

Plane, Mathieu; Döpke, Jörg; Chagny, Odile; Schmidt, Rainer

Working Paper

Labour supply and labour force participation in Europe: a discussion of some recent developments and projections

Kiel Working Paper, No. 1049

Provided in Cooperation with:

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

Suggested Citation: Plane, Mathieu; Döpke, Jörg; Chagny, Odile; Schmidt, Rainer (2001) : Labour supply and labour force participation in Europe: a discussion of some recent developments and projections, Kiel Working Paper, No. 1049, Kiel Institute of World Economics (IfW), Kiel

This Version is available at:

<https://hdl.handle.net/10419/17722>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Institut für Weltwirtschaft
Duesternbrooker Weg 120
24105 Kiel

Kiel Working Paper No. 1049

**Labour Supply and Labour Force Participation
in Europe – A Discussion of Some
Recent Developments and Projections**

by

**Odile Chagny, Jörg Döpke,
Mathieu Plane, and Rainer Schmidt**

May 2001

The responsibility for the contents of the working papers rests with the author, not the Institute. Since working papers are of a preliminary nature, it may be useful to contact the author of a particular working paper about results or caveats before referring to, or quoting, a paper. Any comments on working papers should be sent directly to the author.

Labour Supply and Labour Force Participation in Europe – A Discussion of Recent Developments and Projections

Abstract:

The prospects for labour supply in Europe are considered. The analysis begins with a so-called labour market balance covering the development on an aggregate level. Estimations to shed light on the relation between unemployment and labour force participation are given in the second part of the paper. Detailed analyses of the forces behind the participation rates for individual countries and labour force projections are given. We expect the labour force in Europe to decline during the next years. However, the impact of this development on unemployment is rather limited.

Keywords: Labour Force, Labour Force Participation, Unemployment, Europe.

JEL classification: J0, J1, C2

Corresponding authors :

Dr. Jörg Döpke

Kiel Institute of World Economics

24100 Kiel, Germany

Telephone: +49/431/8814-261

Fax: +49/431/8814-525

E-mail: j.doepke@ifw.uni-kiel.de

Dr. Rainer Schmidt

Kiel Institute of World Economics

24100 Kiel, Germany

Telephone: +49/431/8814-268

Fax: +49/431/8814-525

E-mail: rainer.schmidt@ifw.uni-kiel.de

*This paper is part of the research project "Growth and European Labour Markets" funded by the 5th Framework of Key Action – Socio-Economic Research of the European Commission.

1. Introduction

It is often stated that the link between unemployment and growth is broken. Though this is not true with regard to employment measured in hours or persons there might be a grain of truth in the statement referring to the official unemployment rate. A possible reason for a missing link between growth and unemployment is increased labour supply. The following paper should analyze the main determinants of labour supply for the European countries. It aims at giving some projections for labour supply for the coming years based on assumptions on demographic trends, migration, female labour participation, and other possible relevant factors. Moreover, it will be discussed whether reducing the labour force is an advisable strategy of dealing with Europe's labour market problems.

The paper is organized as follows. In a first step a so-called labour market balance for Euroland as a whole is developed. It is discussed whether this tool might help to understand the developments on Europe's labour market. It turns out, however, that drawing more specific conclusions from this highly aggregated approach is hampered mainly by serious statistical problems. Therefore, in a second step, the relation between key labour force variables and the business cycle is analyzed in a more detailed framework. We use a panel of 18 OECD countries and break down the labour force participation rate by age and sex. The results are economically meaningful and provide some insights in the interaction between labour force participation and unemployment. Particularly, it is emphasized that the correlation between the unemployment rate and the participation rate is negative rather than positive as it is sometimes assumed in the public opinion. However, the panel approach does not allow for a richer discussion of the dynamics and the trend behaviour of the variables under investigation. Thus, we turn to a country-by-country estimation in section 4. In this paragraph we use more time series orientated econometric techniques to shed light on the determinants of labour force participation in selected countries of Europe. These equations will also be exploited to give forecasts of the labour force in Europe. The last section is devoted to policy conclusions. In particular we will discuss whether or not a policy of reducing the labour force may be advisable.

2. A Labour Market Balance for the European Union

2.1 Developing the Balance

The construction of labour market balances (LMB) as an instrument for analyzing and forecasting the situation on the labour market has a long tradition in Germany. First tentative experiments in this direction are reaching back as far as to the time of the Great Depression 1929–1932 (Holst 2000: pp. 23). After World War II, it was in particular the Institute for Labour Market and Vocational Research (IAB) of the Federal Labour Office that has developed this concept further.

The present second draft of the LMB (see Table 1 in the annex) is essentially a refined version of our first more experimental approach to identify and quantify the sources of labour supply in EU-15. The forecasting basis has been actualized so as to include, among others, the results of the EUROSTAT Labour Force Samples 1998 and 1999¹ as well as provisional data for 2000 which have been derived from official EUROSTAT Labour Market Statistics.

Apart from the basic demographic data, which rely almost exclusively on "EUROSTAT, Population Statistics, data 1960–1999 (edition '99)" as well as on the 2000 edition of EUROSTAT European Social Statistics, Population, the crucial elements of the LMB for EU-15 are the employment and unemployment figures for the years from 1995 until 1999 presented in the Labour Force Samples for EU-15 by EUROSTAT. Concerning the years before (1985 until 1994) much effort has been devoted to construct series for employment and unemployment in EU-15 with the mutual aid of OECD Labour Force Statistics and the EUROSTAT Labour Force Sample data for EU-13. Both series have to fulfil mainly two conditions:

1. In level terms no significant break with the employment and unemployment figures given by EUROSTAT for EU-15 (sample basis) from 1995 onwards.
2. An adequate representation of the cyclical component in both series from 1985 to 1994.

¹ These are typed in italics in Table 1 since there have been made some methodological changes in preparing the samples as compared with the years before.

The unavoidable inconsistencies between demographic and educational systems data turned out to be mainly of a short-term character and thus could be at least partly eliminated by smoothing the time series "Persons in working age who are neither scholars nor students" by a three-year moving average. At first sight, the sudden interruption of the strong upward trend in the total work force (as just defined) during 1993/94 might appear implausible. It results mainly from a big upsurge in the number of students at universities and to a lesser extent from a stronger than normal rise in the number of scholars at secondary stage II which began already in 1992. Thereafter (1995), just the opposite was the case, and the total work force resumed their growth. In our opinion this phenomenon shows that during and immediately after the recession in 1993 labour market conditions worsened so much that it was a superior strategy especially for students to stay at universities and improve their educational level rather than to accept inferior jobs on the labour market or to remain unemployed for a more or less long period.² When the labour market recovered in 1995 the "backlog" of scholars and students which had been built up in 1993/94 was dissolved and made itself felt in a growing stream to the labour market.³

Relating the actual labour force (employment plus unemployment) to the smoothed series of the total work force (as defined above) yielded a visible participation rate which shows, on the basis of yearly changes and with one major exception in 1989, the expected negative relationship with the corresponding changes of the unemployment rate (see Figure 1). This relation is statistically significant (estimation period: 1986–2000; method of estimation: OLS):

$$(1) \quad DVISPR = 0.386 - 0.426 DALILOQ - 0.601 DUM89$$

(4.9)
(3.9)
(1.9)

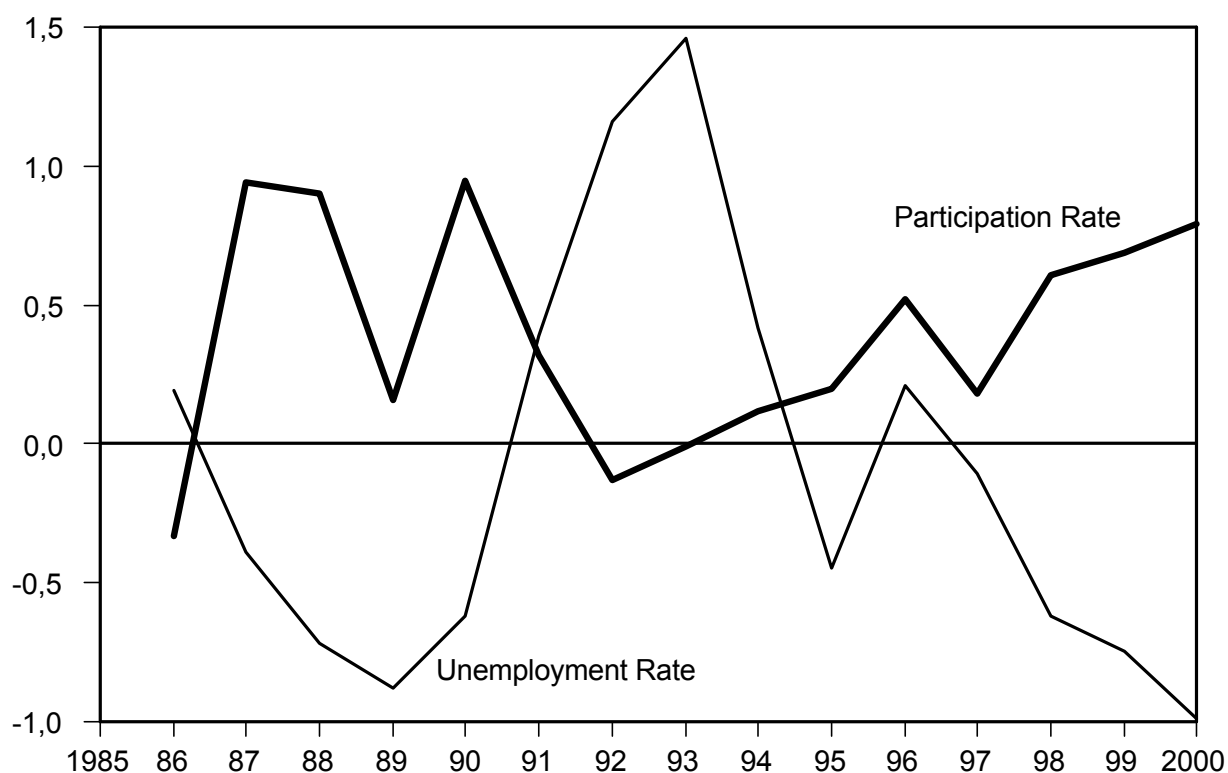
² There is a strong tendency at least among German entrepreneurs to prefer, other things being equal, candidates for vacancies who have not to list periods of (registered) unemployment in their curriculum vitae. It may well be that similar trends can be observed in other countries of the European Union. Occasionally, there might exist some gender-specific differences in this respect, i.e. females should be less affected by this negative selection criterion than males.

³ The renewed decline of the number of persons in working age who are neither scholars nor students in the year 2000 should be interpreted with some caution since official EUROSTAT data about the participation in the educational system are only available until 1997.

$$R^2 = 0.568 \quad D.W. = 2.11 \quad F - statistic = 7.90$$

where $DVISPR/DALILOQ$ denotes the changes (in percentage points) of the visible participation and the unemployment rate, $DUM89$ represent a dummy variable (1989=1, other years=0).

Figure 1 – Changes of the Visible (or Actual) Participation Rate and the Unemployment Rate (ILO-concept) in EU-15



^aAccording to ILO-Concept.

Source: Compare Labour Market Balance Sheet for EU-15.

The estimation of the maximum labour force that includes hidden unemployment during the period 1985–2000 is done in two steps:

1. In the first step, the pronounced cyclical fluctuations of the visible participation rate are eliminated to a high degree (but not totally) via the application of an HP(Hodrick- Prescott)-filter (100). The reasoning behind this procedure is that the short-term varia-

tions in employment are mainly echoed in the changes of regular (ILO-concept) unemployment, whereas hidden unemployment is believed to show a lower cyclical responsiveness to varying labour market conditions. This in turn has to be seen against the background of the assumption that hidden unemployment in most EU-15 countries represents predominantly female discouraged workers, i.e. women who withdraw from the labour market in cyclical downswings or recessions, and who re-enter the labour market when employment conditions improve.⁴ This effect is believed to be much greater than the additional worker effect, which exerts its influence just in the opposite direction. Naturally, there are no direct estimates available (on a panel basis, for example) for hidden unemployment in EU-15. However, an indirect approach to estimate at least roughly the magnitude of this effect may be drawn from the EUROSTAT labour force samples that show under the heading "inactive population in working age" the subgroup "persons who wish to be employed". The latter might well be perceived as a rough indicator for hidden unemployment. It is surely not by chance that about two thirds of this subgroup are women. From 1995 until 1999, the aforementioned persons represented on average with more than 8 ½ mill. persons approximately one third of total unemployment (= sum of ILO-concept and hidden unemployment as defined above).

2. In a second step, the HP-filtered visible participation rate has been increased by 3½ percentage points to arrive at the maximum participation rate. This value has not been chosen arbitrarily, but, in fact, has been orientated at the number of inactive persons in working age who actually wish to work (see above). The latter are regarded as the upper limit for hidden unemployment. Thus, to remain on the safe side, the PP-addendum (+3.5) to the HP-filtered visible participation rate was fixed so that the resulting estimate for hidden unemployment with somewhat more than 8.1 mill. persons or nearly 32 percent of total unemployment (Ø1995/99) turned out to be a little bit lower than the figures calculated from the EUROSTAT labour force samples for the same period (8.5 mill. persons or slightly less than 33 percent of total unemployment). Compared with calculations done by Fuchs (2000; p. 12) for the United Kingdom, the

⁴ Elmeskov and Pichelma (1993a, pp. 144) came to quite similar conclusions for most OECD-countries („... with the notable exception of Japan ...“).

Netherlands and Germany this seems to be a rather conservative estimate: whereas Fuchs arrives at a ratio of hidden to registered (Germany) or to ILO-unemployment (Netherlands, UK) within the range of about 0.6 to 1.4 in recent years, we get even somewhat less than 0.5.

The main results derived from the estimation procedure described above are shown in Figure 2. On the basis of yearly changes, the character of hidden unemployment as a cyclical less responsive component of total unemployment (as compared with "open unemployment") seems to be well documented, letting apart the aberrations in 1988/89 which may be due mainly to errors in variables.

Already during the period 1985–2000, the rising participation rate turns out to be the dominant factor for the increase in labour supply (contributing roughly three quarters of total growth), whereas the weight of the demographic factor has become more and more smaller. Splitting up the participation rate according to sex, rising female labour participation in the northern as well as in the southern regions of EU-15 had to bear the brunt of this development.⁵ But since about the mid-nineties, also the participation rate for males has increased again⁶ — among others due to a cutback in public programs for earlier pensioning which had been used especially during and after the recession of 1993 to solve structural problems in shrinking „old industries“ as well as to improve job opportunities for young entrants to the labour market, since in many countries of EU-15 high youth unemployment is a very severe social problem.

⁵ According to EUROSTAT the female participation rate in the age group 15–64 years in EU–15 climbed from 49.7 per cent in 1995 to 52.6 percent in 1999.

⁶ Following EUROSTAT the male participation rate for men aged 15–64 years averaged 69.9 percent in 1995/97. Thereafter it picked up to 71.6 percent in 1999.

Figure 2 – Comparison between the Absolute Changes of Employment, Unemployment and Estimated Hidden Unemployment in EU-15



^aAccording to ILO-Concept.

Source: Compare Labour Market Balance Sheet for EU-15.

2.2 Preparing a Conditional Forecast until 2020

In the following we undertake to establish a long-term forecast of our own of the EU-15 labour market balance. The primary aim of this forecast is not in the predictive sector. In this respect, the only prerequisite of our scenario is that it is lying within a range of alternative scenarios which are all realistic in the sense that their probability to happen in the future is positively and significantly different from zero. Thus the ultimate aim of our forecast is to demonstrate the close interactions between the trends in demography (including migration), in education and in the labour market of EU-15.

Since so far there seems to be no detailed demographic model available for EU-15 as a whole, we had to retreat in preparing the demographic forecast to the utmost rough approach — namely making assumptions for the natural population increase (crude birth and death rates) and for net immigration. The only alternative would have been population projections given by EUROSTAT⁷ which do rely on national forecasts under very different assumptions and which are starting in different base years (from 1995 to 1998). We have used the aforementioned forecasts only indirectly in projecting the age structure of the population until 2020. The scope of these national forecasts seems to concentrate mainly on the demographic sector — namely to show how much the domestic population in working age will shrink or how fast the age burden will grow if both developments are not coped partly by an increasing net immigration. Thus cumulating the national assumptions about net immigration for EU-15 yields a decline from nearly 700,000 persons (average 1995/2000) to only 500,000 in 2020. From an economic point of view (migration theory; social policy) such an assumption does not seem to be sustainable mainly for two reasons:

- The prospective enlargement of the European Union in 2004 by at least five Eastern European Countries will attract additional immigration into EU-15 (especially during the years from about 2005 until 2010) as it had been the case in the eighties when Spain and Portugal entered the EU.⁸
- The future decline of the domestic EU-15-population in working age as well as the impact of the fast growing age burden, which both represent an intertwined severe problem for the whole social security system, should increase net immigration into EU-15 even further, i.e. beyond 2010.

⁷ EUROSTAT (2000, pp. 123).

⁸ The European Integration Consortium (Boeri et al. 2000) arrives, with the help of econometrically underpinned investigations about immigration caused by EU-enlargement by Eastern European countries, at the conclusion that emigration from these countries to EU-15 would culminate during about the first ten years after EU-accession of MEE-countries (MEE: Mid Eastern European).

2.2.1 Assumptions and Results of the Demographic Scenario

The **crude birth rate** (see Table 1, Part 1) will continue its decline which could already be observed during the nineties throughout the whole forecasting period. The negative impact of the worsening overall age structure as well as the accelerating fall in the number of women in childbearing age can be only partially compensated for by a moderate increase in net reproduction rates of women, for example in Italy or Spain (as is optimistically shown in national forecasts). **Crude death rates** should remain more or less stable at least until 2015, since the negative effect of the ageing of the total population will be neutralized (as in recent years) by a steadily growing life expectancy. Thereafter, when the first cohorts of the post-war baby boom generation will reach the age of 60–65 years, this could marginally outweigh the positive life expectancy growth-effect with the result of a slight rise in the crude death rate. Thus, the **natural population increase** (excess of live births over the number of deaths), which during the period 1995–2000 had been above 300,000 persons (annual average), should become increasingly negative from 2010 onwards (average 2010/2015: nearly –180,000 persons; 2015/2020: –315,000 persons). The Achilles heel of every population projection is **net immigration** which, as a rule, is extremely volatile since it is affected by a wide range of economic, political and social factors — let alone civil wars motivated by multiethnic problems.⁹ As outlined above, under such conditions we should confine ourselves to economic and foreseeable political (enlargement of EU-15) factors, which in this case both point into the same direction: the rapid ageing (which is already under way) and the expected shrinking of the domestic EU-15-work force should attract more and more immigrants even under the risk that future problems of integration of the migrants might (but must not!) become an even more sensitive political issue than in the past. Accordingly, it is assumed that net immigration into EU-15 will rise from an average of nearly 700,000 persons in 1995/2000 to a maximum of 900,000 persons in 2020. This is a rather conservative hypothesis in view of the aforementioned shrinking process of the domestic population. It enables the **total population** of EU-15 to increase further until 2020, but with a declining rate of growth: decade 1990–2000: 3.5 percent; 2000–2010: 2.3 percent; 2010–2020: 1.5 percent.

⁹ The consequences of the civil war in the former Yugoslavia during recent years provide a by no means excessive example.

The future changes in the **age structure** of the EU-15-population are roughly in line with those given in the national forecasts which are compounded by EUROSTAT. The differences are stemming exclusively from the assumption of a higher net immigration as discussed above. For the whole forecasting period (2000–2020) the cumulated difference in the assumptions between the "national" and our forecast arrives at nearly 5 mill. persons. Only a very small minority of these should be in the age group "65 years and older". Most of them will be in working age (labour migration). In the case of permanent immigration migrants will be accompanied by spouses and children, so that at least 20 to 25 percent of them should be younger than 15 years. According to these assumptions we have corrected approximately upwards the percentages given in the national forecasts for the age groups "less than 15 years" and "15–64 years". This in turn resulted in a somewhat lower percentage (as compared with the EUROSTAT calculations from national projections) for the age group "65 years and older". As can be seen from Table 1, Part 2, under these conditions the number of persons in working age will rise until 2015, but with a declining growth rate. From 2015 onwards, a steep decline takes place. This development should be seen against the background of a rapid ageing process within the group 15–64 years old which will become most dramatic from 2015 onwards. This may also implicitly be derived from the steadily diminishing number of persons under 15 years old who must be seen as a rough indirect indicator for the future influx into the "working age group" as well as from the ever rising number of persons aged 65 and over. The massive inflow into this age group mirrors to a considerable extent the outflow from the "working age group".¹⁰

In Part 3 of Table 1 we have tried to calculate at least approximately the impact of the **educational system** on the work force. A rapidly ageing society like the one of EU-15 which is forced to cope successfully with the consequences of globalization has no other choice but to increasingly invest in an improvement of the skills/qualifications of its work force. The higher the average educational standard, the greater are later on the chances for additional training on the job or, which seems to be much more important in the future, for the change into another job. This tendency has become already apparent in the past: during the base period 1985–2000 the percentage of persons in working age who visited schools of secondary stage II (according to

¹⁰ That, especially in recent years, a growing number of scholars at secondary stage II and of students has been entering the work force temporarily will be discussed later in the section 2.2.2.

the "International Standard Classification for Education by the UNESCO") increased only from 7.2 to an estimated 8.0, whereas the attendance of high schools and universities rose much faster from 3.2 to an estimated 5.2 percent. We expect this trend to continue until 2020. But at the same time much effort should be devoted to shorten the average time span, especially for achieving a university's degree. Hence, the future growth of the "students percentage" might well slow down somewhat until 2020. The implications of the latter assumption (shorter average duration to reach a university's degree) should not be overlooked: less chances for students to participate temporarily in the work force (this item will be discussed later under 2.2.3).

As can be seen from Table 1, Part 4, the growth in the number of persons in working age, excluding scholars and students (it shall be denominated here as the "nucleus work force" – NWF), will diminish strongly until 2015 (the "interim high" during the period 2005–2010 stems from the assumption of a temporarily higher net immigration as a consequence of EU-enlargement by eastern European countries). From 2015 onwards, NWF is forecast to shrink sharply — despite an allowance made for net immigration of more than 850,000 persons annually. This should have severe repercussions on the labour market which shall be analyzed in the following chapter.

2.2.2 Impact of Population Ageing and Shrinking on the European Union's Aggregate Labour Market

To get a first grasp of the main determinants of labour demand we have estimated a simple log-linear employment equation for Euroland for the period 1987–2000 with the aid of OLS. The results do not seem to be unreasonable. The elasticity with respect to the activity term (real GDP) is 1.0 and with respect to real wage costs -0.5 . Moreover, autonomous technical progress, the influence of which had been captured by a linear time trend, would reduce total employment by 1 percentage point per annum. If we now take a somewhat optimistic stance and assume a growth rate of $2\frac{1}{2}$ percent for real GDP in EU-15 from 2000 until 2020 (that means we exclude the possibility of deep and/or prolonged future recessions like the one of 1992/93), and if we furthermore stick to a continuing modest growth of real wage costs as in recent years

(+½ percent annually), total employment in EU-15 would grow by 1.25 percent [2.5–(0.25+1.0)].¹¹ Under these conditions, total employment in EU-15 in 2020 would slightly exceed a level of 205 mill. persons (2000: 158.5 mill. persons). To achieve this the maximum participation rate, in view of a progressively declining NWF (for definition see above), must go up tremendously to 93.6 percent which is completely unrealistic since so far no allowance has been made for open (ILO) and hidden unemployment. If the assumptions about real GDP growth and autonomous technical progress are left unchanged, we have to concentrate any efforts for a better balancing of supply and demand on the future EU-15 labour market at the really scarce production factor — namely labour itself. Accordingly, the price for labour (real wage costs) should grow much faster until 2020 than in the recent past. To avoid a sudden upward leap in real wage costs (RWC) which causes unnecessary disturbances in the employment forecast, the growth rate of RWC will be increased step by step from about 0.5 percent (average 2000/2003) over 1 percent (2005) to 2 percent from 2010 onwards. This reduces the growth rate of employment from 1.7 percent (average 2000/2004) over 1 percent in 2005 to 0.5 percent from 2010–2020.

As a result, total productivity per person in employment (employees plus self-employed) would grow much faster from 2010–2020 (by 2 percent) than in the base period (1.1 percent on average for the period 2000 until 2004). Since autonomous technical progress had been assumed constant (see above), this is almost exclusively a wage-driven rise in productivity growth. It is beyond the scope of this investigation to answer the difficult question whether a rapidly ageing work force would really be able to increase its productivity so much during a relatively short time span. Our revised employment forecast for 2020 (nearly 185 mill. persons) is about 10 percent or 20 mill. persons lower than the former "low-wage forecast" (Table 1, Part 5). This in turn gives room for adequate estimations of open (ILO) and hidden unemployment in 2020. The scenario which we have developed for this purpose is as follows:

- It should be clear from the above that in 2020, conditional on the assumptions that have been made, EU-15 will be a full-employment economy. This does not mean that either

¹¹ Autonomous technical progress is presumed to exert its influence on employment until 2020 in the same way as in the past.

open or hidden unemployment should become a *quantité négligeable*. At first, especially in such a heterogeneous, multilingual region as in EU-15, there will always be a certain amount of unemployment which is due to the high fluctuations on the regional labour markets (i.e. stocks are rather small in relation to changes). Secondly, and much more important, full employment can only bring cyclical unemployment to zero, whereas structural unemployment (for example, a mismatch due to inadequate skills) will remain more or less unaffected. Thus, we suppose that even under such extremely favourable labour market conditions as the ones forecast for 2020 open (ILO) unemployment in France, Italy, the United Kingdom or Germany will not fall much below 1–1 ½ mill. in either country. For EU-15 as a whole, structural open unemployment as well as open unemployment due to fluctuations will add up to not less than 7 ½ mill. persons or less than half of total ILO unemployment in 1999. This is no more than a first rough country-by-country guess, the risks of which are clearly lying on the low side.

- As far as hidden unemployment is concerned we even do not know if it contains a structural component at all. Theoretically the discouraged worker concept which figures so prominently in explaining hidden unemployment would exclude a structural element. At least for Germany this is further underpinned by empirical evidence which shows that rather often female discouraged workers have above average skills. Hence, we should be cautious and assume for 2020 only a fluctuation component for hidden unemployment which is put rather arbitrarily at 2 ½ mill. persons or only slightly more than one third of total estimated hidden unemployment in 1999. Again, as in the case of open unemployment, the risks of this estimate should be on the low side.

According to the above estimates total (open and hidden) unemployment in 2020 will equal ($7\frac{1}{2} + 2\frac{1}{2} =$) 10 mill. persons or 42.5 percent of the 1999-level. The ILO unemployment rate for 2020 is calculated at 3.9 percent (1999: 9.4 percent) and it seems to be at first glance compatible with a full-employment rate. But also the total unemployment rate (including hidden unemployment) signals full employment (5.1 percent in 2020 as compared with 13.2 percent in

1999; see Table 1, Part 6).¹² Adding total unemployment estimated for 2020 to the total employment estimate restricted by increasing wage pressure (see above) yields a forecast of the maximum work force in 2020 in EU-15 of somewhat less than 195 mill. persons (1999: 179 mill.; +8.5 percent; Table 1, Part 6). From this follows a maximum participation rate of 88.8 percent in 2020. This is a considerable gain of 7 percentage points as compared with 1999. But the average annual increase from 2000 until 2020 (0.34 percentage points) is well in line with the development during the base period. Moreover, it should be taken into consideration that the acceleration of real wage growth (see above) provides a positive stimulus for a rising participation rate, especially during the period 2010–2020. But nevertheless a participation rate approaching 90 percent seems to be an extremely high level even for a full-employment economy. This is ultimately the crucial result of our forecast of the labour market balance for EU-15. Hence, it will be discussed in the following section if a participation rate of nearly 90 percent in 2020 is feasible.

2.2.3 *Discussion of Results*

Participation rates on the macrolevel in a range from 85 to 90 percent remind of the conditions in socialist economies like the former GDR. They could only be realized by creating the necessary infrastructure (for example, a dense network of kindergardens in firms) which allows women with young children to work. Over and above, there had been also a certain amount of ideological pressure on women to enter the active part of the population. In market economies, where there is free choice to work, an important precondition for a further substantial rise in female labour participation would be in the first instance to encourage in most regions/countries of EU-15 the creation of private and/or public institutions of professional child care since family networks will become increasingly thinner in the future due to demographic reasons (low birth rates in the past). A process already under way in nearly all EU-15-countries is, on

¹² In the meantime EUROSTAT has prepared, with the aid of „Statistics Netherlands“, a new long-run conditional prediction of population and labour force until 2050 on a regional (NUTS-2) basis (EUROSTAT 2001). For three scenarios (high, medium or basic, and low) the total work force in EU–15 is calculated. Compared with this very detailed predictions our own forecast of total labour supply is well within the high and the low scenario-range. In 2015 it exceeds only slightly, in 2020 more considerably the level of the EUROSTAT basic scenario prediction.

the side of enterprises/firms, to offer more part-time and temporary jobs on a flexible basis¹³ (to give one practical example: life-time working hour budgets which allow women a flexible adjustment of their working time to the needs, for example, of child education). A further step in this direction would be to grant more generous maternity leave benefits or subsidies for better child care arrangements. There are countries in EU-15 which so far have done a lot in these fields (for example France), whereas in others there seems to be much room for further improvements (Germany, Italy or Spain).¹⁴ For the time being, it is rather unsecure if all or at least some of the above mentioned measures could be realized until 2020 — but at least this is not wholly impossible.

Another step on the way to the forecast high participation rate in EU-15 may be seen in further cutbacks in earlier retirement programs especially for men. Apart from solving severe regional structural problems, such programmes seem to be counterproductive in times of a shrinking domestic labour supply. One could go even a step further and envisage the politically very sensitive issue of a rise in the legal retirement age.

A special methodological problem should also be discussed here — namely the deduction of all scholars and students in working age from the work force. This is a problematic issue insofar as in the past it could be observed that a rising part of these scholars and students

¹³ During the years 1998/99 about 45 percent of employment growth in Euroland can be attributed to part-time and temporary work (European Central Bank, 2000c, pp. 46).

¹⁴ Kreyenfeld and Hank (2000, pp. 317–337) have found out with the aid of a multinomial logit approach that in Western Germany labour force participation of women with children is not significantly influenced neither by the availability nor by the cost of public day care for children. They argue that the main reason for this is that the West German public day care system (private providers do play only a marginal role) is rather ineffective especially with respect to opening hours. We should add that it is very unevenly distributed over the country. Improving the whole system should therefore contribute much to facilitate labour participation of women with children in a world where the reliance on family networks becomes more and more difficult. Under such conditions it is not surprising that even for the costs of public day child care no statistically significant, negative impact on labour participation of women with children could be detected (these costs can be economically perceived as a reduction of the wage income of the aforementioned women). Thus the number and the age of the children, the income of the partner and the educational degree figure most prominently in influencing part- and full-time employment of women with children in Western Germany.

entered the labour force temporarily (during holidays, for example). If they get a job, they are counted twice in the Labour Market Balance — as scholars/students and at the same time as an employee. Thus, the calculated participation rate is systematically overestimated. Since there are no separate data available about this special subgroup of employees, we can do nothing to improve the situation. But when interpreting the very high maximum participation rate for 2020 this issue should be taken into consideration: the maximum participation rates estimated for the second half of the nineties are already in a very high range (80–82 percent) which is predominantly caused by the above mentioned "scholar/student effect" (SSE). In the future, the SSE-effect is believed to increase further, but at a somewhat lower rate than in the past since we have assumed (see above) a shortening of the average duration of the studying time in some important EU-15-countries like especially Germany. Nevertheless taking the SSE-factor into account a maximum participation rate approaching 90 percent in 2020 seems to be not completely beyond the horizon.

But we may not conclude this discussion without putting a big question mark behind our rather conservative assumptions about future net immigration into EU-15. All the above points to the possibility of allowing for a substantially higher net immigration (one million or more annually as during the period of the fall of the "iron curtain" around 1990) into EU-15. The prospective enlargement of EU-15 by eastern European countries should provide a favourable chance for this. This should be the more the case as one can expect that especially immigrants from these countries should turn to EU-15 who for many reasons would be prepared to integrate themselves with no major problems into the recipient countries and who will acquire in a rather short time the necessary skills. This item will be discussed in more detail in the following simulation experiment.

2.3 Scenario for Europe's Aggregate Labour Market in the Medium Term: Prospective Enlargement of the EU by East European Countries

The envisaged entry of especially Poland, the Czech Republic, Hungary, Estonia and Slovenia to the EU could spur labour migration to EU-15 countries, mainly to Germany, France, the United Kingdom, the Scandinavian countries (Estonia) and Austria (Slovenia). Thus it may be appropriate to assume as a hypothetical scenario that net immigration forecast in the first draft

of the EU-15-labour market balance (LMB)¹⁵ with a yearly average of 440,000 persons during 2000-2005 (basic scenario) will increase by an additional 500,000 persons per year from the above mentioned eastern European countries (in the following denoted as the EEIS scenario). In reality we believe that especially permanent net immigration from eastern Europe should be considerably lower than the 2 ½ mill. assumed in the EEIS-scenario for the total period 2000-2005.¹⁶ But for demonstration purposes such a magnitude has the advantage that the secondary effects of this assumption will not become too small. One illustrative example is provided by hidden unemployment which normally is only a minor fraction of total immigration and which at the same time as an estimated variable is subject to a rather large error margin.

In the following the structural assumptions underlying the EEIS-scenario will be commented briefly before the results are discussed.

- Main characteristics of migrants: Especially highly motivated labour migrants with their families will come who have, thanks to above average, specific vocational skills, good

¹⁵ This had already been done on the basis of the first draft of the LMB. An "update" of this simulation experiment using the second current draft under the same assumptions would have delivered only marginally different results. Thus, we see no urgent reason to prepare another simulation experiment on the basis of the second draft of the LMB.

¹⁶ The lion's share of prospective immigrants from eastern Europe is expected to come from Poland. According to estimates given in a report of the Polish Labour Ministry, after accession to EU at the beginning of the year 2004 between 300,000 and 700,000 persons might emigrate to EU-15-countries. Main determinants of the number of emigrants is the development of the situation on the Polish labour market between now and 2004 (Aktuelt.dk-Nyhederne på nettet, 16 October 2000: Polakker vil emigrere til EU (Ritzau)). In a more recent inquiry it turned out that nearly a third of the adult Poles takes at least into consideration to search for labour in EU-15 after the accession of Poland — among them mainly young people who are at the beginning of their vocational or high school/university education. This has to be seen before the background of a continuous upward trend in the Polish unemployment rate (to nearly 16 percent in spring of this year) since the mid-nineties ([http:// de.news.yahoo.com/010423/3/1ju7y.html](http://de.news.yahoo.com/010423/3/1ju7y.html)), which can be interpreted as an important push factor within the context of migration theory. — Boeri et al (2000) estimate, mainly on the basis of an econometric model applied to migration into Germany from 1967 to 1998, that in the first years after a hypothetical accession of **all** ten MEE-countries, immigration into EU-15 could amount to 335 000 pers. per annum — in our view a rather cautious estimate.

chances to find a job at least in the medium term on the EU-15 labour market.¹⁷ More often than not an at least basic knowledge of the language spoken in the country of destination is presumed to be available.

- Age structure: It is assumed to be similar to the one which had been characteristic for ethnic Germans coming from Poland, Romania and the CIS-countries from 1988 until 1992.¹⁸ Thus the age structure of the prospective immigrants would be significantly more favourable than the one of the EU-15 population in the basic scenario (much higher percentage of people in best working age; elder people (65 years and over) will be under-, children (less than 15 years) will be overrepresented).
- Birth rates: After the fall of the iron curtain and the introduction of a market economy in the former socialist countries of eastern Europe crude birth rates experienced a considerable decline. The most dramatic and world-wide unique example in this respect is provided by eastern Germany where crude birth rates more than halved from 1989 until 1992. Before that time they were on average higher in eastern Europe than in the EU-15 population. Thus it is believed that it is not unrealistic to assume that, especially during the first years after arrival, the crude birth rates of the immigrant families from eastern Europe will at best reach the EU-15 level.
- Death rates: Due to the more "juvenile age structure" of the immigrant families their crude death rates will be considerably lower than the ones in EU-15. Hence, the crude death rates applied in the EEIS-scenario have to be corrected increasingly downwards, starting in the year 2000. Since in relation to the total population in EU-15 the prospective immigrant population from eastern Europe will even in the final year 2000 be only a

¹⁷ The already mentioned report of the Polish Labour Ministry expects that the majority of emigrants to EU-15 will be members of the rapidly growing middle class of the country. Such emigrants are believed to be normally very well educated, and they should have indeed above average vocational skills.

¹⁸ During the average of the years 1996/99 nearly one third (one half) of immigrating ethnic Germans had been in the age of less than 18 years (18-45 years), whereas the elderly (age group 60 years and more) accounted only for about 10 percent of the total (Info-Service Ethnic Germans (ed.), Federal Ministry of the Interior, no. 110, January 2001).

minor fraction, this downward correction is in fact so small that is more of a symbolic character.

- Participation rates in the educational system: The participation rates of the east European immigrants in work force age in the educational system should well exceed the ones for the EU–15 population mainly as a direct consequence of the much more favourable age structure. Moreover, language barriers are expected to be overcome rather quickly. The higher the vocational skills of the parent generation in the country of origin (notwithstanding the fact that the parent generation might often be forced to work in EU–15 below their formal skills achieved in the home country),¹⁹ the more on average the young generation will be felt itself driven to try to reach a more advanced educational standard in EU–15. This is a typical phenomenon which has often been observed in the past in the case of skilled labour migration (immigrant families from Europe or South East Asia in the US, Canada and Australia provide a good example).²⁰ Thus the participation rates of the population in working age in the educational system should be revised increasingly upwards in the case of the EEIS-scenario in spite of the fact that the amount of this revision in percentage points is again very small (see above).
- Maximum Participation Rate (MPR): The MPR calculated for the basic version of the EU–15-LMB is deliberately left unchanged in the EEIS-scenario. As a first guess this seems to be appropriate insofar as we can put forward only vague theoretical and/or speculative arguments for in any case minor upward revisions of the overall MPR following mainly from the more favourable age structure of the east European immigrant work force.

Concerning the results of the EEIS-scenario as compared with the basic scenario (no additional influx of eastern Europeans into EU–15 due to the prospective enlargement by Poland, Czech Republic, Hungary, Estonia and Slovenia) see Table 2. Total labour supply will increase under

¹⁹ See also Boeri et al. (2000).

²⁰ Compare for example: Basavasajappa et al. (1993, pp. 60–66, see especially Table 33, p. 65); Fawcett et al. (1990); Stark (1991, pp. 371–380); Borjas et al. (1991, pp. 15–26); Seifert (1994, pp. 76–92).

the EEIS-scenario by somewhat more than 1 mill. persons than in the basic scenario. This seems at first glance rather modest when confronted with the additional resident population in EU-15 (+2 ½ mill.) stemming from the assumed total influx of migrants from eastern Europe. But it has to be recognized that more than 36 percent are accounted for by children (under 15 years) and by the elderly (≥ 65 years), where children alone dominate with nearly one fifth. A further nearly 10 percent in work force age are absorbed by the educational system.

As far as labour demand is concerned, the mechanism of the LMB is such that the forecast of total employment and registered unemployment has to be carried out *i n d e p e n d e n t l y* from the supply side (Estimated Maximum Labour Force). Thus we get in a first step the economically meaningless result that all the additional increase in the total work force according to the EEIS-scenario is transferred to hidden unemployment. Hence, in a second step the forecast of total employment and registered unemployment performed in the basic scenario has to be revised upwards so as to include the greatest part of the work force increase in the EEIS-scenario, leaving only the rest for hidden unemployment. This is done by an iterative procedure. From traditional employment/unemployment forecasts it differs only insofar as in the present case we have a strict upper limit (Maximum Work Force) as well as the guidelines provided by cyclical and trend developments in the distribution of total unemployment on its open and hidden component in the basic forecast.

According to our assumptions (see above) the majority of adult male (and often also female) immigrants from Eastern Europe will highly skilled workers/specialists who, after a rather short phase of training on EU-15-standards and of overcoming language deficits, should succeed in finding a job. Thus, after about 1-2 years their employment rate is expected to be higher than the one of the EU-15-work force in the basic scenario. Correspondingly, their unemployment rate should be much lower. Even many women who have to care for children aged under 15 years might well be "labour-market-oriented". But mainly due to their time-budget constraints they may often be forced to stay in hidden unemployment for some years. Accordingly, the percentage of the additional work force under the EEIS scenario remaining in hidden unemployment should be clearly above the average for EU-15 in the basic scenario.

Table 2 – Differences between the EEIS-scenario and the Basic Forecast for EU–15 from 1999 until 2005 (in 1,000 persons)

| | |
|---|------------------------|
| <u>Population:</u> | |
| total: | + 2,521 |
| less than 15 years old: | + 487 |
| 15–64 years old: | + 1,600 |
| 65 years and more: | + 434 |
| <u>Educational System:</u> | |
| scholars at secondary stage II: | + 137 |
| students at universities and high schools: | + 91 |
| <u>Persons aged 15–64 years who are neither scholars nor students:</u> | (+ 1,226) ^a |
| <u>Labour Market:</u> | |
| estimated maximum labour force: | + 1,039 |
| total employment ^b : | + 961 |
| unemployment (open; according to ILO-criteria) ^b : | + 36 |
| estimated hidden unemployment ^b : | + 42 |
| total unemployment ^b : | + 78 |
| Unemployment rate (ILO): | – 0.01 ^c |
| Estimated total unemployment rate ^d : | – 0.01 ^c |
| ^a Smoothed series. – ^b Independent estimate. – ^c Percentage points. – ^d Own estimate (total unemployment as percent of maximum labour force). | |

Source: Compare EU–15-labour market balance; own estimates and calculations.

Under these conditions more than 90 percent of the additional work force in the EEIS-scenario are supposed to find a job in EU–15. With 7 ½ percent their total unemployment rate (3.5 percent for open and 4.0 percent for hidden unemployment) will be far below the one for the EU–15-work force in the basic scenario (9.1 percent for total unemployment and 6.1 percent for open unemployment). Similar to the Ethnic German immigrants in the years 1988–1992 the main price many of them have to pay for this performance is an occupation more or less below their formal vocational skills in the country of origin. But even such disadvantages might be overcome after some years.

3. Labour Participation and Unemployment: Empirical Evidence

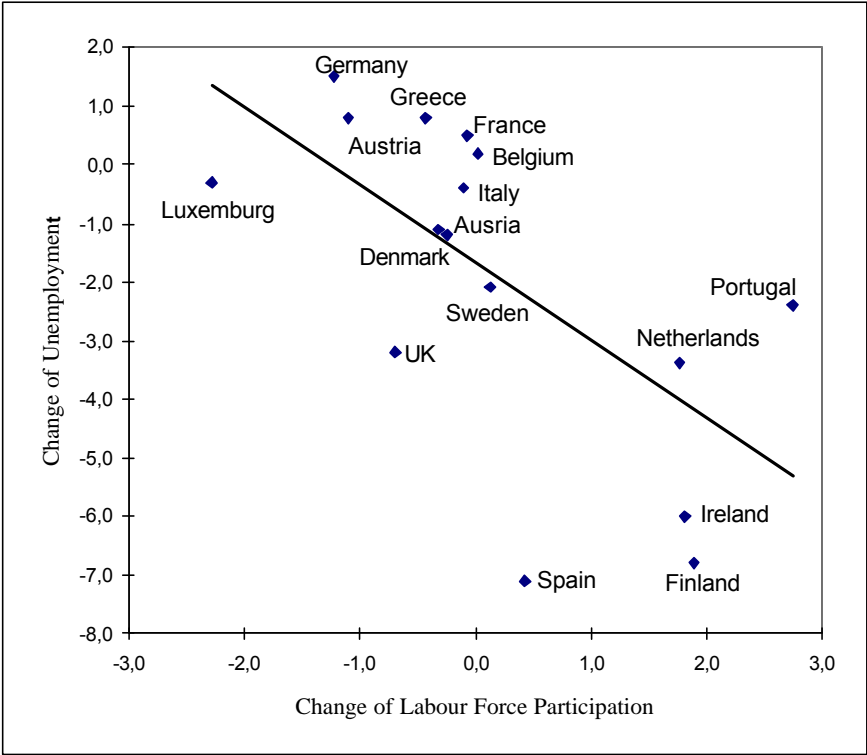
The crucial question with regard to economic policy is whether or not there is a link between unemployment and labour force participation. The time-series analysis of the previous chapter is far too much aggregated to detect such a link. Hence, in the following panel estimation techniques will be used to figure out whether or not the correlation between the two variables is positive or negative.

3.1 Unemployment Changes, Participation Rate Changes, and the Stance of the Business cycle

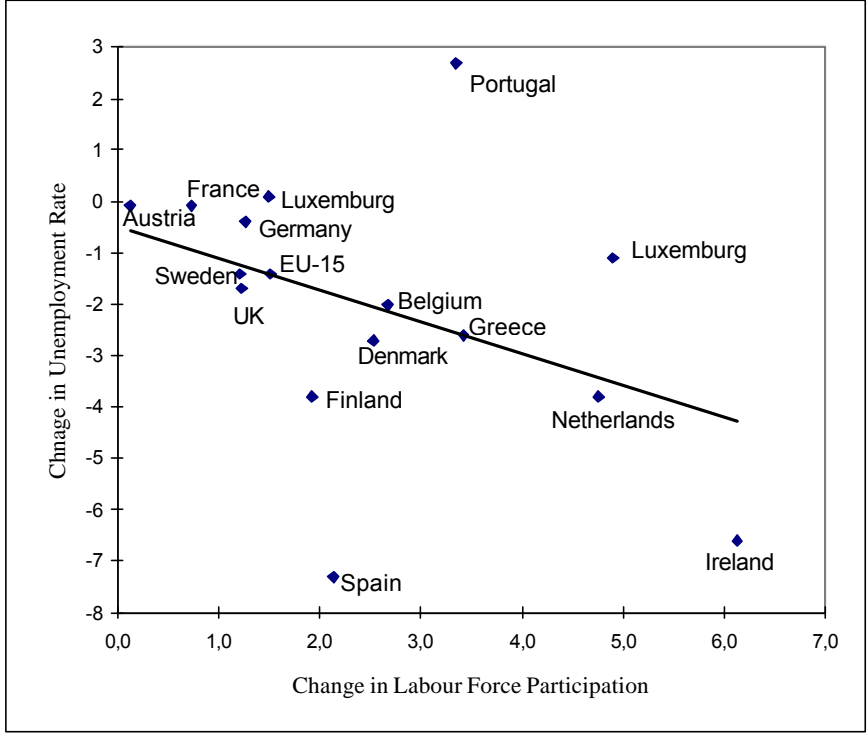
Figure 3 exhibits the link between the changes in the unemployment rates and the labour force participation rates in the European union for males and females respectively. The plot reveals that the overall correlation across the member states of the European Union is negative rather than positive. An increase in the participation rates, therefore does not point to a subsequent rise in the unemployment rate. This result does hold for males as well as for females. However, it is not quite clear how the unemployment rate should be interpreted in this context. On the one hand it can be seen as a measure of the labour markets shortcomings as an indicator for excess supply and frictional elements of the labour markets, on the other hand it may be well characterizing the stance of the business cycle. If the latter is the case, the positive correlation reveals that the participation rate is partly of cyclical nature. To shed light on this question, we have compared the overall participation rates for the countries under investigation with a measure of the business cycle. In particular the output gap defined as the deviation of real GDP from its trend has been used. It turned out that the cyclical influence on the participation rate varies heavily across countries.²¹ In some prominent cases the participation rate seems to follow the output gap very closely. In particular, in Italy the correlation is very high. In most of the other countries, however, the participation rate is more or less independent from the business cycle.

²¹ The figures are available upon request from the authors.

Figure 3 – Change of Labour Force Participation and Unemployment Rates in Percentage Points in the European Union from 1992 to 1999



(a) Males



(b) Females

3.2 Possible Econometric Specifications

In the long run, the labour supply (LS) is equal to the underlying labour supply (LS*), supposed to be exogenous. On the past, LS* is calculated by smoothing effective participation rates (by sex and age). These smoothed participation rates are applied to the population figures by sex and age. The estimated equation, for every age group and sex, is:

$$(2) \quad \Delta LS_t = \mathbf{a} \Delta LS_t^* + (1 - \mathbf{a}) \Delta E_t + u_t$$

where LS is the effective labour supply, LS* the underlying labour supply and E the employment.

In projection, underlying participation rates by sex and age are extrapolated according to a logistic method with assumptions about maximum (upper limits) participation rates and LS* by sex and age is obtained by applying these extrapolated rates to population projections by sex and age.

An alternative specification is proposed by Elmeskov et. al (1993). The labour force «responsiveness» to employment conditions is revealed by estimating the elasticity of participation rates with respect to the employment share in the working-age population from structural participation rate equations. The estimated equation is:

$$(3) \quad \ln PR_t = \mathbf{a}_0 + \mathbf{a}_1 \ln PR_{t-1} + \mathbf{a}_2 \ln RDI_t + \mathbf{a}_3 \ln ES_t + \mathbf{a}_4 t + u_t$$

where PR is the participation rate, RDI the real disposable income per head and ES the overall employment share in working-age population. This estimation can be done by age group and sex.

Another approach to model the development of the labour force is the approach advocated by Bloch et al. (1986). They try to split up the evolution of the labour force by sex and age group into four effects i) the demographic effect ; ii) the structural effect (measured by a time trend); iii) the institutional effect; iv) the fluctuation effect. The estimated equation therefore is:

$$(4) \quad PR_t^G = \mathbf{b}_0 + \mathbf{b}_1 t + \mathbf{b}_2 I_t^G + \mathbf{b}_3 F_t^G + \mathbf{e}_t$$

where PR is the participation rate, t represents a time trend equal to 1 for each period, I represents persons affected by specific measures on employment (like persons on early retirement) related to working-age people and F represents flexion variables (like the unemployment rate). The suffix G represents the different age groups.

Last, but not least, it is possible to estimate an error correction model. The long-term relationship is given by:

$$(6) \quad \ln LS_t^* = \mathbf{a}_0 + \mathbf{a}_1 t + \mathbf{a}_2 \ln WAP_t + (1 - \mathbf{a}_2) \ln E_t + u_t$$

With this long run relation at hand, we can apply an error correction model of the form:

$$(7) \quad \Delta \ln LS_t = \mathbf{g} u_{t-1} + \sum_{i=1}^n \mathbf{a}_{1i} \Delta \ln LS_{t-i} + \sum_{i=0}^n \mathbf{a}_{2i} \Delta \ln WAP_{t-i} + \sum_{i=0}^n \mathbf{a}_{3i} \Delta E_{t-i} + \mathbf{e}_t$$

where LS and LS* are respectively the labour supply and the underlying labour supply, t a time trend, WAP the working age population, and E denotes employment. This model allows to perceive between long run and short run effects of the flexion. We can use this method for an estimation by sex and age group.

3.3 Empirical Results

At a first glance, the specific influence of labour market measures was neglected. Taking the unemployment rate as a cyclical variable equation (1) was estimated for a pool of 18 OECD countries. Adding the cross-section dimension to the equation gives:

$$(5) \quad PR_{t,i}^G = \mathbf{b}_{0,i} + \mathbf{b}_1 UR_{t,i}^G + \mathbf{b}_2 t + \mathbf{e}_{t,i}$$

with i as an index for the countries under investigation. The estimation has been done for five age groups and for male and female persons, respectively. Since the institutional and social

settings are quite different between the countries included in the estimation the fixed effect model has been used to allow for a country-specific constant. The results are given in Table 3.

In a nutshell, the coefficient regarding the unemployment rate is negative, that is a higher unemployment rate has gone in lone with a lower participation rate. Though this result underscores previous findings (e.g. Elmeskov et al 1993) it is in contrast to widespread beliefs in the public opinion. It is often argued that high unemployment and high labour force participation should go hand in hand because a higher labour force would increase the labour supply. If the demand for labour is restricted for any reason — for example by a too low demand — this would clearly increase unemployment. The results presented here show that this view on the labour market is not the correct one. Rather, a good labour market performance allows both a low unemployment rate and a high labour force participation rate. Though one has to keep in mind the limits of the data set, the heterogeneity between the countries, and several econometric shortcomings of this rather simple approach, it is still a challenge for any recommendations to reduce labour force in order to reduce unemployment.

Furthermore, the results are reasonable if the unemployment rate is mainly seen as a measure of the business cycle. A better stance of the business cycle means a lower unemployment rate corresponds with a higher participation rate. This is in line with the statement that persons may withdraw from the labour market if the economy is in a recession.

As regards the trend variable the coefficients differ sharply between males and females. Whereas trend influence on male labour participation is negative for all age groups it turns out to be positive for the two largest females age groups. This might reflect in part the fact that the political efforts to increase the participation of women in the labour market has been successful. At a first glance, one might suspect that the estimates for the two youngest female age groups are at odds with this line of argumentation. However, this not the cast. The negative trend estimated for younger women's labour market participation is due to a better education among these group. In particular, younger women stay longer in the education system than before.

Table 3 – Participation Rate and Unemployment Rate by Sex and Age — Evidence from a Panel of 18 OECD Countries 1985–1997

| Age Group | \hat{b}_0 | \hat{b}_1 | \hat{b}_2 | R ² |
|---|-------------|---------------------|----------------------|----------------|
| Males | | | | |
| 15–19 years | (–) | –0.40 (–5.76)*** | –0.73 (–8.16)*** | 0.93 |
| 20–24 years | (–) | –0.35 (–9.42)*** | –0.75 (–14.53)*** | 0.85 |
| 25–54 years | (–) | –0.16 (–5.98)*** | –0.17 (–11.72)*** | 0.82 |
| 55–59 years | (–) | 0.17 (3.23)** | –0.42 (–10.26)*** | 0.94 |
| 60–64 years | (–) | 0.24 (4.50)** | –0.68 (–17.75)*** | 0.98 |
| Females | | | | |
| 15–19 years | (–) | –0.28 (–4.11)** | –0.59 (–7.39)*** | 0.93 |
| 20–24 years | (–) | –0.40 (–7.32)*** | –0.50 (–9.04)*** | 0.86 |
| 25–54 years | (–) | –0.25 (–1.50) | 0.78 (13.24)*** | 0.95 |
| 55–59 years | (–) | –0.04 (–0.61) | 0.47 (14.33)*** | 0.98 |
| 60–64 years | (–) | –0.20 (–2.27)** | 0.00 (0.04) | 0.98 |
| t-values are given in brackets. They are calculated using Heteroskedasticity-Consistent standard errors as proposed by Withe (1987). *** (**,*) denotes that the coefficient is significant at the 1(5,10) percent level. | | | | |

To analyze to what extend the link between the unemployment rate and the participation rate which has been found in the previous estimation has to be interpreted as a cyclical one in the next step the equation (5) has been extended to control for the change of real GDP:

$$(5') \quad PR_{t,i}^G = \mathbf{b}_{0,i} + \mathbf{b}_1 UR_{t,i}^G + \mathbf{b}_2 t + \mathbf{b}_3 GDP_{t,1} + \mathbf{e}_{t,i}$$

where GDP denotes the growth rate of real GDP in the respective country. The results of this task are given in Table 4. It turns out that real GDP growth which can be seen as a proxy for real income growth in this context is only in one case significant different from zero.

Additionally, the sign and the significance of the unemployment rate is not altered by including the real GDP variable. One might see this as a hint that the close link between unemployment and participation rates is not predominantly a cyclical one. However, the results have to be taken with great caution. Since the relation of unemployment and real GDP growth is a close one too, the outcome might easily stem from multicollinearity problems. Note on the other hand that the level and not the change of the unemployment rate is included. Therefore, one might expect the multicollinearity problem to be of limited size only.

Table 4 – Participation Rate, Unemployment Rate, and Real GDP by Sex and Age — Evidence from a Panel of 18 OECD Countries 1985–1998

| Age Group | \hat{b}_0 | \hat{b}_1 | \hat{b}_2 | \hat{b}_3 | R ² |
|-------------|-------------|---------------------|----------------------|--------------------|----------------|
| Males | | | | | |
| 15–19 years | (–) | –0.39 (–5.35)*** | –0.74 (–7.64)*** | –0.20 (–1.48) | 0.94 |
| 20–24 years | (–) | –0.34 (–8.61)*** | –0.76 (–13.34)*** | –0.10 (–1.05) | 0.86 |
| 25–54 years | (–) | –0.17 (–6.50)*** | –0.17 (–10.68)*** | –0.08 (–2.57)** | 0.83 |
| 55–59 years | (–) | 0.16 (2.85)*** | –0.39 (–9.27)*** | –0.10 (–1.52) | 0.94 |
| 60–64 years | (–) | 0.17 (3.45)*** | –0.63 (–17.07)*** | –0.20 (–3.20) | 0.99 |
| Females | | | | | |
| 15–19 years | (–) | –0.25 (–4.02)** | –0.62 (–7.41)*** | –0.15 (–1.26) | 0.94 |
| 20–24 years | (–) | –0.43 (–7.80)*** | –0.54 (–9.14)*** | –0.06 (–0.77) | 0.87 |
| 25–54 years | (–) | –0.36 (–2.13)* | 0.77 (12.40)*** | 0.15 (1.27) | 0.96 |
| 55–59 years | (–) | 0.01 (0.12) | 0.48 (13.57)*** | –0.12 (–1.48) | 0.94 |
| 60–64 years | (–) | –0.27 (–3.16)** | 0.04 (1.16) | 0.05 (0.82) | 0.98 |

t-values are given in brackets. They are calculated using Heteroskedasticity-Consistent standard errors as proposed by Withe (1987). *** (**,*) denotes that the coefficient is significant at the 1(5,10) percent level.

The estimations so far have been done using unemployment and participation rates defined in persons. However, this might well be misleading, since there is a large and growing share of

part time work in the countries under investigation. Therefore, equation (5) is also re-estimated using the share of part-time work relative to total employment (Part) as an additional variable:

$$(5) \quad PR_{t,i}^G = \mathbf{b}_{0,i} + \mathbf{b}_1 UR_{t,i}^G + \mathbf{b}_2 t + \mathbf{b}_3 PART_{t,1} + \mathbf{e}_{t,i}$$

The results of this exercise are given in Table 5.

Table 5 – Participation Rate, Unemployment Rate, and Part-time Work by Sex and Age — Evidence from a Panel of 18 OECD Countries 1988–1998

| Age Group | $\hat{\mathbf{b}}_0$ | $\hat{\mathbf{b}}_1$ | $\hat{\mathbf{b}}_2$ | $\hat{\mathbf{b}}_3$ | R ² |
|-------------|----------------------|----------------------|----------------------|----------------------|----------------|
| Males | | | | | |
| 15–19 years | (–) | –0.27 (–3.04)*** | –0.74 (–4.91)*** | 0.002 (0.61) | 0.96 |
| 20–24 years | (–) | –0.33 (–4.42)*** | –0.91 (–7.43)*** | 0.003 (1.42) | 0.91 |
| 25–54 years | (–) | –0.06 (–1.24) | –0.25 (–6.19)*** | 0.001 (–2.00)** | 0.86 |
| 55–59 years | (–) | –0.04 (–0.47) | –0.49 (–5.72)*** | 0.003 (–1.68)* | 0.96 |
| 60–64 years | (–) | 0.20 (1.52) | –0.64 (–7.25)*** | 0.002 (–3.20) | 0.99 |
| Females | | | | | |
| 15–19 years | (–) | –0.20 (–2.01)** | –0.59 (–3.48)*** | 0.001 (0.26) | 0.97 |
| 20–24 years | (–) | –0.27 (–2.28)*** | –0.79 (–5.24)*** | 0.002 (0.84) | 0.93 |
| 25–54 years | (–) | 0.01 (0.07) | 0.12 (1.37) | 0.016 (10.50)*** | 0.99 |
| 55–59 years | (–) | 0.30 (2.63) | 0.13 (1.26) | –0.008 (4.62)*** | 0.99 |
| 60–64 years | (–) | 0.002 (0.02) | –0.12 (–1.35) | 0.004 (2.96)*** | 0.99 |

t-values are given in brackets. They are calculated using Heteroskedasticity-Consistent standard errors as proposed by Witte (1987). *** (**,*) denotes that the coefficient is significant at the 1(5,10) percent level.

The most striking result coming from these estimations is that female labour force participation is strongly influenced by the share of part time workers. This points to the fact that women

represent the vast majority of part time workers, whereas full time workers are dominated by men. Therefore, it is not possible to conclude that the goal of the EU whitebook to achieve a higher female participation on labour markets has been fulfilled in the last recent years. It might well be that many women wish to have full employment and find themselves mainly restricted to part-time or even inferior jobs on the informal sector (grey) of the labour market.

4. Evidence from Individual Countries

4.1 Stylized facts

Since the beginning of the seventies, in Europe and in the United States, activity behaviours have experienced substantial changes, especially for the young, for women and for the oldest people. These modifications in activity behaviour are the result of the conjunction of many factors, among which social (longer schooling, modification of the role of women in households...), demographic (decline of the fertility rate, modifications of the age structure...), institutional (early retirement schemes, change in the age of retirement...) and / or economic (level of the rate of unemployment, average income by household, share of part-time employment in total employment, share of services sector in the economy...) are the most important. Consequently, it is necessary to distinguish, for each sex and age groups, what factors have a preponderant role in the evolution of active population.

In an international comparison, we can note that the level and the evolution of participation rates are particular to each country. These disparities are directly linked to the national institutional arrangements affecting activity, to differences in macroeconomic variables reflecting the state of labour market, to the peculiarities of the demographic regime and to some sociocultural factors in each country. Nevertheless, even if each nation has its own evolution of the labour force, we can easily detect common trends in changes in activity behaviour for the largest European countries and for the United States during the last three decades.

Our study focuses on the analysis of participation rates for men and women for the six most important age groups (15-19 years, 20-24 years, 25-54 years, 55-59 years, 60-64 years, 65 years and more) in six countries (France, ex-West Germany, Italy, Spain, United Kingdom and United States).

4.2 Trends common to every country

Labour force participation rates are relatively inert in the short term. However, in the long run, some trends, more or less pronounced according to sex and age, can be recognized. Thus, since the beginning of the seventies, there is a contrast in activity trends between men and women.

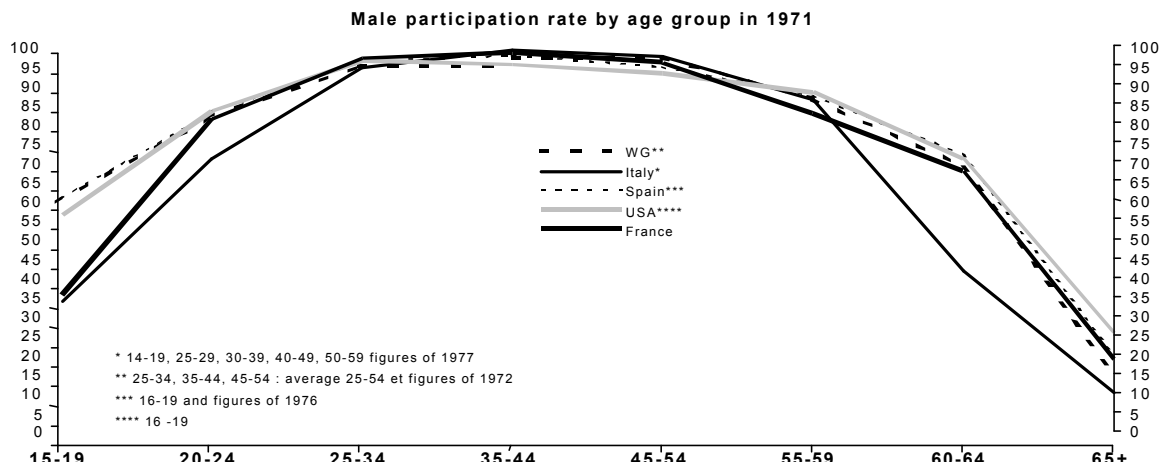
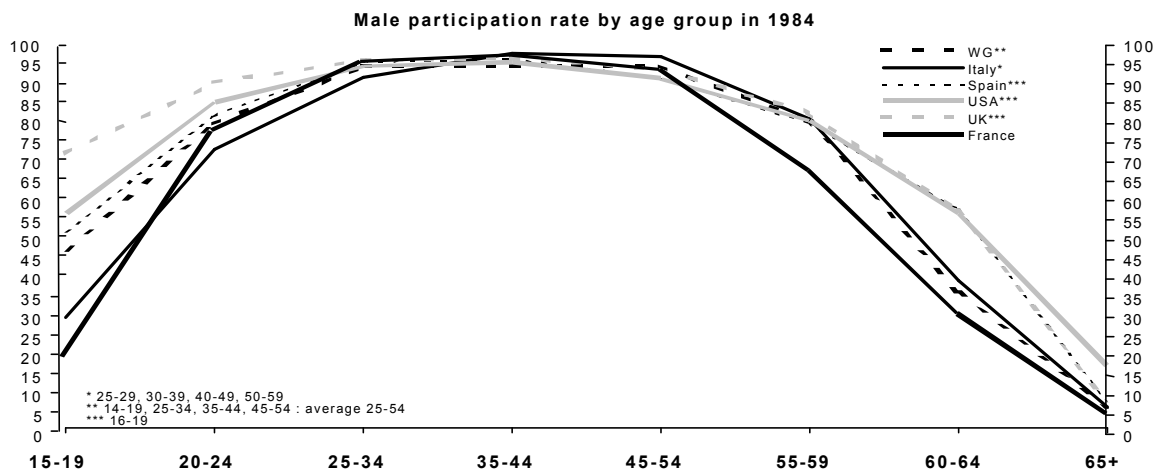
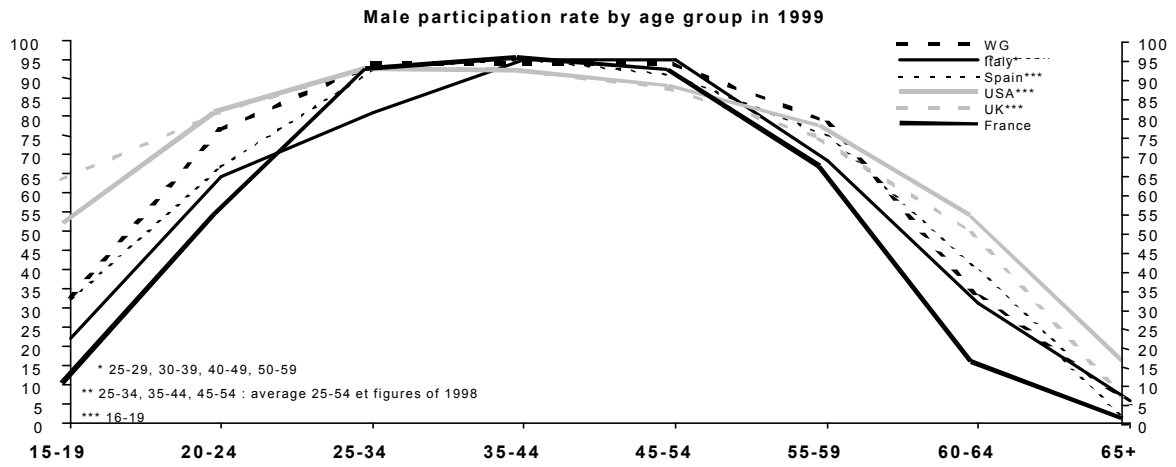
4.2.1 Participation rates of men

If we depict participation rates of males by age groups at three different years (1971, 1984 and 1999), we can observe that in every countries activity behaviour is bell-shaped.

These three charts describe clearly the logic of the bell curve followed by male participation rates. So, men enter gradually the activity phase when they become 25 years and older among the age group 25-54 years more than 90 % of the male population is active. This growing arrival of young people on the labour market coincides with their progressive exit from the schooling system. In 1999, between 59% (United Kingdom) and more than 70% (France, Germany) of men being 19 years old stayed in the educative system or in training while for men 24 years old, this figure oscillates between 22% (France) and 36% (Germany)²². Nevertheless, it is necessary to distinguish between two groups of countries

²² These figures come from the labour force survey 1999 of Eurostat

Figure 4 – Male Participation Rates by Age Groups for Selected Countries



Source : OECD Labour force Statistics

In the first group, composed of Latin countries, there are very few people who are at the same time in education and in the employment. On the opposite, in the second group (UK, USA and Germany), there is an important interaction between education and employment. A lot of people in professional education or students have mostly temporary jobs.

Within the age group 25 to 54 years old, i.e. more or less at the top of the bell, almost all adult being present in the labour force. Above 55 years, male participation rates fall more or less strongly according to the country and the period. Men in the age groups 55-59 and 60-64 years are particularly sensitive to institutional measures allowing for earlier withdrawals from activity (early retirement schemes, system of invalidity...). For most countries, the legal retirement age in public pensioning systems for men is 65 years (except for France : 60 years since 1983 and for Italy : 62 years since the course of 1990). Beyond this age, labour participation rates are often marginal except in the United States where the participation rate of men aged 65 and more was 17% in 1999.

The change of activity behaviour with age, common to all studied countries, should not make forget the existence of important disparities between countries in participation rates levels of the same age group. Moreover, even if all curves are bell-shaped, we can observe that for the two Anglo-Saxon countries, the curves are more smoothed. That means that activity rates are more uniform with age. Conversely, in France and in Italy, the curve shows a more accentuated fall for the age group 60 years and more. The obvious main reason for this is the lower legal retirement age in these countries (see above).

During 30 years, in all countries and for all age groups, male participation rates have fallen without exceptions. These trends to a decline of men's labour force participation are particularly important at the lower and the upper end of active life.

This table shows that the relative declines in participation rates are much more important for age groups which are not in prime working age (25-54 years). Thus, the most important fall in the absolute value of the participation rate can be observed for men being 60-64 years old. This decline of more of 30 points can be explained almost exclusively by the introduction of early retirement and invalidity schemes initiated to struggle against the high rate of unemployment in the eighties and nineties in most industrialised countries. For the young people (15 to 24 years)

the decline of the participation rate can be explained by an improved educational level which means a longer stay at the schooling system. This is mainly motivated by the high rate of youth unemployment by which more qualified people are less affected than the lesser skilled.

Table 6 – Variations of male participation rates in percentage points/percentages between 1971¹ and 1999

| | <i>Men 15-19</i> | <i>Men 20-24</i> | <i>Men 25-54</i> | <i>Men 55-59</i> | <i>Men 60-64</i> | <i>Men 65+</i> |
|-----------------------------|------------------|------------------|------------------|------------------|------------------|----------------|
| <i>In percentage points</i> | -18.55 pts | -11.15 pts | -3.52 pts | -13.20 pts | -30.36 pts | -11.74 pts |
| <i>In percentage</i> | -34.08 % | -13.58 % | -3.66% | -15.16% | -44.65% | -63.66% |

¹ West Germany : 1972-1998, Spain:1976-1999 and United Kingdom: 1984-1999 for the 15-19 years old et and 20-24 years old

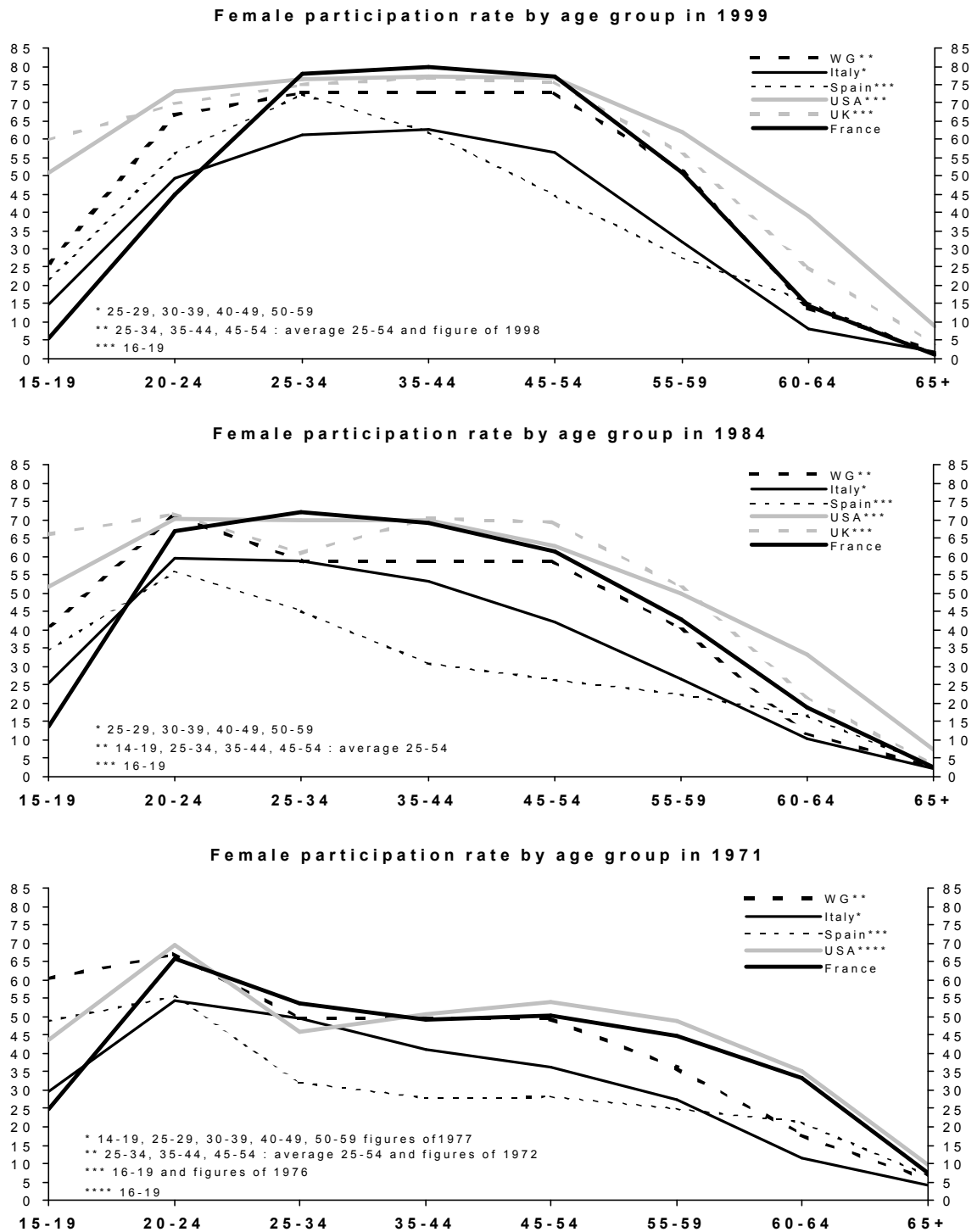
4.2.2 Participation rates of women

Female participation rates have fundamentally changed during the last 30 years in all countries. The form of the activity cycle has muted between 1971 and 1999, getting closer to the bell-shaped type characteristic for men with the years. In the beginning of the seventies, in all countries, the female participation rate was the highest for the age-group of 20-24 years old. From 25 years until 35 years old, an important part of women left the labour market to educate their children and very often stayed out the labour force the rest of their life. From the beginning of eighties, women's participation rates tended to increase more and more within the age group 25 years and older. In the economic literature, there are two opposite theories trying to explain this phenomenon. The first one which, may be interpreted as a rather simple behaviouristic approach stresses that some exogenous factors like a secular change in attitudes and minds had reduced the level of the fertility rate. Thus, the resulting reduction of the average size of families increased the spare time available for women to go on the labour market. Conversely,

the symmetric thesis puts forward arguments for the growing motivations for women to participate in the labour market with a decline in fertility as consequence. As explain D.Blanchet and S.Pennec, a lot of economic arguing about demographic behaviour and labour supply have this optic : the general rise of the employees' labour productivity which resulted in higher real wages increased the opportunity cost for women of non-working. This in turn had consequence as a general switch from the domestic to the market sphere, and the decrease in birth rates would be one of the consequences.

Another approach considers, according to a model elaborated by E.M.Falaris and H.E.Peters, that women alter the timing of the first birth and return to work in order to mitigate any adverse effects of the demographic cycle on their wages profiles. They suggest that individuals born in different phases of the demographic cycle face different potential wage profiles due to exogenous shifts in the potential supply of labour. Thus the demographic cycle is the direct cause of exogenous wage changes which, in turn, alter the labour force participation and fertility decision of women. According to this paper, the increase of labour force participation rates of mothers with young children from 1970 to the mid-eighties can be explained by the incentives to return to work more quickly for women who were born during the upswing of the demographic cycle since at that time labour supply had been scarce as a consequence, among others, of the preceding small cohorts (Great Depression 1929/32; impact of World War II), and labour demand expanded rapidly due to the high economic growth (in Europe, the upswing of the demographic cycle corresponds to the cohorts of people born between 1950 and 1965). However, according to the authors, the increase in participation rates of women during the mid-eighties until now might well have been even larger if women born during the downswing of the demographic cycle did not have incentives to delay their return to work following childbearing. These negative incentives stem from the fact that the growth in labour supply was considerably higher than in the period before because the baby boom generation (see above) had entered the labour market, which per se lowered job opportunities and depressed real wage growth.

Figure 5: Female Participation Rates by Age Groups for Selected Countries



Source : OECD Labour Force Statistics

Other factors play an important role in the development of female participation rate. One is the growing tendency for all young women to stay longer in school and at universities to improve

their educational skills. Thereafter, the interest of these women is to realize their human capital on the labour market. An other factor which contributed, in industrialised countries, to the growth of the female participation rate is the development of part-time jobs in employment. It has allowed women with children a better combination of labour participation and child care. The net increase of the share of jobs in the tertiary sector in employment has also, partly, contributed to the development of the female activity. Indeed, women are, in proportion, more numerous to work in the services sector rather than in industry or agriculture.

4.3 Specific evolution of participation rates to each countries

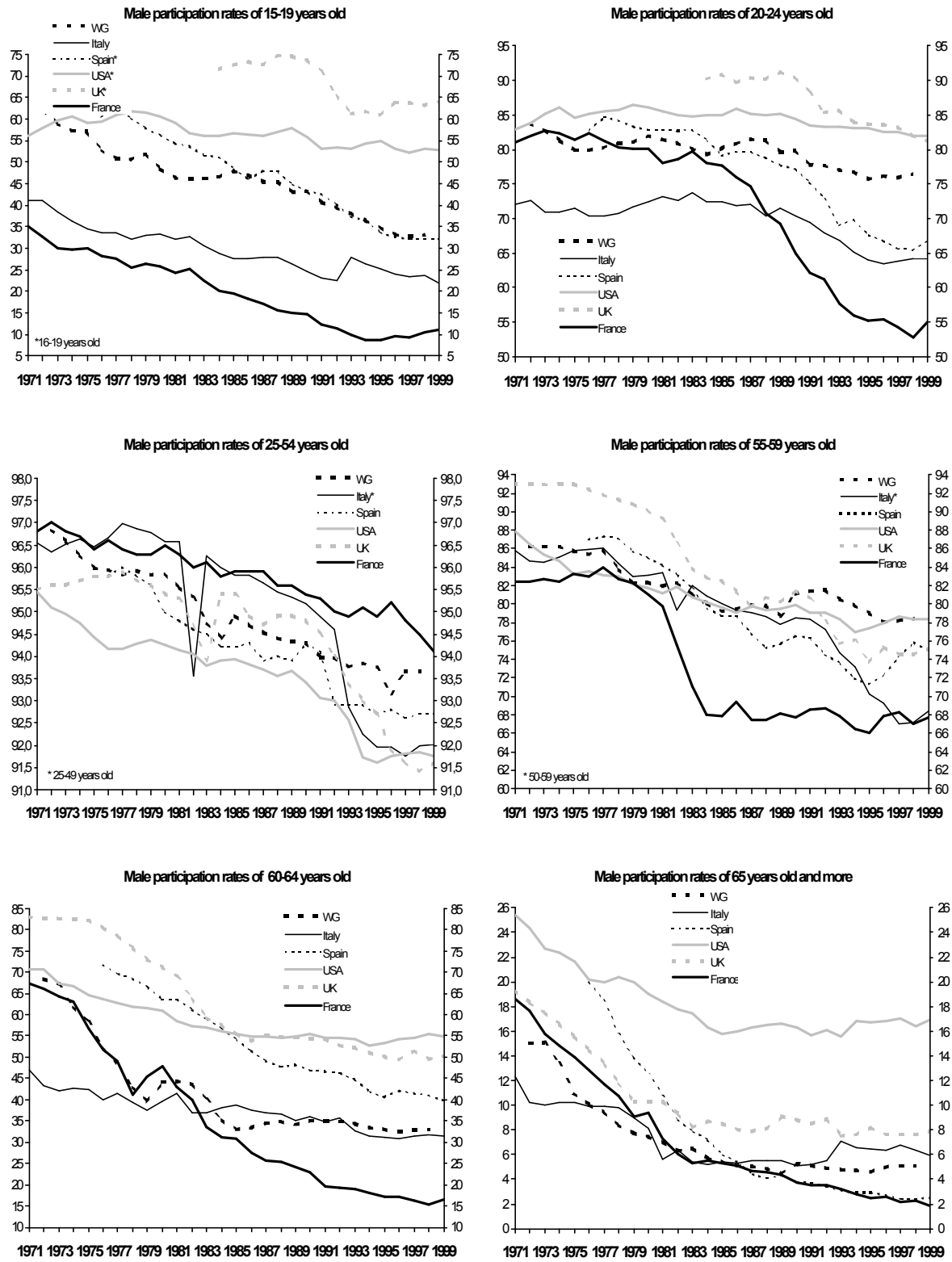
We can distinguish for our comments four groups of countries classified according to their level of working age participation rate.

a) Countries of the south of Europe (Italy and Spain) : extremely low female labour participation

Similar to the other EU-countries, , men being in extremities of the active life have low participation rates in Italy and Spain (15-24 years old and 55 years old and more). The male labour force is concentrated essentially in the prime working age (25-54 years). But the main characteristic of these two countries is the very low level of the labour force participation rates of women, especially for adult ones in comparison with other industrialised countries (around 60 % in 1999 for Italy and Spain). Moreover, we can observe that the importance of part-time employment for the total employment is very low (approximately 8% in 1999).

According to our results of an econometric estimation of the participation rate of females aged between 25 and 49 in Italy, an increase of approximately 0.8 percentage points in the participation rate induces a one point rise in the share of part-time in total employment. Thus, we can suppose that if the share of part-time jobs would grow to 18%, participation rate of Italian women aged between 25 and 49 years would be closer to the ones of other industrialised countries (passing from 60% to 68%) what would correspond to a differential of 800 000 active women in this age group in 2000.

Figure 6: Male Participation Rates for different Age Groups 1970-1999

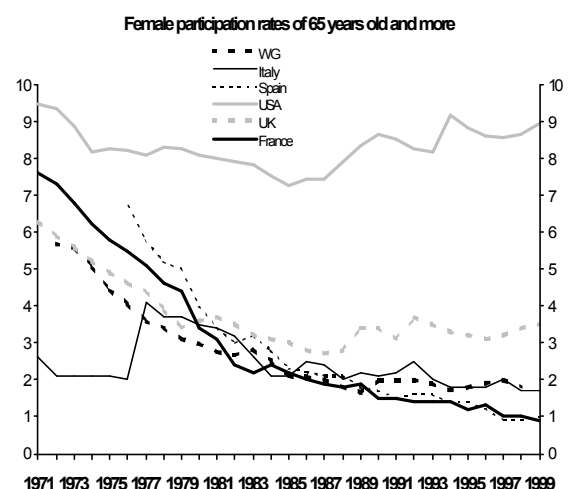
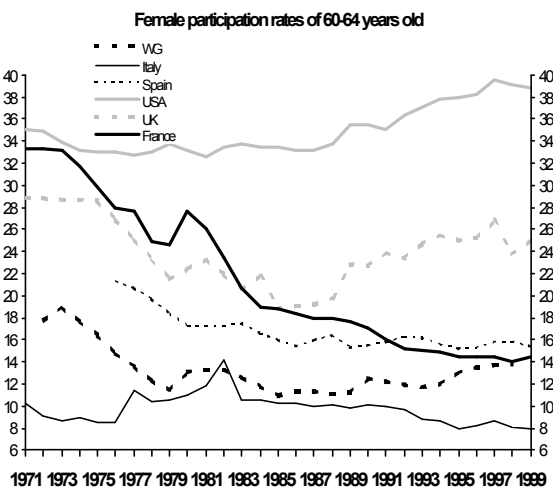
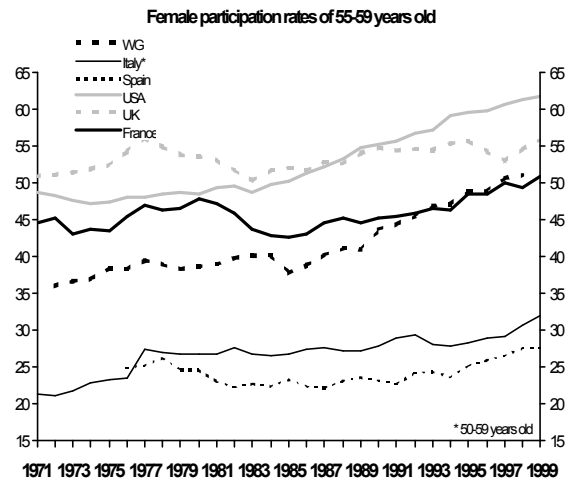
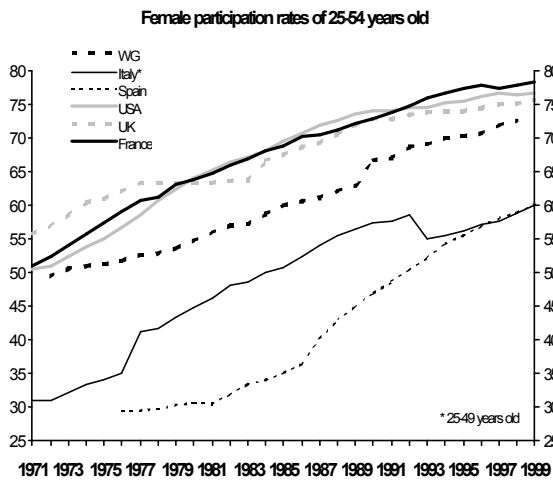
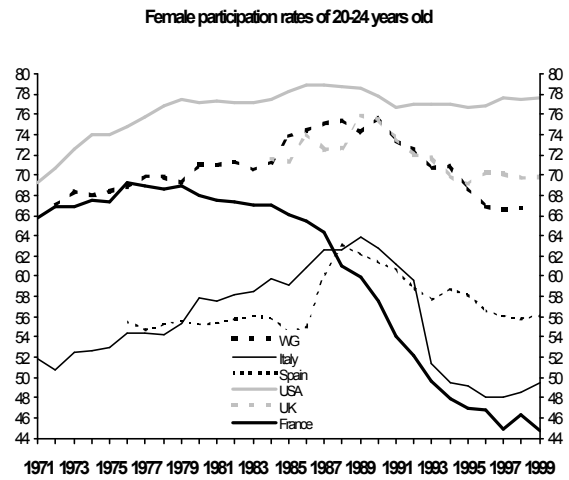
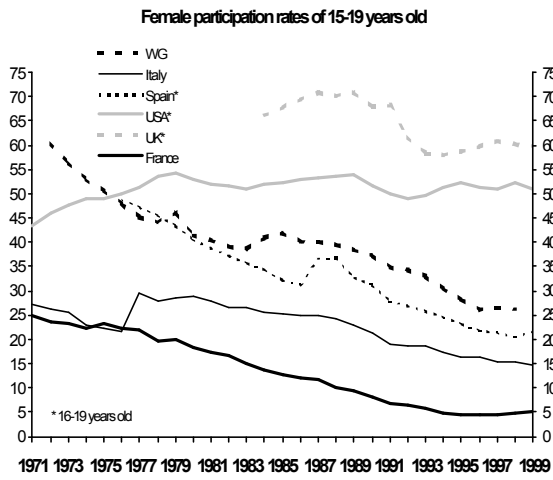


In the case of Italy and Spain, we can imagine that an encouragement to the part-time employment could favour the entry on the labour market of women that otherwise would stay outside because of the impossibility to reconcile a full time job with their traditional activities within the families.

Labour force participation rates of Spanish men aged 55 years and more have particularly declined during the last 25 years. The share of active persons in the population of men being 55-59 years old has decreased more than 15% between 1976 and 1994-1995, when the rate of unemployment has reached a record level (23.7% in 1994). Since that period, the males being 55-59 years old showed an increasing participation rate. According to econometric estimations, we conclude that this category of population is sensitive to the situation of the labour market, what explains partly the rise of participation rate of men 55-59 years old with the progressive decline of the overall rate of unemployment. We observe that for men of 60-64 years old, the participation rate has been practically divided by two, passing from more than 70 percent to 40 percent between 1976 and 1999. For men aged 65 years and more, we get the impressive observation, that their participation in the labour market has been fallen by about 90 percent in less of 25 years.

In Spain, the normal retirement age is 65, but early retirement at age 60 is permitted for those who became affiliated to SS before 1967. In 1997, more than one third of those who retire under the general scheme took advantage of this possibility. As it is explained by M.Boldrin et al., the current legislation distinguishes between two cases. The first one, representing the vast majority of those currently retiring between age 60 and 65, is the case of workers who started contributing as dependent employees to "Mutualidad Laboral" before 1967. In this case, the replacement rate is reduced by 8 percentage points for each year under age 65. The decision for a 60-65 years old person either to work further or to become early retired is focused on the table of replacement rates by age and number of years of contribution. Thus, for example, there is a different incentive to work an extra year for a person aged 60 and another aged 65, both with 34 years of contribution. In the former case, the pension increases from 56.8 to 68 percent of the benefit base, while in the latter it only increases from 98 to 100 percent.

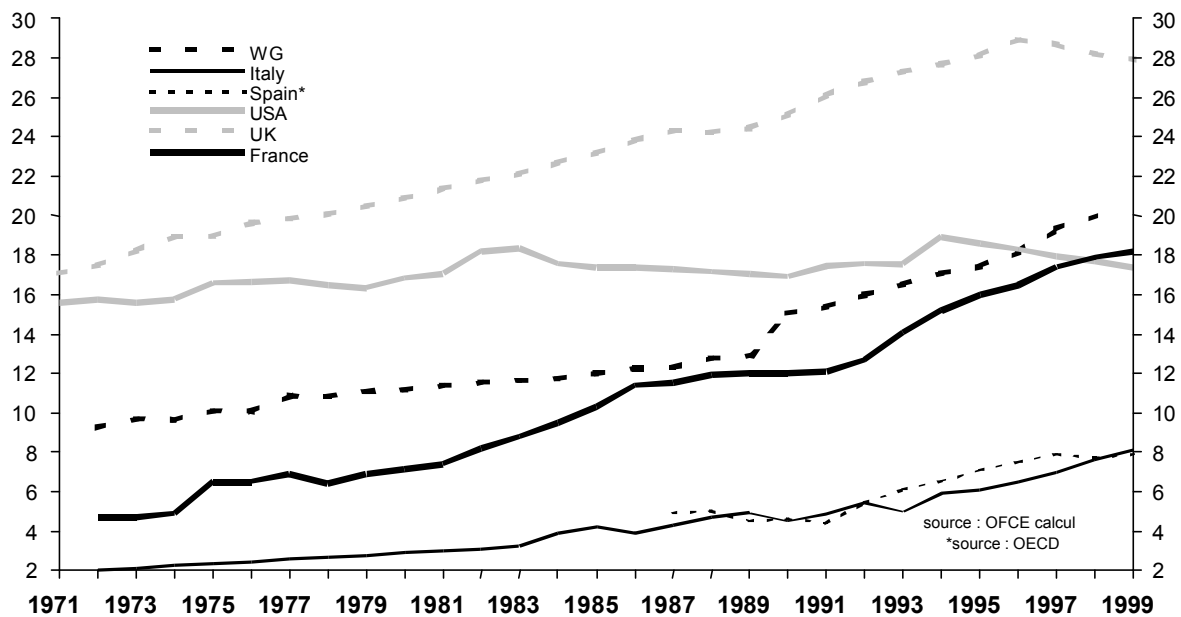
Figure 7: Female Male Participation Rates for different Age Groups 1970-1999



Source : OECD Labour Force Statistics

The second case, representing about 10 percent of the early retirees, is the case of workers with dangerous or unhealthy jobs, or workers who were laid off for industrial restructuring regulated by special legislation. In this case, no reduction applies.

Figure 8: Part-Time as % of Employment



Unless there are collective agreements that prescribe mandatory retirement, individuals may continue working after age 65. At least for those individuals who have already reached 35 years of contribution at the age of 65, there is no direct incentive for delaying retirement,. For those with less than 35 years of contribution, a very small direct incentive to postpone retirement is provided by the fact the ratio of the pension to the benefit base grows 2 percentage points per year of contribution until reaching 100 percent.

Contrary to Spain, in Italy, participation rates of men aged 60 and more have declined relatively little from 1971 to 1999. It is important to note that this age group has clearly improved its relative position in comparison with other countries. Italian men aged 60 years and more had been largely the most inactive persons in the beginning of the seventies. Nowadays, participation rates of men 60–64 years old and over 65 years are well above the ones for France and stay at the same level as in West Germany.

In Italy, two reforms of the retirement system (1992 : Amato reform and 1995 : Dini reform) continue to have an impact on participation rates of older workers. Before these reforms, the earning related pension system was characterised by two sources of benefits : old-age pensions and seniority. The old-age pension was determined by the number of contribution years (at the most 40) multiplied by 2 percent rate per year of contribution and by the reference wage (last wage for administration workers, average wage of the last five years for employees of the private sector and average income of the last ten years of activity for independent workers). The retirement age was 55 for women and 60 for men, but there was lot of derogatory rules.

The seniority benefit could be obtained in full for private workers after 35 years of contribution irrespective of the actual age. For public workers, the rules permitted to obtain full seniority benefits after 20 years of work (15 years for married women).

The Amato reform modified partially these rules. The retirement age had to be increased from 55 to 60 years for women and from 60 to 65 years for men, in the rhythm of one year each two years. The calculation of the average wage for workers of the private sector had to be done progressively on the last 10 years.

As is explained by A.Brugiavini, the second reform (Dini reform) changed more deeply the system, especially with respect to the rules of pension calculation. The contributions paid during the course of the career are fictitiously capitalised to the rhythm of GDP growth, and, in the moment of liquidation, are converted in an annual pension with a coefficient that depends on the age of departure. These coefficients are established on an actuarial basis, that takes into account the average duration of the retirement, adjusted according to the increase in life expectancy. The rise of the age of retirement to 60 years for women and to 65 years for men still holds, but it will be possible, in the new system, to retire at the age from 57 years onwards. The coefficient of the annual pension calculation increases between 57 and 65 years, but beyond 65 years remains unchanged. Finally, the liquidation remains possible before 57 years, to the applicable rate of this age, but the person has to provide 40 years of contribution.

These reforms of the Italian retirement system will have an impact in the long term on participation rates of persons being between 55 and 65 years old. The participation rate of 50-59 years old males which has fallen is expected to stabilise and even to ascend in coming

years, since few individuals will be able to provide 40 years of contribution payment before becoming 60 years old. Moreover, the Dini reform of the Italian system in standardising rules of pension calculation of the different regimes limits considerably the number of early retirements by the way of seniority pensions.

b) France : wide differences in activity rates according to age groups

In France, there is an important contrast in participation rate levels between the 25-54 age group and the others. Actually, if we have a look on the evolution of participation rates according to age group in 1999, we find that the form of the French activity curve is very specific in comparison with others industrialised countries, active persons being essentially concentrated in prime working age. The participation rates of French men and women aged between 25 and 54 are the highest of the six studied countries but inversely, participation rates of young and older French people are the lowest of industrialised countries.

Opposite to Germany, the United Kingdom and the United States where there is an important number of persons combining a job and an education (4/5 of 15-19 years old people in employment are at the same time either in school or in professional education), in Latin countries and especially in France, the low participation rates of young people correspond to a lengthening of full time studying.

Since the beginning of the seventies, there has been a surprising decline in participation rates of French men being 55 years old and elder and women being 60 years old and elder. Actually, the setting up of early retirement schemes in the sixties, their fast development since the end of the seventies and also the decrease of the legal age of retirement to 60 years in 1983 explain, to a great extent, this fall of labour force participation of elder workers.

During the seventies, as explain D.Blanchet et L.P.Pelé, measures of earlier retirement concerned workers aged between 60 and 64. The system of resource (revenue?) maintenance ensured 60 to 70% of the last income to any individual losing his job after having become 60 years old, up to the age of 65 which at that time had been the normal retirement age. This system gained considerable acceptance, covering up to 425 000 people in 1983, i.e. more than 17 % of all people aged between 60 and 64 in that year. It is in this context that retirement at the age of 60 years was introduced in 1983 with the consequence that no break in the labour force

participation rate of this age group could be observed in 1983. The introduction of retirement at age 60 was initially expected to definitely eliminate the necessity of any form of early retirement. But, with the rise of the unemployment rate, it became unavoidable to reintroduce preretirement schemes even for the age group 55-59 years. Between 1982 and 1983, the number of early retirées aged less than 60 years increased by 166 000 persons and reached more than 400 000 in 1987. In 1999, there had been around 460 000 early retirées, representing 17% of people aged between 55 and 59. These massive measures of earlier retirement and the legal age of retirement at 60 years explain clearly the very low labour force participation rate of French people aged 55 and more.

It is important to note that the reform of 1993 of the general regime, by increasing progressively the number of necessary contribution years from 37.5 years to 40 years, should per se have an positive impact on the participation rate of people aged between 60 and 64 years, since few of them are able to gather 40 years of contribution until the age of 60 years. Moreover, a progressive decline in earlier retirement numbers, following the decrease of the unemployment rate and a general improvement in labour market conditions, will lead to a rise of the labour force participation rate of 55-59 years old people.

c) West Germany : a level of activity among Latin and Anglo-Saxon countries

In West Germany, activity behaviours are close to Latin countries for oldest age groups of the labour force (60 years and more) and quite similar to UK and USA for the 16-59 years old population. Actually, in comparison with other industrialised countries, the labour force participation rates of West Germans are characterised by relatively high levels for young and for people in prime working age and low levels for oldest people.

The high level of the labour force participation of young people in Germany can be attributed to two interrelated phenomena. The first one is the importance of the German educational system which has a close institutional link to the labour market, that means that vocational training is being legally tied to a job (“Duales System”), even in part-time. The other reason, which is in

part dependant upon the first one, is the very low unemployment rate of young people in comparison with other industrialised countries.

The rupture of participation rates between 55-59 and 60-64 years old people (-41 percentage points for men and -37 percentage points for women in 1998) can be explained by the introduction of a flexible retirement system since 1972, and by disability schemes.

Before that time, as is shown by A.Börsch-Supan and R.Schnabel, the system was very inflexible and only permitted retirement at age 65, except for disability which, however, made up for roughly 50 percent of new retirement entries. In the landmark 1972 pension reform, the normal retirement age was still 65 years. But four derogatory dispositions permitted the pension payment before the age of 65 without reduction : at 63 years old after 35 years of contribution, at 60 years old for women and unemployed people having 15 years of contribution, at 60 years old in case of disability after 35 years of contribution.

In the 1992 social security reform, the legal retirement age is still 65 years, but the reform introduces a cut in pension payments for earlier retirement, except for disability pensions. The 1992 reform will only be fully effective in 2012. Nevertheless, it will be still possible to obtain the pension payment before becoming 65 years old, but for each year of earlier retirement benefits will be reduced by 3.6 percent per year. The 1992 reform also introduced a reward for later retirement in a systematic way. For each year the retirement is postponed beyond the age of 65 , the pension is increased by an additional 6 percent.

Consequently, the 1992 reform in shaping off partly the economic benefits granted by the flexible retirement system of 1972 will per se have a progressively rising effect on the participation rates of men and women in the age group 60-64 years. Moreover, the increase of the pension of 6 percent for each year retirement is postponed beyond the age of 65 years old could incite a part of oldest workers to retire after the age of 65 years and thus might increase the participation rates of this age group.

d) United Kingdom and United States : a high activity

The labour force participation rates of these two Anglo-Saxons countries can be characterised by two majors points : First, a high level of the overall activity, and second a rather evenly distributed activity behaviour by age. Actually, unlike France, in the United States and in the United Kingdom, there are no important breaks between participation rates of different generations of the population in working-age. If we have a look on the participation rates by generation in 1999, we observe that the form of the curve is very smoothed, participation rates among the young and the old being very high in comparison with other countries.

In the United Kingdom and in the United States, the high level of labour force participation among young people is closely linked to the number of persons who are at the same time in the educational system and in employment. In this category, we can distinguish two groups : the first one, representing the majority of this category, consists of young people studying at high schools and universities full time and, at the same time, working part-time to earn an income to finance their studies. The second one consists of young people who work and follow part-time studies. For example, in the United Kingdom, it corresponds to the modernized apprenticeship and the colleges-for-further-education system.

The comparably high participation rates of British and American women are the result of many factors. There are three which can broadly explain the high level of women activity. The first one is the low unemployment rate in these two countries inciting women to work or to look for a job. The second one is the high level of part-time employment, especially in the United Kingdom, permitting many women to combine a job with family activities. The last one is the high importance of employment in the service sector as compared with the rest of the economy in the United States and the United Kingdom. Women are overrepresented in the service sector and underrepresented in industry or agriculture (in 1998²³, USA : 73.8%; UK : 71.4%; France : 69.2%; Germany : 62.6% ; Spain : 61.7% and Italy :60.8% (figures given do relate to the percentage of women in service sector?)).

²³ These figures come from OECD Employment Outlook of June 2000

In the United Kingdom, even if participation rates of males aged 55 and more have strongly decreased during the last three decades, they still remain higher than in other large European countries. The important fall of the participation rate of elder workers had been in the early eighties. In this period, as explain R.Blundell and P.Johnson, the loss of many jobs in traditional industries where there had been a predominance of elder workers played an important role in the initial reduction of participation rates of men aged 55 and more, since they never recovered with the economic upturn since the latter was fed mainly by new industries at the expense of traditional lines.

In the United Kingdom, the basis public pension system is a Beveridgian regime which pays a lump sum. The age of retirement is 65 years for men and 60 years for women (65 years for the latter from 2020 onwards), and the full pension is obtained after 44 years of contribution for men and 39 years for women. The second part of the old age pension system is the State Earnings Related Pension Scheme (SERPS). But, in the mid-nineties, about three quarters of the workforce were “contracted out” of the SERPS into private occupational or personal pensions.

The fall of participation rates of males aged between 55 and 64 years since the second half of the seventies, can be explained, to a large extent, by the growth in the number of individuals aged between 55 and 65 years who are receiving benefits initially designed for the long term sick and disabled. Invalidity Benefit (IVB) is a contributory benefit payable to long term sick individuals who can show they are incapable to work due to illness or disablement and who have been so far at least 28 weeks. According to R.Disney and S.Webb, the growth in the number of people being in receipt of IVB appears to be related directly to the growth in unemployment rates. Given this remark and the fact that around 23 % of males aged between 60 and 64 years were in receipt of IVB in 1999, we can suppose that IVB indeed has been used as an early retirement vehicle.

The legal pension age for women is five years lower than that for men, but a higher proportion of women work beyond their official pension age. According to R.Blundell and P.Johnson, there are three major reasons for this. One is that there is some tendency for husbands and wives to retire at about the same time. A second is that some occupational (employers?/private?) pension schemes have regular leaving ages for both men and women of

62 or 63. Finally, because many women reach the age of 60 years without entitlement to a full basic pension, they have to work more years in order to raise their pension.

The activity behaviour of American elder people differs from the one in the other countries. Actually, labour force participation rates of people aged 55 years and more are much higher than in the large European countries, especially for women. While in all studied countries the female participation rate for the age group 60-64 years has decreased since the beginning of the seventies, in the United States, this rate has slightly increased, reaching 39% in 1999 (25% in UK, 15.5% in Spain, 14.5% in France, 14% in West Germany and 8% In Italy).

For men, there has been a decrease in labour force participation rates of older workers, but not to the same extent as in other countries. Today, the participation rate of men aged 55 years and more is higher than in the other large European countries.

If we have a look on the level of participation rates of persons aged 65 years and more, there is an outstanding difference between the United States (12.3%) and the other countries studied (5.3% in UK, 3.4% in Italy, 3% in West Germany, 1.6% in Spain and 1.3% in France).

The American pension system is characterised by a mandatory public regime, the OASDI (Old Age, Survivors and Disability Insurance), and facultative private regimes. In the public regime, the normal age of retirement is 65 years. But it is possible to obtain the pension payment from 62 years onwards, with a reduction of 6.66% per year. A departure after the normal age increase the pension amount by 5.5% per year. An American worker must contribute to the public insurance system at least 10 years to obtain a pension.

In 1983, a reform has taken place which introduced an increase of the normal retirement age from 65 to 67 years, for all people reaching the age of 62 years between 2000 and 2022. Moreover, the normal retirement age will rise from 65 to 66 years between 2000 and 2005, and from 66 to 67 years between 2017 and 2022. It shall still be possible to obtain the pension payment at the age 62, but the reduction of the pension will again be 6.66% per year for less than 3 years of anticipation of the legal retirement age and 5% per year for more than 3 years of anticipation. In addition, the incentive to obtain the pension payment after the age of 67 years will be made stronger : from 5.5% per year, the increase in the pension will be raised to 8% per year for the generation born in 1943. (?) (generations born after/until 1943??)

To sum up, the high labour force participation rates of elder persons in the US, which can be explained partly by only very limited possibilities to leave the labour force before the age of 65 years and obtain a full pension, should continue to increase in the future with the rise of the normal retirement age during the next twenty years.

5. The Labour Force Projections

We have derived labour force projections from the estimations of participation rates by sex and age groups. The participation rates we obtained are in accordance with the definition of the International Labour Office. Thus, Employment and Unemployment correspond to very precise objective criteria. In order to obtain projections of the labour force by sex and age, we apply the estimated participation rates to the demographic projections.

5.1 The Demographic Projections

For France, Italy, Spain and United Kingdom, we retained three demographic scenarios elaborated by Eurostat and one scenario prepared by a national institute of each country. For United States and Germany, we utilised respectively three demographic scenarios of the United States Census Bureau and three demographic scenarios of the Statistisches Bundesamt which distinguish between West and East Germany.

These projections follow different assumptions concerning the future evolution of the three factors which condition demographic changes : fertility, mortality (or life expectancy) and international migrations.

The Eurostat high scenario can be interpreted as the most optimistic version of future population growth (high fertility rate, high life expectancy at birth , high net immigration). Accordingly, this scenario will result in the highest estimated level of the labour force.

At the opposite, the low scenario is the pessimistic version with, for example, low net immigration, declining (France), stagnating (United Kingdom) or only marginally increasing (Italy, Spain) birth rates and a rather weak rise in average life expectancy. Hence under these conditions we will get more or less depressed estimates of the future labour force..

The most probable demographic scenarios seem to us the Eurostat baseline scenario and the national scenarios, which have in common very moderate demographic assumptions. These two scenarios are rather similar in the assumption for the fertility rate and for life expectancy. However, there is a difference in the assumptions for net immigration, except for France. For United Kingdom, Italy and Spain, assumptions of net immigration are higher in the Eurostat baseline scenario than in the national scenario.

Table 7: Demographic Assumptions for the Population Projections of Eurostat and the National Institute of each Country

| Assumptions | Scenarios | France | | | | | | United Kingdom | | | | | |
|------------------------------------|----------------------------|--------|------|------|------|------|------|----------------|------|------|------|------|------|
| | | 1999 | 2000 | 2005 | 2010 | 2015 | 2020 | 1999 | 2000 | 2005 | 2010 | 2015 | 2020 |
| Net migration (1000) | Eurostat low scenario | 21.1 | 20.4 | 25.2 | 30.0 | 30.0 | 30.0 | 19.7 | 16.2 | 13.1 | 20.0 | 20.0 | 20.0 |
| | Eurostat high scenario | 79.4 | 79.8 | 74.9 | 70.0 | 70.0 | 70.0 | 75.5 | 73.0 | 69.0 | 70.0 | 70.0 | 70.0 |
| | Eurostat baseline scenario | 50.2 | 50.1 | 50.0 | 50.0 | 50.0 | 50.0 | 44.4 | 38.3 | 37.9 | 45.0 | 45.0 | 45.0 |
| | National scenario | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 40.0 | 15.0 | 0.0 |
| Total fertility rate | Eurostat low scenario | 1.62 | 1.62 | 1.59 | 1.55 | 1.53 | 1.55 | 1.59 | 1.59 | 1.59 | 1.59 | 1.60 | 1.60 |
| | Eurostat high scenario | 1.93 | 1.97 | 2.06 | 2.09 | 2.09 | 2.10 | 1.91 | 1.94 | 2.04 | 2.08 | 2.09 | 2.10 |
| | Eurostat baseline scenario | 1.72 | 1.73 | 1.78 | 1.79 | 1.79 | 1.80 | 1.72 | 1.72 | 1.73 | 1.75 | 1.77 | 1.79 |
| | National scenario | ... | 1.79 | 1.80 | 1.80 | 1.80 | 1.80 | 1.75 | 1.76 | 1.79 | 1.80 | 1.80 | 1.80 |
| Life expectancy at birth — males | Eurostat low scenario | 74.0 | 74.0 | 74.6 | 75.0 | 75.4 | 75.6 | 74.3 | 74.4 | 75.0 | 75.4 | 75.7 | 76.0 |
| | Eurostat high scenario | 75.4 | 75.6 | 77.0 | 78.2 | 79.3 | 80.3 | 75.7 | 76.0 | 77.2 | 78.4 | 79.5 | 80.4 |
| | Eurostat baseline scenario | 74.7 | 74.8 | 75.8 | 76.8 | 77.6 | 78.3 | 75.0 | 75.2 | 76.1 | 77.0 | 77.7 | 78.3 |
| | National scenario | ... | 74.6 | 75.5 | 76.4 | 77.2 | 78.0 | 75.0 | 75.1 | 76.0 | 76.6 | 77.2 | 77.6 |
| Life expectancy at birth — females | Eurostat low scenario | 82.1 | 82.2 | 82.7 | 83.1 | 83.4 | 83.6 | 79.6 | 79.7 | 80.1 | 80.5 | 80.8 | 81.0 |
| | Eurostat high scenario | 83.1 | 83.2 | 84.3 | 85.2 | 86.0 | 86.6 | 80.8 | 81.0 | 82.0 | 82.9 | 83.8 | 84.6 |
| | Eurostat baseline scenario | 82.7 | 82.8 | 83.6 | 84.2 | 84.9 | 85.4 | 80.2 | 80.3 | 81.1 | 81.9 | 82.6 | 83.2 |
| | National scenario | ... | 83.0 | 83.9 | 84.6 | 85.7 | 86.5 | 80.0 | 80.1 | 80.8 | 81.5 | 82.1 | 82.6 |

| | | Italy | | | | | | Spain | | | | | |
|------------------------------------|----------------------------|-------|------|------|-------|-------|-------|-------|------|------|------|------|------|
| Assumptions | Scenarios | 1999 | 2000 | 2005 | 2010 | 2015 | 2020 | 1999 | 2000 | 2005 | 2010 | 2015 | 2020 |
| Net migration (1000) | Eurostat low scenario | 20.0 | 20.0 | 40.0 | 60.0 | 60.0 | 60.0 | 5.5 | 4.9 | 22.5 | 40.0 | 40.0 | 40.0 |
| | Eurostat high scenario | 80.0 | 80.0 | 90.0 | 100.0 | 100.0 | 100.0 | 55.0 | 57.2 | 72.4 | 80.0 | 80.0 | 80.0 |
| | Eurostat baseline scenario | 50.0 | 50.0 | 65.0 | 80.0 | 80.0 | 80.0 | 30.3 | 31.1 | 45.5 | 60.0 | 60.0 | 60.0 |
| | National Scenario | 49.9 | 50.0 | 50.9 | 52.4 | 54.3 | 56.1 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total fertility rate | Eurostat low scenario | 1.19 | 1.20 | 1.21 | 1.22 | 1.25 | 1.27 | 1.22 | 1.22 | 1.23 | 1.24 | 1.26 | 1.28 |
| | Eurostat high scenario | 1.53 | 1.58 | 1.72 | 1.77 | 1.79 | 1.80 | 1.55 | 1.59 | 1.72 | 1.77 | 1.79 | 1.80 |
| | Eurostat baseline scenario | 1.35 | 1.37 | 1.45 | 1.48 | 1.49 | 1.50 | 1.34 | 1.36 | 1.43 | 1.47 | 1.48 | 1.50 |
| | National scenario | 1.29 | 1.31 | 1.43 | 1.46 | 1.46 | 1.45 | 1.24 | 1.25 | 1.32 | 1.43 | 1.56 | 1.70 |
| Life expectancy at birth — males | Eurostat low scenario | 74.3 | 74.3 | 74.7 | 75.1 | 75.4 | 75.6 | 73.6 | 73.6 | 73.8 | 74.0 | 74.3 | 74.5 |
| | Eurostat high scenario | 75.8 | 75.9 | 77.2 | 78.4 | 79.4 | 80.4 | 75.2 | 75.3 | 76.7 | 77.9 | 78.9 | 79.8 |
| | Eurostat baseline scenario | 75.1 | 75.1 | 76.1 | 76.9 | 77.7 | 78.3 | 74.4 | 74.4 | 75.0 | 75.5 | 76.1 | 76.7 |
| | National scenario | 75.7 | 75.9 | 76.6 | 77.1 | 77.7 | 78.3 | 74.0 | 74.1 | 74.8 | 75.3 | 75.7 | 76.0 |
| Life expectancy at birth — females | Eurostat low scenario | 81.1 | 81.1 | 81.4 | 81.7 | 82.0 | 82.1 | 81.2 | 81.2 | 81.6 | 81.8 | 82.1 | 82.2 |
| | Eurostat high scenario | 82.1 | 82.2 | 83.1 | 84.0 | 84.8 | 85.4 | 82.2 | 82.3 | 83.2 | 84.1 | 84.8 | 85.4 |
| | Eurostat baseline scenario | 81.7 | 81.7 | 82.4 | 83.0 | 83.6 | 84.0 | 81.7 | 81.8 | 82.5 | 83.1 | 83.6 | 84.0 |
| | National scenario | 82.2 | 82.3 | 83.0 | 83.5 | 84.1 | 84.7 | 81.7 | 81.9 | 82.5 | 83.0 | 83.4 | 83.7 |

The immigrant population is very important in United States. Thus the US Census Bureau take into account, for its projection of resident population, the differences of demographic behaviour among White, Black, American Indian and Asian people and distinguishes, for each category of these sub-populations, between Hispanic and other origins. Thus, the US Census Bureau makes assumptions for net immigration, fertility rates and life expectancy relating to eight groups of the resident population. We have the demographic assumptions for 1999 and for 2025 only. During the period between these two years, the demographic key figures mentioned above are assumed to follow a (linear?) trend.

Table 8: Demographic Assumptions for the Population Projections of the US Census Bureau

| Assumptions | Scenarios | 1999 | 2025 |
|------------------------------------|------------------|-------------|-------------|
| Yearly Net Migrations (1000) | Lowest | 739 | 183 |
| | Highest | 1191 | 2268 |
| | Middle | 954 | 912 |
| Total Fertility Rate | Lowest | 2.035.8 | 1.865.5 |
| | Highest | 2.059.2 | 2.557.5 |
| | Middle | 2.047.5 | 2.206.8 |
| Life Expectancy at Birth - males | Lowest | 74.0 | 76.5 |
| | Highest | 74.1 | 79.1 |
| | Middle | 74.1 | 77.6 |
| Life Expectancy at Birth - females | Lowest | 79.7 | 82.6 |
| | Highest | 79.8 | 84.6 |
| | Middle | 79.8 | 83.6 |

Demographic projections of the Statistisches Bundesamt are separating between West and East Germany. Assumptions relating to yearly net immigration are for total Germany. Concerning the total fertility rate, demographers suppose a stagnation from 1999 to 2020 in the three scenarios for West Germany. For East Germany the most likely assumption is an progressive increase until the same value as in West Germany is reached.

The only difference between the baseline and the high scenario relates to life expectancy. Actually, in the high scenario, authors consider that life expectancy at birth in 2050 will increase by two years more than in the baseline scenario.

Table 9: Demographic Assumptions for Population Projections in Germany

| Assumptions | Scenarios | 1999 | 2003 | 2005 | 2009 | 2010-2019 | 2020-2029 |
|-----------------------------|-------------------|------|------|------|------|-----------|-----------|
| Yearly net migration (1000) | Low scenario | 90 | 150 | 150 | 140 | 130 | 115 |
| | High scenario | 90 | 150 | 190 | 240 | 230 | 215 |
| | Baseline scenario | 90 | 150 | 190 | 240 | 230 | 215 |
| Total fertility rate | Low scenario | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 |
| | High scenario | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 |
| | Baseline scenario | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 |

Table 10: Demographic Assumptions for Population Projections in Germany

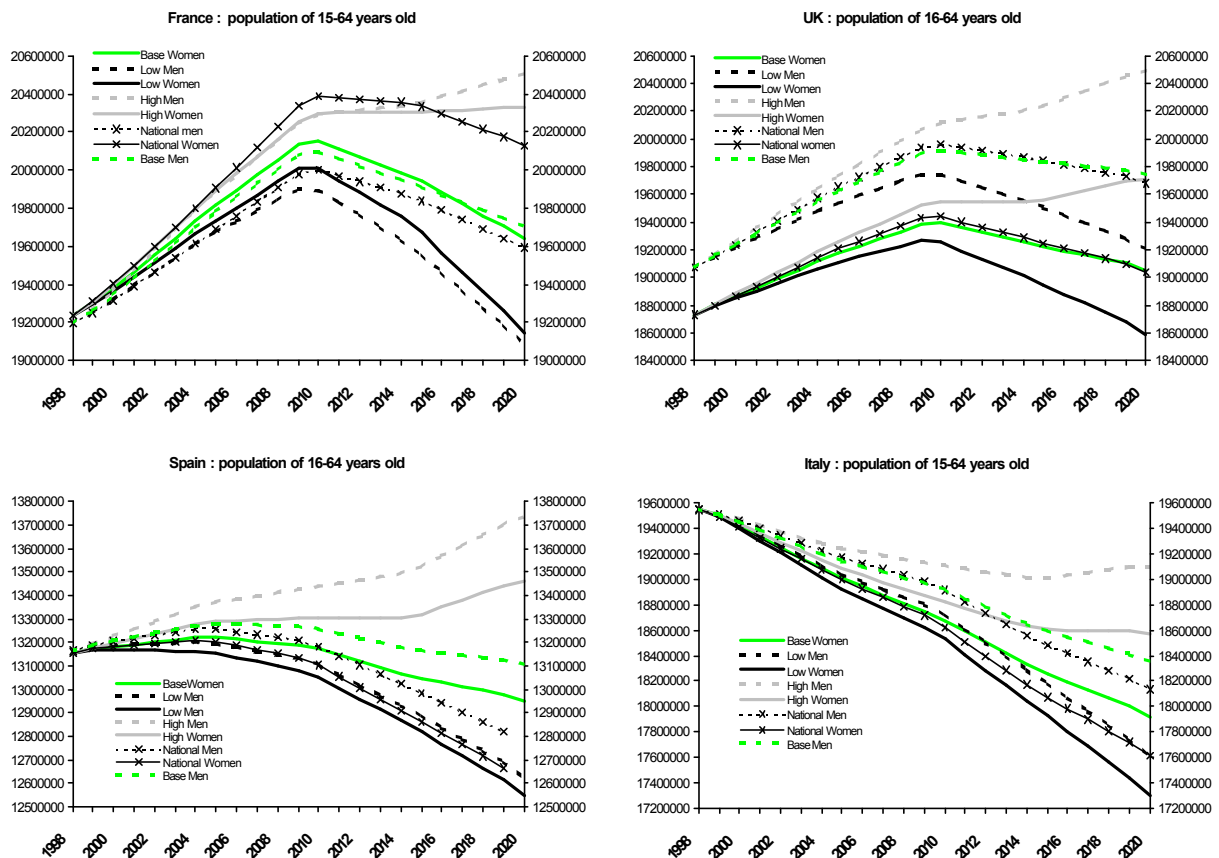
| | | | 1998 | 2025 |
|-------------------------------|-----------------|-------------------|------|------|
| Expectancy at birth - males | ex West Germany | Low scenario | 74,4 | 76,2 |
| | | Baseline scenario | 74,4 | 76,2 |
| | ex East Germany | Low scenario | 72,4 | 76,2 |
| | | Baseline scenario | 72,4 | 76,2 |
| Expectancy at birth - females | ex West Germany | Low scenario | 80,5 | 82,6 |
| | | Baseline scenario | 80,5 | 82,6 |
| | ex East Germany | Low scenario | 79,5 | 82,6 |
| | | Baseline scenario | 79,5 | 82,6 |

The three population projection scenarios show demographic assumptions within a rather narrow range. The only difference between the baseline and the low scenario concerns the level of yearly net immigration. The change in demographic projections between the baseline and the high scenario focuses at the life expectancy at birth.

As to the future population development in these four countries, we can distinguish two groups. The first one consists of France and the United Kingdom. In these two countries the overall population growth will be checked in a rather abrupt manner beyond the year 2010 (see chart).

In the United Kingdom this reversal would be significantly less pronounced than in France. Indeed, except in the case of the high scenario of Eurostat, the positive growth rate of the working age population would suddenly become negative beyond 2010. This break in 2010 corresponds to the date where the outflow from the labour force, namely the first generation of the baby-boom, born in 1945, reaches the age of 65 years. Contrary to this, the inflow into the labour force will be determined by the generations of the second half of the nineties, a period of very low fertility, who will then reach working age. Beyond 2010, the annual decrease in the number of 15-64 years old people is more or less constant.

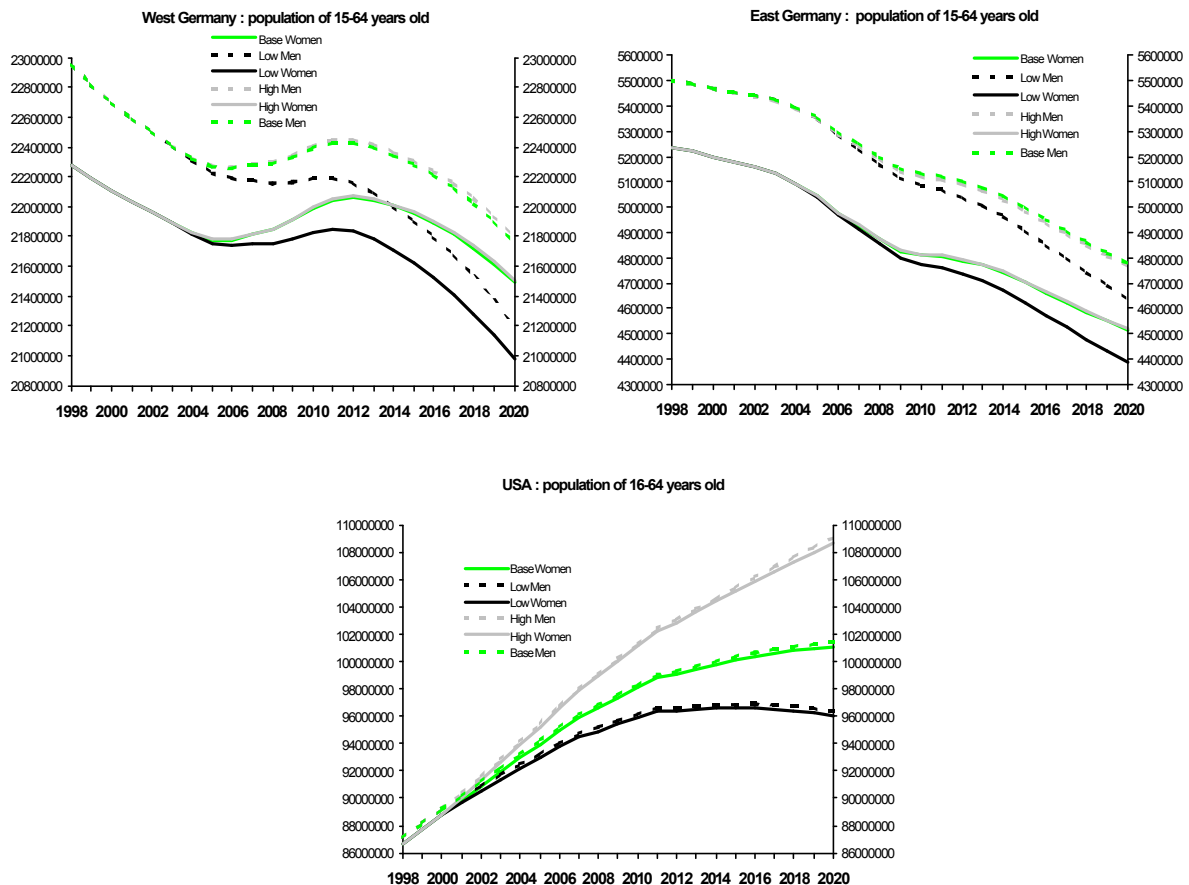
Figure 9: Projections of 15-64 years old Population According to Different Assumptions



The second group consists of Spain and Italy. For these two countries, there is no obvious demographic break between 1998 and 2020. The most essential result for these two countries is that the fall of the population in working age accelerates with years. In the case of Italy, the demographic outlook will become in any case particularly worrying: the shrinking of the working age population is very pronounced. This decline can be explained, on the one hand, by

the pronatalistic policy during the Mussolini era, and, on the other hand, by the steep fall of the fertility rate in the second half of seventies.

Figure 10 : Projections of 15-64 years old Population According to Different Assumptions



In Spain, the marked decline in birth rates has been less pronounced and considerably later than in Italy. A special feature is that Spain experienced already a phase of low birth rates during the period of its civil war in the thirties. It explains that the population in working age will remain almost constant up to 2010 and then shall decrease more and more fast beyond this date.

The evolution of the population in working age in West Germany for the next twenty years differs in many respects from the one in the United Kingdom and in the Latin countries. We can distinguish three periods. From 1998 to 2007, the number of persons aged 15-64 years is expected to decrease since the very numerous individuals born between 1933 and 1941 (strong pronatalistic policy during the “Third Reich”) will reach retirement age (65 years). From 2007 to 2012, the assumed high net yearly immigrations and the comparably low outflow from the

working age population due to the fact that the smaller generations born between 1942 and 1947 will leave the work force should have a positive impact on the evolution of the demographic component of labour supply. Starting 2013, the decrease of the work force will accelerate since the baby-boom generation 1948-1968 is reaching gradually the age of inactivity.

In Eastern Germany, the decline of the working age population would be much more pronounced in the next twenty years than in Western Germany. Among others, the world-wide unique decline in Eastern German birth rates after reunification which has been checked since 1995, but has since then risen only gradually, as well as the lasting net emigration to western Germany, are the main reasons for this.

In the United States, the ageing of the population is much less pronounced than in European countries. Accordingly, if we do not take into account the high scenario of Eurostat which seems to be particularly optimistic, all the large European countries would experience a marked decrease in their working age population during the two coming decades. In the United States, the only marginal ageing of the population would have to be translated into a very moderate slowing down of the growth rate of the working age population. This marginal ageing of the American population is largely due to the influence of immigration into the United States. The immigrant populations as a rule show a much better age structure (preponderance of young adults and children), and they will have, at least after some years of stay in the US, a higher birth rate than the domestic population. In 1965, the law on immigration has been revised and the system of quotas by nationality instituting a preference in favour of Anglo-Saxon countries has been abolished, thereby boosting immigration. From 1965 until now, the number of legal immigrants has gradually risen from 300 000 to approximately 1 million per year, these immigrants being by more than 80% of Asiatic or Hispanic origin. This has to be amended by a fast growing number of illegal immigrants mainly from Mexico. According to the assumptions of the baseline scenario, the net yearly immigration should vary between 910 000 persons and 950 000 persons from 1999 to 2025 which seems to be a rather conservative hypothesis. Thus, an important part of the growth of the population in working age is due to immigration.

5.2.2 Participation Rate Estimations

In order to obtain labour force projections for the six countries, we have estimated econometric equations determining participation rates by sex and age groups. The activity behaviour differs between countries, but they are also differences between age groups and sex in the same country. So we choose six age groups (15-19, 20-24, 25-54, 55-59, 60-64, 65+). Thus, we have twelve estimations for each country. (c.f. annex)

The estimated participation rates are decomposed into a more technical term, namely a logistic trend (with upper and lower limits), and into a compound economic term including the unemployment rate, the early retirement rate and the share of part-time in total employment.

$$PR_{ij} = (1+a1*UR+a6*ERR+a7*PTE)*(a2+a3*\exp(a4+a5*time))/(1+\exp(a4+a5*time))$$

where PR is the participation rate , $i = \text{age group} = \{1, \dots, 6\}$ and $j = \text{sex} = \{1, 2\}$, UR the unemployment rate, ERR the early retirement rate (= part of early retirees in age group), PTE the percentage of part time in total employment, $a2$ is the estimated lower limit of the participation rate, $a3$ is the estimated upper limit of the participation rate, $a5$ represents the estimated speed of diffusion of activity behaviour, $a4$ is an initial condition, but the estimate for $(-a4/a5)$ coincides with the year of inflexion in the evolution of participation rate.

Factors influencing the participation rates according to age and sex are very numerous as well as rather heterogenous (cultural, demographic or socio-economic). The logistic trend is therefore supposed to catch all phenomena that have an important impact on the development of participation rates, over and above the included variables unemployment rate, early retirement measures and part time work. Moreover, for forecasting purposes, a logistic trend, by capturing the effects of a large number of variables not included in the econometric analysis, allows to limit the number of assumptions considerably.

The coefficient $a6$ has to capture the impact of earlier retirement measures on participation rates of the elder work force. Since the number of early retirées is not available for all countries, we could take it into account explicitly for France and West Germany only.

The coefficient a_7 shows the contribution of the share of part time in total employment to the explanation of female participation rates, notwithstanding the fact that both variables are heavily interrelated, i.e. are generated by the same labour market sub-system.

The coefficient a_1 is thought to measure the responsiveness of the participation rate to the unemployment rate. Some persons (especially young and elder members of the work force or married women) adjust their activity behaviour according to the situation on the labour market, represented by the variable unemployment rate. The prospective return to full employment in the European economy should therefore, via the responsiveness of the participation rate to the unemployment rate, increase future labour supply. Indeed, inactive persons who are sensitive to the improvement in the situation on the labour market, are going to look for a full or part-time job. This contributes to the enlargement of the labour force and thus, per se, delays the return to full employment. Hence, the value of the coefficient a_1 should measure the fluctuation effect (? cyclical impact?) on the activity level.

For series with a break in the trend or an "accident" of data (?), we have introduced an indicator variable. This variable had been either constructed as an additive to the first term containing UR, ERR and PTE or, alternatively, included into the logistic trend.

5.3.3 Results of labour force projections

The labour force projections up to 2020 are obtained as follows : for each age and sex group, the projected participation rates are applied to the demographic projections.

For each country, we have therefore :

$$TLF_t = \sum_{\substack{i=1 \\ j=1}}^{\substack{i=6 \\ j=2}} LF_{ijt} = \sum_{\substack{i=1 \\ j=1}}^{\substack{i=6 \\ j=2}} (PR_{ijt} * POP_{ijt})$$

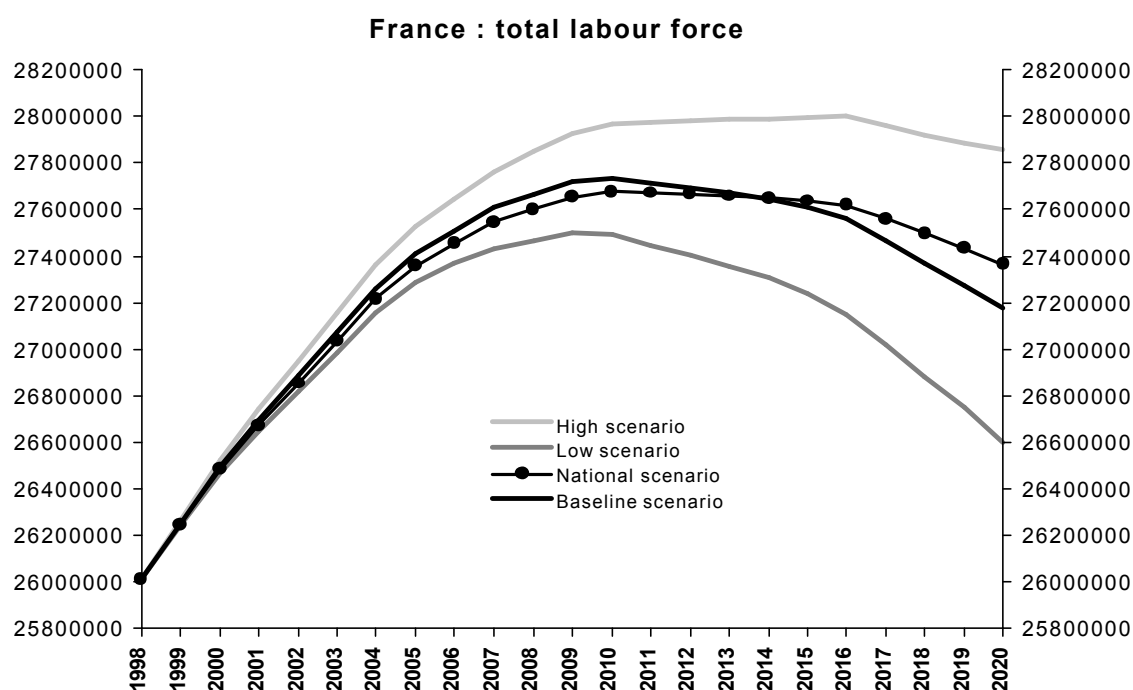
Where TLF is the total labour force, LF_{ij} is the labour force by age group and sex, PR_{ij} is the participation rate by age group and sex, and POP_{ij} is the population by age group and sex.

For each country, there are several (three or four) demographic scenarios. They give boundaries for the labour force evolutions, the upper limit being the high scenario, the lower limit being the low scenario.

France

Following the baseline scenario of Eurostat, four periods may be distinguished in the future development of the French work force.

Figure 11



From 1998 to 2005, the rate of increase of labour supply will remain high. All factors will have a positive impact on the work force. The demographic component alone will allow the active labour force to increase by 830 000 persons. Moreover, the assumed/forecast (?) decrease of the unemployment rate will give an incentive to more and more people entering the labour market. This effect will be concentrated on younger and elder persons, two groups whose labour participation responsiveness to the unemployment rate is high. The cumulative effect is estimated to amount to 250 000 persons. Two other factors will allow the labour force to increase even further. The first is the positive trend element in participation rates, essentially

the expected further rise in the participation rate of adult women. The second is the increase in the participation rate of persons in the age group 55-59 years under the assumption, that the early retirement and the job search (?) exemption schemes will be cut off in view of the lower unemployment rate. The total effect of both factors will amount to another 310 000 persons between 1998 and 2005.

The second period covers the years 2005 to 2010. This period is characterised by a marked slow down in the rate of increase of the labour force. Only the upward trend of the participation rate will continue to make a persistent contribution to the increase in labour supply. The positive reaction of labour force to unemployment will be of less importance. Under the assumptions of our model, the equilibrium unemployment rate of 5% will be reached in 2007. Thus the reaction to unemployment will play a role only in the first two years of the period. The positive effect from demographics will vanish, since the already more numerous first post-war generations will enter the 55-59 age group, where the participation rates are low.

From 2010 on, the decrease of the labour force will begin, as the baby-boom generations will become older and will progressively leave the labour force. Only the upward trend of the participation rate should continue to have a positive effect on the number of active persons. To a great amount, this increase is induced by the assumption of a progressive suppression of early retirement schemes up to 2015. The upward trend of the participation rate of women in the age group 25-54 years will not continue beyond 2010.

From 2015 on, the decrease of the labour force accelerates, due to the demographic shrinking process. The first baby-boom cohorts will begin to reach age groups with usually very low participation rates. Following the baseline demographic scenario, the decrease of the labour force between 2015 and 2020 could amount to 430 000 persons.

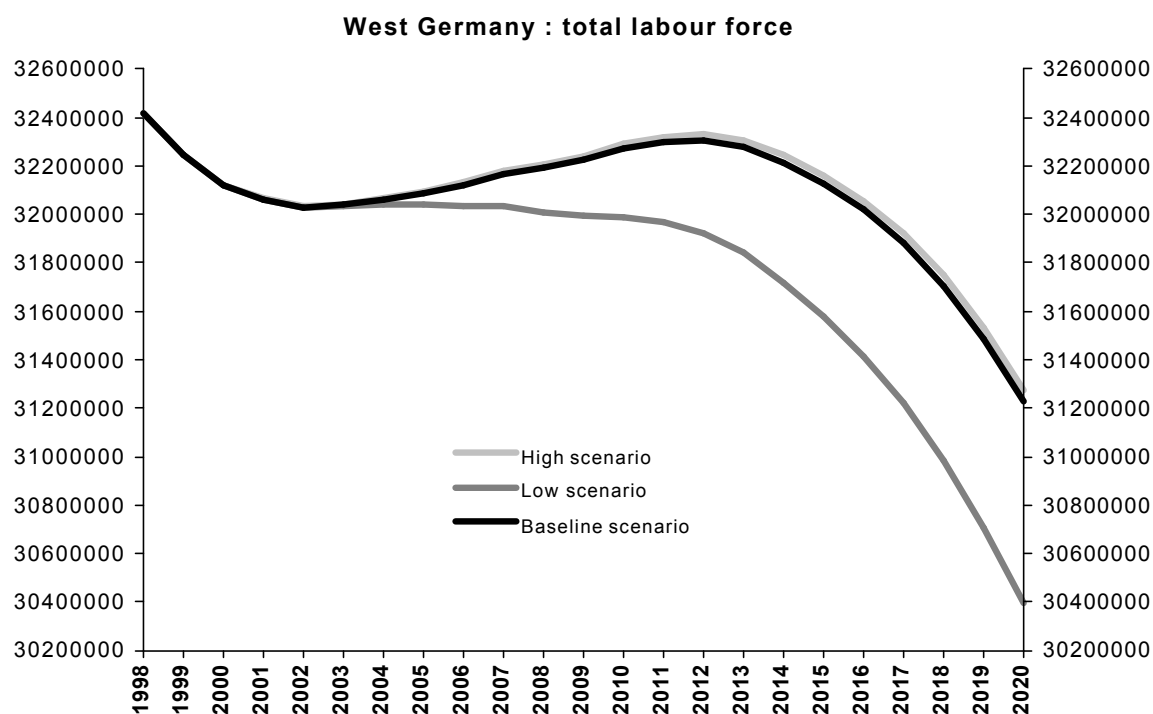
Table 11: France :Variation of the labour force in the baseline scenario and contribution of different effects

| (t-1) - t | 1998-2005 | 2005-2010 | 2010-2015 | 2015-2020 |
|--|------------------|------------------|------------------|------------------|
| Variation of the labour force between t and t-1 | 1398074 | 323375 | -126828 | -433521 |
| Trend evolution of participation rates | 313133 | 171969 | 133813 | -891 |
| Effect of the responsiveness of the participation rate to the unemployment rate | 253721 | 72987 | 0 | 0 |
| Demographic effect | 831221 | 78419 | -260641 | -432630 |

West Germany

The future development of the West German labour force will exhibit specific peculiarities when compared with all the other large EU-countries (see Graph ...). The difference between the low and the baseline scenario is caused exclusively by the assumption of a much higher net yearly immigration in the latter scenario. Moreover it is postulated that new immigrants will react as the existing labour force. – Three periods can be identified.

Figure 12



Following the baseline scenario, the labour force shows a net decrease of 390 000 persons between 1998 and 2002. This decrease would be much higher taking into account demographic factors only (590 000 persons). The resulting progressive decline in the unemployment rate will encourage an additional 210 000 persons to enter the labour market, mainly women and men of the age group 20-24 years. This age group is very sensitive to the unemployment rate for two reasons : with a lower unemployment rate, scholars and students make use of the possibility to combine a study with a job ; at the same time, a smaller unemployment rate lowers also the incentive to prolonged studies.

The second period covers the years 2002 to 2012. It is characterised by an renewed increase of approximately 277 000 persons in labour supply. Since the demographic effect is neutral, this is mainly due to the assumptions related to net immigration (a progressive increase up to the year 2010 to make up for the decline in the domestic population in working age). From 2002 to 2012, the rise in the labour force is caused by the upward trend of the participation rates (+141 000 persons) and by activating additional persons who had not been in the work force

before via the improved labour market conditions, e.g. the decrease of unemployment rate (+137 000 persons). The upward trend concerns mainly persons in the age group 60-64 years. It is caused by a cut back of the pre-retirement schemes and by the increase of the participation rate of women in the age group 55-59 years. The reaction of the labour force to unemployment will have a positive impact in the years 2002 to 2004. It ends in 2004 when the unemployment rate reaches its equilibrium rate.

From 2012 on, the level of the labour force will fall again. This decrease will be more and more rapid. Following the baseline scenario, the number of active persons should decline by more than one million between 2012 and 2020. This is mainly due to the fact that the baby-boom generation will enter the age group with low participation rates.

Table 12: West Germany :Variation of the labour force in the baseline scenario and contribution of different effects

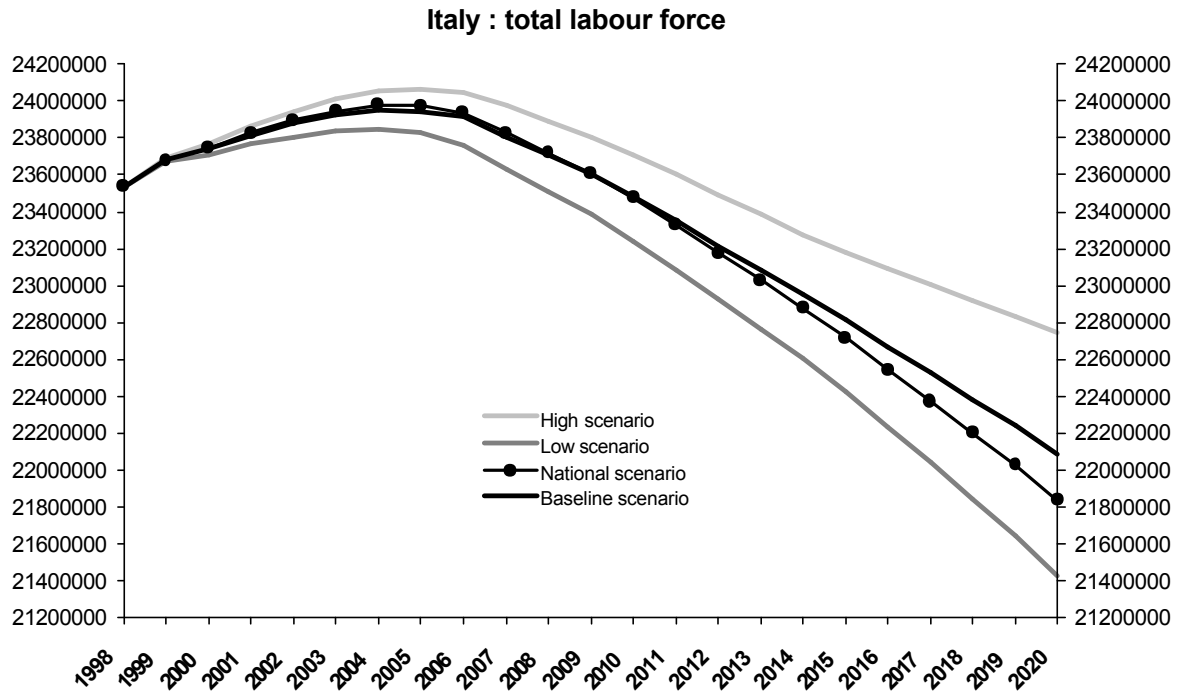
| (t-1) - t | 1998-2005 | 2005-2010 | 2010-2015 | 2015-2020 |
|--|------------------|------------------|------------------|------------------|
| Variation of the labour force between t and t-1 | -331705 | 183476 | -145278 | -899059 |
| Trend evolution of participation rates | 13691 | 74196 | 73952 | 43626 |
| Effect of the responsiveness of the participation rate to the unemployment rate | 351746 | 0 | 0 | 0 |
| Demographic effect | -697142 | 109280 | -219229 | -942685 |

Italy

The future development of Italian labour supply can be decomposed into two periods. The first covers the years 1998 to 2005 and is characterised by an increase of the labour force. According to the baseline scenario, the rise of the labour force should amount to 412 000 persons. Since the demographic contribution is negative (approximately 280 000 persons), the increase is exclusively due to higher participation rates. The upward trend of the latter will allow a growth of 436 000 persons in the labour force. This is mainly caused by higher

participation rates of Italian women in the age groups 25-49 and 50-59 years, thus leading to a convergence of the labour participation rate of women among Europe.

Figure 13



The responsiveness of the work force to the declining unemployment rate explains an additional increase of 256 000 persons in labour supply. This concerns mainly people older than 50 years. It is important to notice that the participation rate of Italian women in the age groups 15-19 and 20-24 reacts negatively to a decrease in the unemployment rate (additional worker effect).

From 2005 on, the contraction of the labour force will accelerate. Between 2005 and 2020, the total decrease would amount to 1 860 000 persons in the baseline scenario. This fall is caused by the progressive ageing of the Italian population, which is due to the fact that the baby-boom generation will leave the labour force as well as by the fact that the much smaller cohorts born in the years from about 1990 until about 2005 can only partly replace them.

Table 13: Italy :Variation of the labour force in the baseline scenario and contribution of different effects

| (t-1) - t | 1998-2005 | 2005-2010 | 2010-2015 | 2015-2020 |
|--|------------------|------------------|------------------|------------------|
| Variation of the labour force between t and t-1 | 411826 | -464610 | -668858 | -728291 |
| Trend evolution of participation rates | 435919 | 17932 | 17882 | 17624 |
| Effect of the responsiveness of the participation rate to the unemployment rate | 255844 | 57627 | 0 | 0 |
| Demographic effect | -279936 | -540169 | -686740 | -745915 |

Spain

The future development of the labour force in Spain is quite similar to the one in France up to 2010. During the years 1998-2005, all factors will contribute to a further growth in labour supply. The demographic component should allow for an increase of nearly half a million persons. Moreover, as in Italy, the catch-up of the participation rate of women in the age groups 25-54 and 55-years to the one of man will contribute positively to the evolution of the labour force.

In Spain, the labour force responsiveness to unemployment is lower than in the other countries. This can on a vice versa-basis be derived from the estimate that in the past 100 new jobs lowered the number of unemployed by 87 as compared with 82 in France, 80 in Italy, 79 in West-Germany, 75 in the UK and 67 in the USA. The main reason behind this is the fact that the unemployment rate was very high in Spain in the mid nineties (23.7 % in 1994). So, the positive impact of the labour market situation on the labour force will be longer lasting in Spain (+181 000 persons between 1998 and 2005 , +104 000 between 2005 and 2010) than in the other countries mentioned above.

Figure 14



From 2005 to 2010, the rate of increase of the labour force will come down. The decrease of the unemployment rate will be the sole factor pushing upwards further the labour supply.

Beyond 2010, the labour force will start to decrease. The fall should be quite similar to the development observed in Italy, but with a delay of ten years. Actually, disregarding the temporal gap, the age structure in Spain is very similar to the former Italian one and the demographic assumptions of both scenarios are also very similar. Hence, from 2010 onwards, the balance between new entrants and outgoing will be negative and the labour force will decrease.

Table 14: Spain :Variation of the labour force in the baseline scenario and contribution of different effects

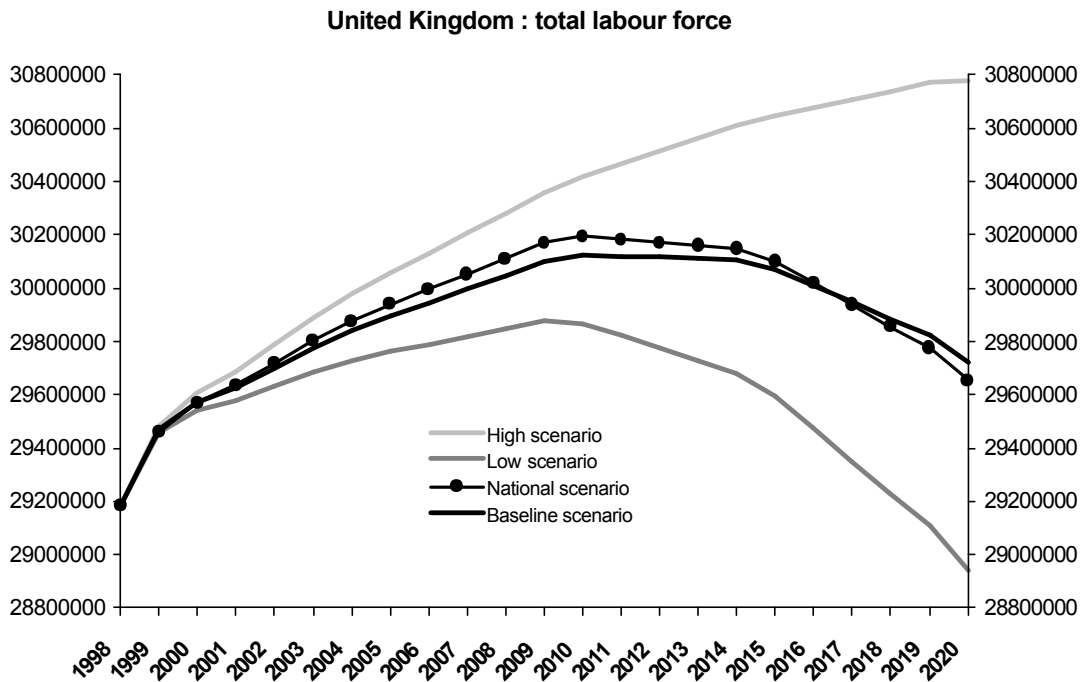
| (t-1) - t | 1998-2005 | 2005-2010 | 2010-2015 | 2015-2020 |
|--|------------------|------------------|------------------|------------------|
| Variation of the labour force between t and t-1 | 842417 | 48968 | -302789 | -406664 |
| Trend evolution of participation rates | 162448 | 2509 | -3994 | -3075 |
| Effect of the responsiveness of the participation rate to the unemployment rate | 180854 | 104265 | 0 | 0 |
| Demographic effect | 499116 | -57805 | -298796 | -403589 |

United Kingdom

Following the baseline scenario, the future labour force development can be divided into three periods:

The first one covers the years 1998 to 2010. It is characterised by an increasing labour force. In 1999, an apparently cyclical upsurge of the participation rate, following a slight downturn in 1998, has caused an important rise of the labour force. During the whole period 1998 and 2010, the labour force should increase by more than 940 000 persons. About three quarters of this is due to demographic factors, a rise in labour force participation accounting for the remaining quarter.

Figure 15



Moreover, the latter positive effect is concentrated in the years 1998 up to 2005. Despite a quite low unemployment rate at the beginning of the period, the high responsiveness of the labour force participation to the unemployment rate allows the labour force to increase by another more than 108 000 persons between 1998 and 2004, the year in which full employment is reached. The upward trend of the participation rate contributes more than 100 000 persons to the rise in the labour force during the period 1998 up to 2005. This is mainly due to the increase of the participation rate of men in the age group 60-64 and of women in the age group 25 - 64 years.

The second period is characterised by a slight decrease of the labour force (–53 000 from 2010 to 2015). Again the reason for this has to be searched in the demographic sector. Nevertheless this phenomenon is less accentuated in the UK mainly because the baby-boom here had been less pronounced and, moreover, because the birth rate during the last two decades was substantially higher in the UK than in many other European countries.

Table 15: United Kingdom :Variation of the labour force in the baseline scenario and contribution of different effects.

| (t-1) - t | 1998-2005 | 2005-2010 | 2010-2015 | 2015-2020 |
|--|------------------|------------------|------------------|------------------|
| Variation of the labour force between t and t-1 | 712513 | 228592 | -52975 | -349004 |
| Trend evolution of participation rates | 100781 | 13225 | 18542 | 2809 |
| Effect of the responsiveness of the participation rate to the unemployment rate | 108874 | 0 | 0 | 0 |
| Demographic effect | 502858 | 215367 | -71517 | -351813 |

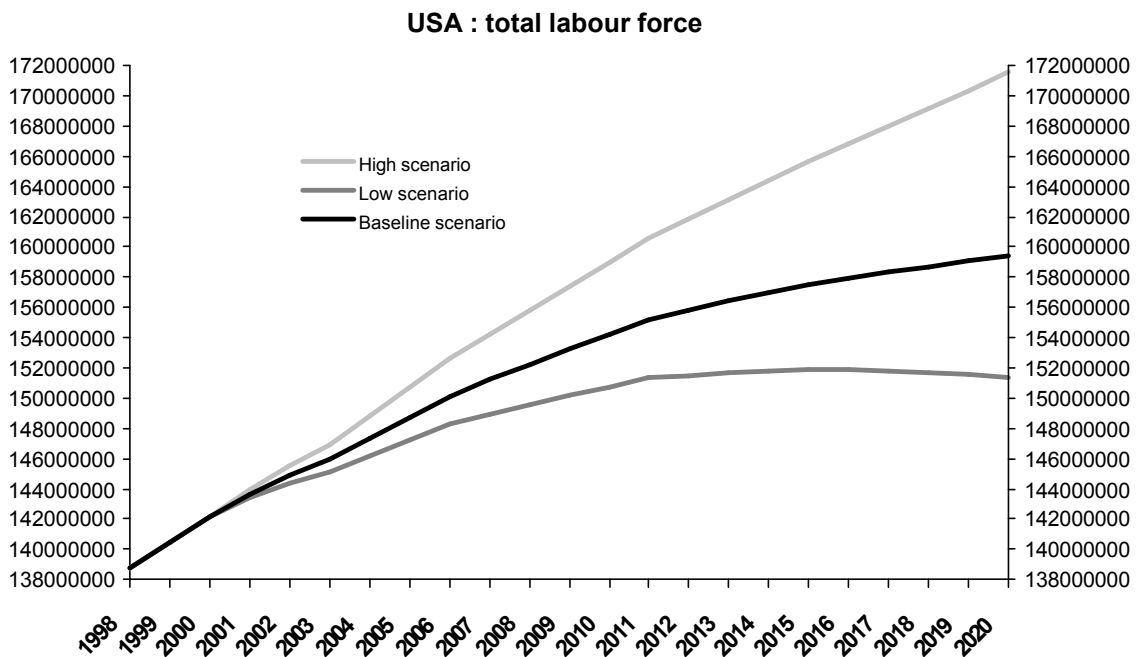
From 2015 to 2020, the accelerating ageing combined with a decline of the UK population will cause a decrease of nearly 350 000 in the labour force.

United States

The outlook for the American labour force differs very substantially from the one in Europe. Whereas all European countries will be confronted with a contraction of the labour force up to 2020, the main change in the USA will be only a decrease of the growth rate of labour supply.

Labour force participation rates are already very high in the USA. It therefore would not be appropriate to make the assumption of a significant rise up to 2020. Moreover, the unemployment rate can already be considered to have reached its equilibrium level, and accordingly the responsiveness of the labour force to unemployment is negligible. The increase of the labour force is therefore only caused by demographic factors.

Figure 16



Following the baseline scenario, the future demographic development will remain very dynamic. The net yearly immigration amounts to nearly one million persons. Most of the new migrants are in prime working age and will join the American labour force under the assumption that these immigrants have the same activity behaviour as the American resident population. Moreover, the migrants, mostly of Hispanic and Asiatic origin, should have more children than the average with the consequence that the fertility indicator in the USA is much higher than in the other industrialised countries since the beginning of the nineties. This in turn will largely outweigh the negative impact of the outgoing US baby-boom generation on the projected labour force.

Table 16: United States :Variation of the labour force in the baseline scenario and contribution of different effects.

| (t-1) - t | 1998-2005 | 2005-2010 | 2010-2015 | 2015-2020 |
|--|------------------|------------------|------------------|------------------|
| Variation of the labour force between t and t-1 | 9916569 | 5503231 | 3251398 | 1900922 |
| Trend evolution of participation rates | 47111 | 17364 | 11051 | 6566 |
| Effect of the responsiveness of the participation rate to the unemployment rate | 0 | 0 | 0 | 0 |
| Demographic effect | 9869457 | 5485867 | 3240347 | 1894356 |

5. Conclusions

The prospect for labour supply in Europe are considered. The analyses begins with a so-called labour market balance covering the development on an aggregate level. Estimations to shed light on the relation between unemployment and labour force participation are given in the second part of the paper. A detailed analyses of the forces behind the participation rates for individual countries and labour force projections are given. We expect the labour force in Europe to decline during the next years. However, the impact on unemployment of this development is rather limited.

References

- Barkume A.J. and F.W.Horvath (April 1995), "Using gross flows to explore movements in the labor force", *Monthly Labor Review*, Bureau of Labor Statistics.
- Basavasajappa, K.G., et al. (1993). *Impact of Migration in the Receiving Countries — CANADA*. International Organization for Migration (IOM), Geneva: 60–66.
- Blanchet D. and Pelé L.P. (1997), "Social Security and Retirement in France", NBER Working Paper 6214.
- Bloch L., Henin P.Y., Marchand O., Meunier F. and Thélot C. (1986), "Analyse macro-économique des taux d'activité et flexion conjoncturelle", *Economie appliquée*, tome XXXIX, N°4, pp 665-703.
- Blöndal S. and Scarpetta S. (1999), "The retirement decision in OECD countries", OECD Economics Department Working Papers N°202.
- Blöndal, S., and S. Scarpetta (1997). *Early Retirement in OECD Countries: The Role of Social Security Systems*. *OECD Economic Review* 29: 7–54.
- Blundell R. and Johnson P. (1997), "Pensions and retirement in the U.K.", NBER Working Paper 6154.
- Boldrin M., Jimenez-Martin S. and Peracchi F. (1997), "Social Security and Retirement in Spain", NBER Working Paper 6136.
- Borjas, G.J., et al. (1991). *On the Labor Market Effects of Immigration and Trade*. Working Paper No. 3761. National Bureau of Economic Research, Cambridge, Mass., June.
- Börsch-Supan A. and Schnabel R. (1997), "Social Security and Retirement in Germany", NBER Working paper 6153.
- Brondel D., Guillemot D. and Marioni P. (1996), "La population active : facteurs d'évolution et perspectives", *Données sociales*, pp110-116.
- Brugiavini A. (1997), "Social Security and Retirement in Italy", NBER Working Paper 6155.
- Calot G. and Chesnais J.C. (October 1997), "Le vieillissement démographique dans l'Union Européenne à l'horizon 2050 : Une étude d'impact", *Futuribles international* N°6.
- Castillo M.D. (July 1998), "Persons outside the labor force who want a job", *Monthly Labor Review*, Bureau of Labor Statistics.
- Charpin J-M. (1999), "L'avenir de nos retraites", *Rapport au Premier ministre*, La Documentation Française.
- Chesnais J.C. (July-October 1999), "L'immigration et le peuplement des Etats-Unis", *Population*, INED.
- Delessy H. and Le Bihan H. (November 1996), "Les comportements des ménages dans MIMOSA", *Document de travail CEPII-OFCE*.
- Diamond P. and Gruber J. (1997), "Social Security and Retirement in the U.S.", NBER Working paper 6097.
- Disney R. and Webb S. (1991), "Why are there so many long-term sick in Britain", *Economic journal*, Vol. 1011, pp 252-262.
- Dupont G. and Sterdyniak H. (2000), "Quel avenir pour nos retraites ?", *Repères*, La Découverte.

- Elbaum M. and Marchand O. (Januar 1994), "Emploi et chômage des jeunes dans les pays industrialisés : la spécificité française", *Travail et Emploi* N°58, DARES, pp 111-122.
- Elmeskov, J., and K. Pichelmann (1993a). Interpreting Unemployment: The Role of Labour Force Participation. *OECD Economic Studies* 21: 139–160.
- Elmeskov, J., and K. Pichelmann (1993b). Unemployment and labour force participation — trends and cycles. OECD Economics Department Working Papers No. 130. Paris.
- Ernst B. (1996), "Marché du travail et cycle conjoncturel", *Données sociales*, pp 98-103.
- EUROFRAME (2001), "The Economic Situation of the European Union and the Outlook for 2001-2002", Working Paper.
- European Central Bank (2000a). *Monthly Report*. Entwicklung und Strukturmerkmale der Arbeitsmärkte im Eurowährungsgebiet. May: 61–79
- (2000b). *Monthly Report*. Entwicklung der Erwerbspersonen im Eurowährungsgebiet (Kasten 5). June: 43–45.
- (2000c). *Monthly Report*. Revision der Beschäftigtenzahlen (Kasten 5). September: 46–47.
- EUROSTAT (1999). *Bevölkerungsstatistik 1960/99*.
- EUROSTAT (2000). *Erhebung über Arbeitskräfte — Ergebnisse 1995–1999*.
- EUROSTAT (2000). Europäische Sozialstatistik - Bevölkerung (Ausgabe 2000), chapter I: Bevölkerungsvorausschätzungen, pp. 123
- EUROSTAT (2000). *Europäische Sozialstatistik: Bevölkerung. Ausgabe 2000*.
- EUROSTAT (2001). *Die Erwerbsbevölkerung in den Regionen der EU: jüngste Entwicklungen und künftige Perspektiven. Statistik kurz gefasst – Allgemeine Statistik, Thema 1–2/2001*.
- EUROSTAT-Jahrbuch. Europa im Blick der Statistik, Ausgaben 2.1995/96, 3.1996/97, 4.1998/99; Ausgabe 2000.
- Falaris E.M. and Peters H.E. (December 1989), "Responses of Female Labor Supply and Fertility to the Demographic Cycle", NLS Discussion Papers 92-9.
- Fawcett, J.T., et al. (1990). Selectivity and Diversity: The Effects of U.S. Immigration Policy on Immigrant Characteristics. Paper presented at the Population Association of America Meetings, Toronto.
- Fuchs, J. (2000). Hidden Unemployment in Selected Countries of the European Union. A contribution to the measurement of unemployment in international comparisons. Paper presented at the 3rd Kiel Workshop in Economics on "Growth and European Labour Markets", 27–28 October, p. 12.
- Guillemot D., Gubian A., Marioni P., Brondel D. and Lincot L. (Januar 1997), "Projections de population active 1995-2040", INSEE Résultats N°516.
- Hayge H.V. (September 1997), "Development in women's labor force participation", *Monthly Labor Review*, Bureau of Labor Statistics.
- Holst, E. (2000). Die stille Reserve am Arbeitsmarkt. Größe — Zusammensetzung — Verhalten. Berlin. (Hidden Unemployment on the Labour Market).
- Howe W.J. (November 1990), "Labor market dynamics and trends in male and female unemployment", *Monthly Labor Review*, Bureau of Labor Statistics.
- INSEE (March-April 1995), "Les trajectoires des jeunes : Transitions professionnelles et familiales", *Economie et Statistique*, N°283-284.

- INSEE (October 1996), "Projections de population active et participation au marché du travail", *Economie et Statistique*, N°300.
- IRES (March 1999), "Special Jeunes et marché du travail : comparaison européenne", *La Revue de l'IRES*, N°31.
- Jacquot A. (Januar 1997), "Les flexions des taux d'activité sont-elles seulement conjoncturelles ? ", *Economie et Prévision* N°127.
- Klös, H.P. (2000). Ältere Arbeitnehmer: Entwicklungstrends und Beschäftigungspolitische Reformbedarf (Elderly Workers: Trends and the Need for Labour Market Reforms). *iw-trends* 27: 71–87.
- Kreyenfeld, M., and K. Hank (2000). Does the availability of child care influence the employment of mothers? Findings from Western Germany. *Population Research and Policy Review*, Vol. 19, No. 4 (August 2000) pp. 317–337.
- Observatoire de l'emploi (Summer 1998), "Sous-emploi : Tendances récentes", *SYSDÉM Tendances* N°30, *Emploi et affaires sociales*, Commission européenne.
- OECD (current issues) *Quarterly Labour Force Statistics*. Paris.
- Plasman Robert (1991), "Les femmes d'Europe sur le marché du travail", *Logiques sociales, Série Démographie*.
- Seifert, W. (1994). Ökonomische und soziale Mobilität von Ausländern in der Bundesrepublik. *Acta Demographica* 1993, Heidelberg: 76–92.
- Stark, O. (1991). *The Migration of Labour*. Cambridge, Mass.
- Statistisches Bundesamt, *Statistisches Jahrbuch für das Ausland*, various issues.
- Taddei D. (1999), "Retraites choisies et progressives", *Rapport du Conseil d'Analyse Economique*, La Documentation Française.
- Tölke, A. (1989). Lebensverläufe von Frauen. Familiäre Ereignisse, Ausbildungs- und Erwerbsverhalten. DJI Forschungsbericht. München. (Life Cycles of Women, Family Formation, Education and Labour Participation).

Appendix Table 1 – Labour Market Balance for EU-15

Part 1 — Population and Population Changes (1,000 persons if not otherwise stated)

| Year | Total population | | Natural population changes | | | | | Immigration: ^b + net outmigration:– |
|-------------------|--|---|----------------------------|--|--------------------|--|--|---|
| | as at 1st January of year stated | absolute change during year stated | live births | | deaths | | excess of live births over deaths | |
| | | | absolute number | per 1000 of popu- lation as at 1st January | absolute number | per 1000 of popu- lation as at 1st January | | |
| 1985 | 358,475 | 674 | 4,275 | 11.93 | 3,765 | 10.50 | 510 | 164 |
| 1986 | 359,149 | 837 | 4,288 | 11.94 | 3,735 | 10.40 | 553 | 284 |
| 1987 | 359,986 | 827 | 4,293 | 11.93 | 3,655 | 10.15 | 638 | 189 |
| 1988 | 360,813 | 1,317 | 4,358 | 12.08 | 3,676 | 10.19 | 682 | 635 |
| 1989 | 362,130 | 1,633 | 4,309 | 11.90 | 3,692 | 10.20 | 617 | 1,016 |
| 1990 | 363,763 | 1,672 | 4,379 | 12.04 | 3,721 | 10.23 | 658 | 1,009 |
| 1991 | 365,435 | 1,638 | 4,290 | 11.74 | 3,730 | 10.21 | 560 | 1,078 |
| 1992 | 367,073 | 1,921 | 4,248 | 11.57 | 3,676 | 10.01 | 572 | 1,350 |
| 1993 | 368,994 | 1,439 | 4,140 | 11.22 | 3,759 | 10.19 | 381 | 1,058 |
| 1994 | 370,433 | 1,157 | 4,053 | 10.94 | 3,679 | 9.93 | 374 | 783 |
| 1995 | 371,590 | 1,080 | 4,009 ^a | 10.79 ^a | 3,734 | 10.05 ^a | 275 ^a | 805 |
| 1996 | 372,670 | 1,047 | 4,040 ^a | 10.84 ^a | 3,732 | 10.01 ^a | 308 ^a | 739 |
| 1997 | 373,717 | 867 | 4,047 ^a | 10.83 ^a | 3,685 | 9.86 ^a | 362 ^a | 505 |
| 1998 | 374,584 | 874 | 4,018 ^a | 10.73 ^a | 3,723 | 9.94 ^a | 295 ^a | 578 |
| 1999 | 375,458 | 989 | 4,005 | 10.67 | 3,727 | 9.93 | 278 | 711 |
| 2000 | 376,455 | 1,159 | 4,055 | 10.77 | 3,712 | 9.86 | 343 | 816 |
| 2001 ^a | 377,614 | 1,008 | 4,022 | 10.65 | 3,738 | 9.90 | 283 | 725 |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ |
| 2005* | 381,235 | 956 ^c | 3,983 ^c | 10.52 ^c | 3,740 ^c | 9.88 ^c | 243 ^c | 713 ^c |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ |
| 2010* | 385,271 | 807 ^c | 3,787 ^c | 9.89 ^c | 3,772 ^c | 9.85 ^c | 42 ^c | 765 ^c |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ |
| 2015* | 388,289 | 604 ^c | 3,633 ^c | 9.40 ^c | 3,809 ^c | 9.86 ^c | –176 ^c | 780 ^c |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ |
| 2020* | 391,028 | 548 ^c | 3,551 ^c | 9.12 ^c | 3,867 ^c | 9.93 ^c | –316 ^c | 864 ^c |

*Forecast based on assumptions about crude birth and death rates as well as net immigration. –
^aPreliminary. – ^bIncluding revisions due to the results of population censuses, errors and omissions. –
^cYearly average during preceding five-year-period.

Source: EUROSTAT-Jahrbuch, Europa im Blick der Statistik, Ausgaben 2.1995/96, 3.1996/97, 4.1998/99, 5.2000. – EUROSTAT, Bevölkerungsstatistik 1960/99. – EUROSTAT, Europäische Sozialstatistik - Bevölkerung, Ausgabe 2000. – EUROSTAT, Erhebung über Arbeitskräfte - Ergebnisse 1995–1999. – EUROSTAT, Statistik kurzgefaßt, Bevölkerung und soziale Bedingungen, Thema 3 - 16/2000: Erste Bevölkerungsschätzungen für 2000. – OECD, Quarterly Labour Force Statistics. – Statistisches Bundesamt, Statistisches Jahrbuch für das Ausland, various issues. – Own estimates, interpolations and forecasts.

Part 2 — Age Structure of the Population (1,000 persons if not otherwise stated)

| Year | Less than 15 years | | | In working age: 15–64 years | | | 65 years and older | | |
|------|--------------------|---------------------------|---|-----------------------------|---------------------------|---|--------------------|---------------------------|---|
| | absolute number | change from previous year | % of total population as at 1st January | absolute number | change from previous year | % of total population as at 1st January | absolute number | change from previous year | % of total population as at 1st January |
| 1985 | 70,620 | | 19.70 | 239,102 | | 66.70 | 48,753 | | 13.60 |
| 1986 | 69,425 | -1,195 | 19.33 ^a | 240,233 | 1,131 | 66.89 ^a | 49,491 | 738 | 13.78 ^a |
| 1987 | 68,414 | -1,011 | 19.00 ^a | 241,318 | 1,085 | 67.04 ^a | 50,254 | 763 | 13.96 ^a |
| 1988 | 67,401 | -1,013 | 18.68 ^a | 242,393 | 1,075 | 67.18 ^a | 51,019 | 765 | 14.14 ^a |
| 1989 | 66,830 | -571 | 18.45 ^a | 243,443 | 1,050 | 67.23 ^a | 51,857 | 838 | 14.32 ^a |
| 1990 | 66,569 | -261 | 18.30 | 244,448 | 1,005 | 67.20 | 52,746 | 889 | 14.50 |
| 1991 | 66,399 | -170 | 18.17 ^a | 245,427 | 979 | 67.16 ^a | 53,609 | 863 | 14.67 ^a |
| 1992 | 66,182 | -217 | 18.03 ^a | 246,455 | 1,028 | 67.14 ^a | 54,436 | 827 | 14.83 ^a |
| 1993 | 66,049 | -133 | 17.90 | 247,596 | 1,141 | 67.10 | 55,349 | 913 | 15.00 |
| 1994 | 65,937 | -112 | 17.80 | 248,190 | 594 | 67.00 | 56,306 | 957 | 15.20 |
| 1995 | 65,400 | -537 | 17.60 | 248,965 | 775 | 67.00 | 57,225 | 919 | 15.40 |
| 1996 | 64,845 | -555 | 17.40 | 249,688 | 723 | 67.00 | 58,137 | 912 | 15.60 |
| 1997 | 64,653 | -192 | 17.30 | 250,390 | 702 | 67.00 | 58,674 | 537 | 15.70 |
| 1998 | 64,054 | -599 | 17.10 | 250,971 | 581 | 67.00 | 59,559 | 885 | 15.90 |
| 1999 | 63,813 | -241 | 17.00 | 251,382 | 411 | 66.95 | 60,263 | 704 | 16.05 |
| 2000 | 63,771 | -42 | 16.94 | 251,773 | 391 | 66.88 | 60,910 | 647 | 16.18 |
| | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ |
| 2005 | 62,408 | -273 ^b | 16.37 | 253,941 | 434 ^b | 66.61 | 64,886 | 795 ^b | 17.02 |
| | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ |
| 2010 | 61,104 | -261 ^b | 15.86 | 255,974 | 407 ^b | 66.44 | 68,193 | 661 ^b | 17.70 |
| | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ |
| 2015 | 59,797 | -262 ^b | 15.40 | 256,465 | 99 ^b | 66.05 | 72,028 | 767 ^b | 18.55 |
| | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ |
| 2020 | 59,162 | -127 ^b | 15.13* | 254,598 | -373 ^b | 65.11* | 77,267 | 1,048 ^b | 19.76* |

*Own forecast using as a guide-line the most actual national forecasts compiled by EUROSTAT for EU-15. These are much more detailed, starting, for example, with assumptions about net reproduction rates or about average life expectancy for different age groups. – ^aOwn interpolations. – ^bYearly average during preceding five-year-period.

Source: EUROSTAT-Jahrbuch, Europa im Blick der Statistik, Ausgaben 2.1995/96, 3.1996/97, 4.1998/99, 5.2000. – EUROSTAT, Bevölkerungsstatistik 1960/99. – EUROSTAT, Europäische Sozialstatistik - Bevölkerung, Ausgabe 2000. – EUROSTAT, Erhebung über Arbeitskräfte - Ergebnisse 1995–1999. – EUROSTAT, Statistik kurzgefaßt, Bevölkerung und soziale Bedingungen, Thema 3 - 16/2000: Erste Bevölkerungsschätzungen für 2000. – OECD, Quarterly Labour Force Statistics. – Statistisches Bundesamt, Statistisches Jahrbuch für das Ausland, various issues. – Own estimates, interpolations and forecasts.

Part 3 — Impact of the Educational System on the Workforce (in 1,000 persons if not otherwise stated)

| Year | Scholars at secondary stage II (15 years+) ^a | | | Students at universities and high schools ^b | | | Persons in working age who are neither scholars nor students | |
|------|---|---------------------------|------------------------------------|--|---------------------------|------------------------------------|--|---------------------------|
| | absolute number ^c | change from previous year | as % of total pop. 15–64 years old | absolute number | change from previous year | as % of total pop. 15–64 years old | absolute number | change from previous year |
| 1985 | 17,193 ^d | | 7.19 | 7,543 ^e | | 3.15 | 214,366 | |
| 1986 | 17,350 ^d | 157 | 7.22 | 7,677 ^e | 134 | 3.20 | 215,206 | 840 |
| 1987 | 17,612 | 262 | 7.30 | 7,841 | 164 | 3.25 | 215,865 | 659 |
| 1988 | 17,797 | 185 | 7.34 | 8,076 | 235 | 3.33 | 216,520 | 655 |
| 1989 | 17,972 | 175 | 7.38 | 8,415 | 339 | 3.46 | 217,056 | 536 |
| 1990 | 17,988 | 16 | 7.36 | 8,816 | 401 | 3.61 | 217,644 | 588 |
| 1991 | 18,292 | 304 | 7.45 | 9,614 | 798 | 3.92 | 217,521 | -123 |
| 1992 | 18,771 | 479 | 7.62 | 10,114 | 500 | 4.10 | 217,570 | 49 |
| 1993 | 19,114 | 343 | 7.72 | 10,845 | 731 | 4.38 | 217,637 | 67 |
| 1994 | 19,506 | 392 | 7.86 | 11,528 | 683 | 4.64 | 217,156 | -481 |
| 1995 | 19,327 | -179 | 7.76 | 11,790 | 262 | 4.74 | 217,848 | 692 |
| 1996 | 19,694 | 367 | 7.89 | 11,931 | 141 | 4.78 | 218,063 | 215 |
| 1997 | 19,369 | -325 | 7.74 | 12,266 | 335 | 4.90 | 218,755 | 692 |
| 1998 | 19,701 | 332 | 7.85 | 12,549 | 283 | 5.00 | 218,721 | -34 |
| 1999 | 19,884 | 183 | 7.91 | 12,820 | 272 | 5.10 | 218,677 | -44 |
| 2000 | 20,016 | 132 | 7.95 | 13,092 | 272 | 5.20 | 218,665 | -12 |
| ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ |
| 2005 | 20,315 | 60 ^f | 8.00 | 14,424 | 266 ^f | 5.68 | 219,202 | 107 ^f |
| ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ |
| 2010 | 20,516 | 40 ^f | 8.02 | 15,128 | 141 ^f | 5.91 | 220,330 | 226 ^f |
| ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ |
| 2015 | 20,594 | 16 ^f | 8.03 | 15,311 | 37 ^f | 5.97 | 220,560 | 46 ^f |
| ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ | ☞ |
| 2020 | 20,495 | -20 ^f | 8.05 | 15,301 | -2 ^f | 6.01 | 218,802 | 352 ^f |

^aISCED3; definition in accordance with the "International Standard Classification for Education [ISCED] of the UNESCO 1976; these scholars are normally 14 or 15 years old when they enter ISCED3. – ^bISCED5-7. – ^cSchooling year 1984/85, etc. – ^dOwn estimates based upon ISCED1-2 and ISCED1-3 and 5-7. – ^eOwn estimates (trend extrapolation backwards). – ^fYearly average during preceding five-year-period.

Source: EUROSTAT-Jahrbuch, Europa im Blick der Statistik, Ausgaben 2.1995/96, 3.1996/97, 4.1998/99, 5.2000. – EUROSTAT, Bevölkerungsstatistik 1960/99. – EUROSTAT, Europäische Sozialstatistik - Bevölkerung, Ausgabe 2000. – EUROSTAT, Erhebung über Arbeitskräfte - Ergebnisse 1995–1999. – EUROSTAT, Statistik kurzgefaßt, Bevölkerung und soziale Bedingungen, Thema 3 - 16/2000: Erste Bevölkerungsschätzungen für 2000. – OECD, Quarterly Labour Force Statistics. – Statistisches Bundesamt, Statistisches Jahrbuch für das Ausland, various issues. – Own estimates, interpolations and forecasts.

Part 4 — Smoothed Series of Persons in Working Age (excl. scholars and students) (in 1,000 persons)

| Year | 3-year moving average | Change from previous year |
|------|-----------------------|---------------------------|
| 1985 | 214,070 | |
| 1986 | 214,590 | 520 |
| 1987 | 215,146 | 556 |
| 1988 | 215,864 | 718 |
| 1989 | 216,480 | 617 |
| 1990 | 217,073 | 593 |
| 1991 | 217,407 | 334 |
| 1992 | 217,578 | 171 |
| 1993 | 217,576 | -2 |
| 1994 | 217,454 | -122 |
| 1995 | 217,547 | 93 |
| 1996 | 217,689 | 142 |
| 1997 | 218,222 | 533 |
| 1998 | 218,513 | 291 |
| 1999 | 218,718 | 205 |
| 2000 | 218,688 | -30 |
| ⌘ | ⌘ | ⌘ |
| 2005 | 219,135 | 89 ^a |
| ⌘ | ⌘ | ⌘ |
| 2010 | 220,092 | 191 ^a |
| ⌘ | ⌘ | ⌘ |
| 2015 | 220,523 | 86 ^a |
| ⌘ | ⌘ | ⌘ |
| 2020 | 219,165 | -272 ^a |

^aYearly average during preceding five-year-period.

Source: EUROSTAT-Jahrbuch, Europa im Blick der Statistik, Ausgaben 2.1995/96, 3.1996/97, 4.1998/99, 5.2000. – EUROSTAT, Bevölkerungsstatistik 1960/99. – EUROSTAT, Europäische Sozialstatistik - Bevölkerung, Ausgabe 2000. – EUROSTAT, Erhebung über Arbeitskräfte - Ergebnisse 1995–1999. – EUROSTAT, Statistik kurzgefaßt, Bevölkerung und soziale Bedingungen, Thema 3 - 16/2000: Erste Bevölkerungsschätzungen für 2000. – OECD, Quarterly Labour Force Statistics. – Statistisches Bundesamt, Statistisches Jahrbuch für das Ausland, various issues. – Own estimates, interpolations and forecasts.

Part 5 — Actual Labour Force and Visible Participation Rate (in 1,000 persons unless otherwise stated)

| Year | Total employment | | Unemployment according to ILO/EU Labour Force Sample Concept | | Actual labour force | | Visible Participation Rate: Actual labour force as % of persons in working age (excluding scholars and students - smoothed series) | | Visible Participation Rate: | |
|------|------------------|---------------------------|--|---------------------------|---------------------|---------------------------|--|-------------------|-----------------------------|----------------------------------|
| | absolute number | change from previous year | absolute number | change from previous year | absolute number | change from previous year | | | HP-filter ^a | Deviations of C from actual rate |
| | A | | B | | (A+B) | | | | C | |
| 1985 | 140,940 | | 15,884 | | 156,824 | | 73.26 | | 73.22 | -0.04 |
| 1986 | 140,350 | -590 | 16,155 | 271 | 156,505 | -319 | 72.93 | -0.33 | 73.63 | 0.70 |
| 1987 | 143,156 | 2,806 | 15,776 | -379 | 158,932 | 2,427 | 73.87 | 0.94 | 74.04 | 0.17 |
| 1988 | 146,539 | 3,383 | 14,870 | -906 | 161,409 | 2,477 | 74.77 | 0.90 | 74.45 | -0.32 |
| 1989 | 148,699 | 2,160 | 13,511 | -1,359 | 162,210 | 801 | 74.93 | 0.16 | 74.84 | -0.09 |
| 1990 | 152,015 | 3,316 | 12,700 | -811 | 164,715 | 2,505 | 75.88 | 0.95 | 75.21 | -0.67 |
| 1991 | 152,235 | 220 | 13,418 | 718 | 165,653 | 938 | 76.19 | 0.31 | 75.55 | -0.64 |
| 1992 | 150,170 | -2,065 | 15,332 | 1,914 | 165,502 | -151 | 76.07 | -0.13 | 75.88 | -0.19 |
| 1993 | 147,731 | -2,439 | 17,744 | 2,412 | 165,475 | -27 | 76.05 | -0.01 | 76.19 | 0.14 |
| 1994 | 147,197 | -534 | 18,449 | 705 | 165,646 | 171 | 76.18 | 0.12 | 76.50 | 0.32 |
| 1995 | 148,406 | 1,209 | 17,766 | -683 | 166,172 | 526 | 76.38 | 0.21 | 76.82 | 0.44 |
| 1996 | 149,147 | 741 | 18,250 | 484 | 167,397 | 1,225 | 76.90 | 0.51 | 77.15 | 0.25 |
| 1997 | 150,070 | 923 | 18,142 | -108 | 168,212 | 815 | 77.08 | 0.19 | 77.51 | 0.43 |
| 1998 | 152,494 | 2,424 | 17,258 | -884 | 169,752 | 1,540 | 77.69 | 0.60 | 77.87 | 0.18 |
| 1999 | 155,272 | 2,778 | 16,157 | -1,101 | 171,429 | 1,677 | 78.38 | 0.69 | 78.25 | -0.13 |
| 2000 | 158,530 | 3,258 | 14,600 | -1,557 | 173,130 | 1,701 | 79.17 | 0.79 | 78.64 | -0.53 |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | | |
| 2005 | 169,602 | 2,214 ^b | 9,740 | -972 ^b | 179,342 | 1,242 ^b | 81.84 | 0.53 ^b | | |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | | |
| 2010 | 175,619 | 1,203 ^b | 8,050 | -338 ^b | 183,669 | 865 ^b | 83.45 | 0.32 ^b | | |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | | |
| 2015 | 180,051 | 886 ^b | 7,650 | -80 ^b | 187,701 | 806 ^b | 85.12 | 0.33 ^b | | |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | | |
| 2020 | 184,595 | 909 ^b | 7,500 | -30 ^b | 192,095 | 879 ^b | 87.65 | 0.51 ^b | | |

^aHodrick-Prescott-Filter (100). – ^bYearly average of preceding five-year-period.

Source: EUROSTAT-Jahrbuch, Europa im Blick der Statistik, Ausgaben 2.1995/96, 3.1996/97, 4.1998/99, 5.2000. – EUROSTAT, Bevölkerungsstatistik 1960/99. – EUROSTAT, Europäische Sozialstatistik - Bevölkerung, Ausgabe 2000. – EUROSTAT, Erhebung über Arbeitskräfte - Ergebnisse 1995–1999. – EUROSTAT, Statistik kurzgefaßt, Bevölkerung und soziale Bedingungen, Thema 3 - 16/2000: Erste Bevölkerungsschätzungen für 2000. – OECD, Quarterly Labour Force Statistics. – Statistisches Bundesamt, Statistisches Jahrbuch für das Ausland, various issues. – Own estimates, interpolations and forecasts.

Part 6 — Estimated Maximum Labour Force and Hidden Unemployment (in 1,000 persons unless otherwise stated)

| Year | Estimated maximum participation rate | | Estimated maximum labour force ^a | | Result. estimate for hidden unemployment rate (mainly female discouraged workers): ^b | | | Est. total (open and hidden) unemployment: | | Unemployment as % of actual labour force | Est. total unemployment as % of est. total labour force |
|------|--------------------------------------|---------------------------|---|---------------------------|---|---------------------------|------------------------------|--|---------------------------|--|---|
| | Assumption (C+3.5 percentage points) | Change from previous year | Absolute numbers | Change from previous year | Absolute numbers | Change from previous year | % of est. total unemployment | Absolute numbers | Change from previous year | | |
| 1985 | 76.72 | | 164,235 | | 7,411 | | 31.81 | 23,295 | | 10.13 | 14.18 |
| 1986 | 77.13 | 0.41 | 165,513 | 1,279 | 9,008 | 1,598 | 35.80 | 25,163 | 1,869 | 10.32 | 15.20 |
| 1987 | 77.54 | 0.41 | 166,824 | 1,311 | 7,892 | -1,116 | 33.34 | 23,668 | -1,495 | 9.93 | 14.19 |
| 1988 | 77.95 | 0.41 | 168,266 | 1,442 | 6,857 | -1,035 | 31.56 | 21,727 | -1,941 | 9.21 | 12.91 |
| 1989 | 78.34 | 0.39 | 169,591 | 1,325 | 7,381 | 524 | 35.33 | 20,892 | -835 | 8.33 | 12.32 |
| 1990 | 78.71 | 0.37 | 170,858 | 1,268 | 6,143 | -1,237 | 32.60 | 18,843 | -2,048 | 7.71 | 11.03 |
| 1991 | 79.05 | 0.34 | 171,860 | 1,002 | 6,207 | 64 | 31.63 | 19,625 | 782 | 8.10 | 11.42 |
| 1992 | 79.38 | 0.33 | 172,714 | 853 | 7,212 | 1,004 | 31.99 | 22,544 | 2,918 | 9.26 | 13.05 |
| 1993 | 79.69 | 0.31 | 173,386 | 673 | 7,911 | 700 | 30.84 | 25,655 | 3,112 | 10.72 | 14.80 |
| 1994 | 80.00 | 0.31 | 173,963 | 577 | 8,317 | 406 | 31.07 | 26,766 | 1,111 | 11.14 | 15.39 |
| 1995 | 80.32 | 0.32 | 174,734 | 770 | 8,562 | 244 | 32.52 | 26,328 | -439 | 10.69 | 15.07 |
| 1996 | 80.65 | 0.33 | 175,566 | 832 | 8,169 | -393 | 30.92 | 26,419 | 91 | 10.90 | 15.05 |
| 1997 | 81.01 | 0.36 | 176,782 | 1,215 | 8,570 | 400 | 32.08 | 26,712 | 292 | 10.79 | 15.11 |
| 1998 | 81.37 | 0.36 | 177,804 | 1,022 | 8,052 | -518 | 31.81 | 25,310 | -1,402 | 10.17 | 14.23 |
| 1999 | 81.75 | 0.38 | 178,802 | 998 | 7,373 | -679 | 31.33 | 23,530 | -1,780 | 9.42 | 13.16 |
| 2000 | 82.14 | 0.39 | 179,630 | 828 | 6,500 | -873 | 30.81 | 21,100 | -2,430 | 8.43 | 11.75 |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ |
| 2005 | 83.57 | 0.29 ^c | 183,131 | 700 ^c | 3,789 | -542 ^c | 28.01 | 13,529 | -1,514 ^c | 5.43 | 7.39 |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ |
| 2010 | 84.90 | 0.27 ^c | 186,858 | 745 ^c | 3,189 | -120 ^c | 28.37 | 11,239 | -458 ^c | 4.38 | 6.01 |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ |
| 2015 | 86.37 | 0.30 ^c | 190,466 | 722 ^c | 2,765 | -85 ^c | 26.55 | 10,415 | -165 ^c | 4.08 | 5.47 |
| ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ | ⌘ |
| 2020 | 88.79 | 0.48 ^c | 194,595 | 826 ^c | 2,500 | -53 ^c | 25.00 | 10,000 | -83 ^c | 3.90 | 5.14 |

^a(Estimated Maximum Participation Rate*0.01)*(Smoothed Series of Persons in Working Age (excluding scholars and students)). – ^b(Estimated Maximum Labour Force – Actual Labour Force). – ^cYearly average of preceding five-year-period.

Source: EUROSTAT-Jahrbuch, Europa im Blick der Statistik, Ausgaben 2.1995/96, 3.1996/97, 4.1998/99, 5.2000. – EUROSTAT, Bevölkerungsstatistik 1960/99. – EUROSTAT, Europäische Sozialstatistik - Bevölkerung, Ausgabe 2000. – EUROSTAT, Erhebung über Arbeitskräfte - Ergebnisse 1995–1999. – EUROSTAT, Statistik kurzgefaßt, Bevölkerung und soziale Bedingungen, Thema 3 - 16/2000: Erste Bevölkerungsschätzungen für 2000. – OECD, Quarterly Labour Force Statistics. – Statistisches Bundesamt, Statistisches Jahrbuch für das Ausland, various issues. – Own estimates, interpolations and forecasts.