0.1	53.9 0.1	53.8 0.1	53.7 0.1	53.5 0.1	51.4 0

Note: The standard deviation is given below employment estimates

**Table A.16: Total Employment by Economic Sectors: Agriculture ('000)**

Region	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	16532.6 773.6	15839.7 735.1	16075.6 782.2	15997.2 814.2	14458.5 772.2	13672.6 833.2	15143.2 778.7	14974.4 771.4	14645.8 763.7	10541.5 516
Major Non-Europe	8435.2 180.8	8312.2 191	8221.8 199.7	8065.9 228.9	7987 272.7	7631 261.6	6998.2 275.5	6893.9 290.9	6686.8 327.6	4789.4 912.6
Eastern Europe + Baltic	11464.4 159.7	11411.8 171.3	11149.9 178.7	10830 175.9	10719.8 165.7	10689 155.1	7335.2 147.8	7029 145.1	6662.3 144.9	5514.7 387.1
CIS	32886.8 604.6	28688.7 598.2	28363 590.8	24099.1 585.1	28146.1 648	27702.5 712.7	29065.6 779	28740 862.4	28457.5 952.4	29908.1 1263.6
Eastern Asia	429231 46169	433246 46326.3	450653 46433.9	456744 46447.7	462277 46579.4	387689 46733	377874 47004.3	368714 47171.9	358524 47373	113949 27195.6
South Central Asia	242593 5954.1	251332 6177.9	255309 6468.1	247944 7032.6	248535 7372.3	254265 7672.5	253222 7989.4	251557 8330.5	247573 8677.7	218973 11058.6
South-Eastern Asia	97891 4455.9	108626 4499.6	103508 5017.5	91142.8 5102.7	81971.6 5128.2	70260.1 5121.4	65786.7 5099.6	66147.7 5112.5	66216 5095.1	56012.6 4625.7
Central America	14378.3 377.7	15613 393.4	14759.9 402.8	14869.2 406.2	14835.4 403.2	14453.1 414.4	10780.9 426.9	10458.7 439.1	10614.3 446.9	11565.6 509.3
South America	20421.2 961.6	20805.4 983.9	20472 1004.4	21767.8 1024.5	10601.1 1014.2	23846.2 1050.9	12710.3 1069.7	12270.3 1083.9	12511.3 1090.7	12185.2 1017.1
Sub-Saharan Africa	98780 3326.3	101769 3439.7	101374 3548.6	103178 3624.6	109564 3732.5	112422 3840	114903 3938.6	117575 4031.8	120356 4140	157689 5542.3
Middle East	21367.1 960.2	21046.4 990.9	21569.1 1014.9	22622.4 1052	25102.9 1049	25850 1065.6	26429.2 1086.1	26889.8 1107.8	27353.1 1129.3	29968.7 1282.6

Note: The standard deviation is given below employment estimates

**Table A.17: Total Employment by Economic Sectors: Industry ('000)**

Region	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	52683.8	52560.2	53426.1	53250	54070.	53881.3	53441	53649.8	53844.8	53218.6
	247.7	242.5	251.8	257.4	257.1	263.6	256.7	257.9	260.3	293.9
Major Non-Europe	58478.3	59391.4	58853.7	58269.6	58437.	57031.1	54949.3	54964.6	54577.5	41121.7
	1271.1	1364.6	1423.5	1758.5	2258.7	2134.9	2295.2	2465.3	2878.5	7990.5
Eastern Europe + Baltic	17568.2	17502.3	17348.2	16732.6	16200	16285	18116.1	18375.8	18610.4	20427.1
	113	117.3	121	124.5	126	124.8	124.6	129.2	137.4	343.7
CIS	39101.5	34937.3	33678.5	31035	37354.	38521.2	38109.2	39108.7	39960.8	41030.9
	1342.6	1323.9	1257.5	1355.3	1595.5	1821.6	2046.5	2319.3	2607.1	3539.8
Eastern Asia	196576.	195001.	180103.	178791.	18191	213300.	220420.	225529.	230977.	286515.
	1	5	9	8	4	4	8	5	7	2
	5371.3	5393.6	5414.3	5434.4	5478.6	5531.8	5616.4	5700.5	5808.5	8239.8
South Central Asia	69832	71350.4	74776.2	84591.9	91679.	93537.8	99623.7	106734.	115267.	198881.
	3546.6	3699.1	3989	4725.1	5116.6	5482.3	5937.7	6458.2	7094.8	13724.8
South-Eastern Asia	41305.5	39709.7	36574.7	41929.7	42620.	46912	49900.5	51704.1	53702.7	83214.1
	1031.5	1033.2	970.1	1015.3	1067.2	1077.6	1110.2	1147.7	1188.3	1904.9
Central America	13150.9	13576.1	15481.3	15283.4	16096.	15960.3	15060.8	15451.5	15824.5	19129
	198.1	212.8	221.4	230.5	244.3	242.4	243.3	249.5	258.5	358
South America	29386.1	30521.5	30421.7	29552.1	33341.	30287.5	35465.7	36477.4	37614	46637.3
	382.4	409.9	418.9	412.2	413	409.1	403.2	413.5	423.9	677.9
Sub-Saharan Africa	26143.7	26685	28305.1	28152.7	29277.	30182.9	31049	31985.7	33195.2	43751.1
	691.4	709.7	730.4	755.2	777.6	795.6	816.3	839	864.5	1164.6
Middle East	22477.4	23229.3	23947.3	25237.7	24480.	25153	26089.3	27188.3	28301.2	42368.6
	463.1	471.2	481	497.3	518	535.2	553	577.6	603.3	970.1

Note: The standard deviation is given below employment estimates

**Table A.18: Total Employment by Economic Sectors: Services ('000)**

Region	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	111918.7 812.3	113620.9 774.1	116134.3 821.7	118912 853.9	122711.9 813.9	125244.4 873.9	123851.8 819.9	124591.2 813.4	125562.3 806.8	132281.9 593.8
Major Non-Europe	153695.8 1283.9	156728.8 1377.9	159644.9 1437.4	162603.4 1773.3	165034.4 2275.1	166715 2150.8	169094.1 2311.7	170791.1 2482.4	173604 2897.1	200200.8 8042.4
Eastern Europe + Baltic	23706.2 195.6	24095.8 207.6	24349 215.8	24682.3 215.5	24578.4 208.2	24694 199	25963.2 193.3	26272.4 194.3	26455 199.7	25278.4 517.7
CIS	48883.8 1472.4	56347.3 1452.8	56707.2 1389.4	59385.4 1476.2	51802.4 1722.1	52537.4 1956.1	52308.5 2189.7	52503.8 2474.4	52615.7 2775.6	52425 3758.5
Eastern Asia	127360.5 46480.4	133586 46639.3	137344.7 46748.5	141265.6 46764.6	143299.7 46900.5	195662.7 47059.3	210134.8 47338.6	223499.4 47515.1	238283.5 47727.8	492394.3 28416.5
South Central Asia	140342.3 6930.3	144374.8 7200.7	148917.8 7599.2	157096.2 8472.6	162093.4 8973.9	166006.6 9429.9	171538.6 9954.3	177894.5 10540.7	184730.3 11208.9	274556.5 17625.6
South-Eastern Asia	82226.8 4573.7	77148.9 4616.6	87036.2 5110.4	100612.7 5202.8	116269.4 5238	128303 5233.6	133113.9 5219.1	136482.6 5239.7	140031.1 5231.8	178735.8 5002.6
Central America	31004 426.5	31997.2 447.3	32722.8 459.6	34303 467	34893.8 471.4	36274.8 480.1	42051.5 491.4	43612.2 505.1	44757.7 516.3	56941.7 622.5
South America	81457.4 1034.8	84755.2 1065.9	87235.1 1088.3	89628.2 1104.3	98984.6 1095.1	93443.2 1127.7	101489.5 1143.2	104750.2 1160.1	107995.5 1170.2	129352.1 1222.3
Sub-Saharan Africa	78722.8 3397.4	80557.3 3512.1	85428.2 3623	90020.2 3702.4	88458 3812.6	90963.6 3921.5	93405.2 4022.3	96065 4118.2	99408.9 4229.3	132476 5663.3
Middle East	43513.6 1066	46077.5 1097.2	47881 1123.1	50297 1163.7	50713.8 1169.9	52474.6 1192.5	53763.2 1218.8	55468.4 1249.4	57253.1 1280.3	77716.6 1608.2

Note: The standard deviation is given below employment estimates

**Table A.19: Total Employment by Economic Sectors: Agriculture (%)**

Region	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	9.1 0.4	8.7 0.4	8.7 0.4	8.5 0.4	7.6 0.4	7.1 0.4	7.9 0.4	7.8 0.4	7.5 0.4	5.4 0.3
Major Non-Europe	3.8 0.1	3.7 0.1	3.6 0.1	3.5 0.1	3.5 0.1	3.3 0.1	3.0 0.1	3.0 0.1	2.8 0.1	1.9 0.4
Eastern Europe + Baltic	21.7 0.3	21.5 0.3	21.1 0.3	20.7 0.3	20.8 0.3	20.7 0.3	14.3 0.3	13.6 0.3	12.9 0.3	10.8 0.8
CIS	27.2 0.5	23.9 0.5	23.9 0.5	21.0 0.5	24.0 0.6	23.3 0.6	24.3 0.7	23.9 0.7	23.5 0.8	24.2 1.0
Eastern Asia	57.0 6.1	56.9 6.1	58.7 6.0	58.8 6.0	58.7 5.9	48.7 5.9	46.7 5.8	45.1 5.8	43.3 5.7	12.8 3.0
South Central Asia	53.6 1.3	53.8 1.3	53.3 1.4	50.6 1.4	49.5 1.5	49.5 1.5	48.3 1.5	46.9 1.6	45.2 1.6	31.6 1.6
South-Eastern Asia	44.2 2.0	48.2 2.0	45.6 2.2	39.0 2.2	34.0 2.1	28.6 2.1	26.4 2.0	26.0 2.0	25.5 2.0	17.6 1.5
Central America	24.6 0.6	25.5 0.6	23.4 0.6	23.1 0.6	22.5 0.6	21.7 0.6	15.9 0.6	15.0 0.6	14.9 0.6	13.2 0.6
South America	15.6 0.7	15.3 0.7	14.8 0.7	15.4 0.7	7.4 0.7	16.2 0.7	8.5 0.7	8.0 0.7	7.9 0.7	6.5 0.5
Sub-Saharan Africa	48.5 1.6	48.7 1.6	47.1 1.6	46.6 1.6	48.2 1.6	48.1 1.6	48.0 1.6	47.9 1.6	47.6 1.6	47.2 1.7
Middle East	24.5 1.1	23.3 1.1	23.1 1.1	23.0 1.1	25.0 1.0	25.0 1.0	24.9 1.0	24.5 1.0	24.2 1.0	20.0 0.9

Note: The standard deviation is given below employment estimates

**Table A.20: Total Employment by Economic Sectors: Industry (%)**

<b>Region</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2015</b>
Europe	29.1 0.1	28.9 0.1	28.8 0.1	28.3 0.1	28.3 0.1	27.9 0.1	27.8 0.1	27.8 0.1	27.7 0.1	27.1 0.1
Major Non-Europe	26.5 0.6	26.5 0.6	26 0.6	25.5 0.8	25.2 1	24.6 0.9	23.8 1	23.6 1.1	23.2 1.2	16.7 3.2
Eastern Europe + Baltic	33.3 0.2	33 0.2	32.8 0.2	32 0.2	31.5 0.2	31.5 0.2	35.2 0.2	35.6 0.3	36 0.3	39.9 0.7
CIS	32.3 1.1	29.1 1.1	28.4 1.1	27.1 1.2	31.8 1.4	32.4 1.5	31.9 1.7	32.5 1.9	33 2.2	33.3 2.9
Eastern Asia	26.1 0.7	25.6 0.7	23.4 0.7	23 0.7	23.1 0.7	26.8 0.7	27.3 0.7	27.6 0.7	27.9 0.7	32.1 0.9
South Central Asia	15.4 0.8	15.3 0.8	15.6 0.8	17.3 1	18.3 1	18.2 1.1	19 1.1	19.9 1.2	21.1 1.3	28.7 2
South-Eastern Asia	18.7 0.5	17.6 0.5	16.1 0.4	17.9 0.4	17.7 0.4	19.1 0.4	20.1 0.4	20.3 0.5	20.7 0.5	26.2 0.6
Central America	22.5 0.3	22.2 0.3	24.6 0.4	23.7 0.4	24.5 0.4	23.9 0.4	22.2 0.4	22.2 0.4	22.2 0.4	21.8 0.4
South America	22.4 0.3	22.4 0.3	22 0.3	21 0.3	23.3 0.3	20.5 0.3	23.7 0.3	23.8 0.3	23.8 0.3	24.8 0.4
Sub-Saharan Africa	12.8 0.3	12.8 0.3	13.2 0.3	12.7 0.3	12.9 0.3	12.9 0.3	13 0.3	13 0.3	13.1 0.3	13.1 0.3
Middle East	25.7 0.5	25.7 0.5	25.6 0.5	25.7 0.5	24.4 0.5	24.3 0.5	24.5 0.5	24.8 0.5	25.1 0.5	28.2 0.6

Note: The standard deviation is given below employment estimates

**Table A.21: Total Employment by Economic Sectors: Services (%)**

Region	1996	1997	1998	1999	2000	2001	2002	2003	2004	2015
Europe	61.8 0.4	62.4 0.4	62.6 0.4	63.2 0.5	64.2 0.4	65.0 0.5	64.4 0.4	64.5 0.4	64.7 0.4	67.5 0.3
Major Non-Europe	69.7 0.6	69.8 0.6	70.4 0.6	71.0 0.8	71.3 1.0	72.1 0.9	73.2 1.0	73.4 1.1	73.9 1.2	81.3 3.3
Eastern Europe + Baltic	45.0 0.4	45.5 0.4	46.1 0.4	47.2 0.4	47.7 0.4	47.8 0.4	50.5 0.4	50.8 0.4	51.1 0.4	49.4 1.0
CIS	40.4 1.2	47.0 1.2	47.8 1.2	51.9 1.3	44.2 1.5	44.2 1.6	43.8 1.8	43.6 2.1	43.5 2.3	42.5 3.0
Eastern Asia	16.9 6.2	17.5 6.1	17.9 6.1	18.2 6.0	18.2 6.0	24.6 5.9	26.0 5.9	27.3 5.8	28.8 5.8	55.1 3.2
South Central Asia	31.0 1.5	30.9 1.5	31.1 1.6	32.1 1.7	32.3 1.8	32.3 1.8	32.7 1.9	33.2 2.0	33.7 2.0	39.7 2.5
South-Eastern Asia	37.1 2.1	34.2 2.0	38.3 2.3	43.1 2.2	48.3 2.2	52.3 2.1	53.5 2.1	53.7 2.1	53.9 2.0	56.2 1.6
Central America	53.0 0.7	52.3 0.7	52.0 0.7	53.2 0.7	53.0 0.7	54.4 0.7	61.9 0.7	62.7 0.7	62.9 0.7	65.0 0.7
South America	62.1 0.8	62.3 0.8	63.2 0.8	63.6 0.8	69.3 0.8	63.3 0.8	67.8 0.8	68.2 0.8	68.3 0.7	68.7 0.6
Sub-Saharan Africa	38.7 1.7	38.5 1.7	39.7 1.7	40.7 1.7	38.9 1.7	38.9 1.7	39.0 1.7	39.1 1.7	39.3 1.7	39.7 1.7
Middle East	49.8 1.2	51.0 1.2	51.3 1.2	51.2 1.2	50.6 1.2	50.7 1.2	50.6 1.1	50.6 1.1	50.7 1.1	51.8 1.1

Note: The standard deviation is given below employment estimates



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