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Trade and Wage Inequality, Mirage or Reality?

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Trade and Wage Inequality, Mirage or Reality?

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Abstract

In the $2 \times 2 \times 2$ Heckscher-Ohlin model there exists a one to one relation between relative good prices and relative factor prices. A change in the relative price of one good changes the relative price of the factor used intensively in the production of the good in the same direction. We review this relation in the context of an analysis of European wage inequality. During the 1980-2000 period wage inequality in Europe increased. However, this movement is not explained by changes in wage differentials by skill level. The education and experience wage premiums remained relatively constant over the sample period. The largest fraction of the increase in wage inequality is accounted by residual inequality.

JEL Classification: D31, F16, J31.

Keywords: Inter-industry Trade, Intra-industry Trade, Product Differentiation, Wage Inequality.

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1 Introduction

The consequences of international trade for the remuneration of the factors of production is one of the most studied subjects of trade theory. In the traditional Heckscher-Ohlin (HO) model there exists a one to one relationship between relative good prices and relative factor prices, provided the analysis is restricted to the conventional two countries, two goods, two factors of production ($2 \times 2 \times 2$) case. This in turn implies that movements in relative good prices are translated one to one in movements of relative factor prices. In this framework technologies are identical across countries and the main motivation for trade is provided by differences in factor endowments between countries.

The relationship between relative good prices and relative factor prices predicted by the $2 \times 2 \times 2$ version of the HO model has been investigated in a number of important studies, including Lawrence and Slaughter (1993), Sachs and Shatz (1994), Wood (1994), Bhagwati and Kosters (1994), Borjas, Freeman and Katz (1997) and Krugman (1995, 2008). All these works begin from the premise that the relation between relative good prices and relative factor prices predicted by the model is an important proposition of trade theory, they find however that the effect of relative price changes on changes in relative factor prices is relatively small in actual data.

This outcome can be interpreted considering that according to the HO model foreign trade should be mainly determined by trade flows between developed and developing countries. However, actual world trade flows do not correspond to this picture closely. In the European Union (EU) for instance it is well known that intra-EU trade accounts for the most important fraction of trade. The greatest part of foreign trade in the EU occurs therefore between countries characterized by relatively similar factor endowments. When the HO model is modified in order to account for the presence of economies of scale in some industry, it is possible to provide an explanation for these trade flows. An important distinction in the extended framework is between inter-industry and intra-industry trade. While the inter-industry trade motive is present in the modified framework, the presence of economies of scale

provides the incentives for additional intra-industry trade. Trade flows between countries with similar factor endowments can be rationalized in terms of intra-industry trade.

In the modified HO model the inter-industry relation between relative good prices and relative factor prices can be reversed by the operation of economies of scale. Moreover, intra-industry factors may have an important role in the determination of the remuneration of the factors of production. In the present paper we provide a review of this subject, in the context of an econometric analysis of movements of wage inequality in the EU. The econometric application uses as main source of data the Luxembourg Income Study (LIS). A collection of country surveys included in the LIS in either of the five study waves of the 1980-2000 sample period is used to estimate a wage distribution for the European Union 15 members area (EU15) for each wave. Movements of wage inequality in the EU15 area are then analyzed over time and interpreted in terms of the framework provided by international trade theory. Similarly to previous work in this field, the analysis builds on the hypothesis that increased trade of the EU15 area with developing countries may cause a decline of the relative wage of unskilled labor. The HO model would predict this outcome to the extent that the EU15 countries are relatively more endowed with skilled labor.[1]

The main finding of the econometric analysis is that, although during the 1980-2000 sample period wage inequality has increased in the EU15 area, a relatively small part of these movements can be explained by movements in the relative wage of skilled and unskilled labor. We distinguish between skilled and unskilled labor along different dimensions and find that movements in wage inequality are not explained by these skill dimensions, rather a substantial amount of wage inequality must be characterized as residual or unexplained inequality. This result is consistent with a substantial amount of evidence in the field of wage inequality measurement. We argue that the modified HO model might provide an explanation for this finding. In particular, we view the wage inequality movements in the EU15 area during the

[1]The EU15 area is defined by the set of countries that were members of the European Union until 1 January 2004.

sample period mainly as a result of intra-industry competition.

The rest of the paper is organized as follows. Section 2, reviews the HO model and its modifications. Section 3, introduces the data. Section 4, describes the main evidence concerning wage inequality in the EU15 area during the 1980-2000 sample period. Section 5, proposes an analysis of the relation between human capital and wage inequality. Conclusions are provided in section 6.

2 Trade and the Labor Market

In order to introduce the main framework, we report in table 1 descriptive statistics on the evolution of the trade pattern of the European Union 15 members area over the time period 1980-2000. The data for the table are taken from the International Trade by Commodity Statistics database maintained by the Organization for Economic Cooperation and Development (OECD). The table provides the following important facts about the patterns of trade of the EU15 area. The trade/GDP ratio, defined as the ratio between the volume of imports and exports in goods and services and gross domestic product, increased over the sample period by about twenty percentage points. Moreover, considering the composition of merchandise trade by region of the world, during the sample period the greatest share of trade is accounted by trade flows within the EU15 area. Intra-EU15 trade represents approximately 60 per cent of merchandise trade flows for both imports and exports. Finally, the share of merchandise trade with other European countries and with Asia has shown a tendency to increase during the sample period.

These figures summarize a large body of evidence on the patterns of EU15 trade and will provide the basis for our discussion of the consequences of trade on wage inequality. We will consider in particular two main possible transmission mechanisms. The increased share of trade with European partners outside the EU15 and with Asia could be a determinant of wage inequality, to the extent that countries belonging to these areas have a comparative advantage in unskilled labor intensive commodities and trade occurs through the

exchange of skilled labor intensive goods produced in the EU15 for unskilled labor intensive foreign goods. The movements of relative good prices related to this type of trade flow would set a tendency for increased wage inequality. However, the relatively high intra-EU15 trade suggests that a different mechanism might be more important. The EU15 countries present patterns of specialization that are relatively similar across countries. The trade patterns reflect this similarity across countries and are composed mainly of trade in differentiated product varieties within the same industries. A tendency for greater wage inequality could occur as a result of competition in the markets for differentiated product varieties.

Following Krugman (2000) we illustrate the main arguments for the above statements considering the international trade relations in a conventional Heckscher-Ohlin (HO) framework with two countries (home and foreign), two goods (good A and good B) and two factors of production (skilled labor and unskilled labor). We assume that consumer preferences are given and equal across countries, that the production technology for both good A and good B is characterized by constant returns to scale and that each technology is available both in the home and in the foreign country. In addition, we assume that good A is a skilled labor intensive commodity and good B is an unskilled labor intensive commodity. This means that for given relative factor prices the optimal proportion of skilled labor employed in the production of good A is greater than the optimal proportion of skilled labor employed in the production of good B. Denoting with L_S the amount of skilled labor and with L_U the amount of unskilled labor, with w the relative wage of unskilled labor and with $(L_S/L_U)_A$ and $(L_S/L_U)_B$ the corresponding optimal proportions of skilled labor and unskilled labor employed in the production of good A and good B, it therefore holds that $(L_S/L_U)_A > (L_S/L_U)_B$ for all w. Finally, we suppose that the home country is skilled labor abundant and that the foreign country is unskilled labor abundant, therefore the proportion of skilled labor to unskilled labor endowment is greater in the home country than in the foreign country, $(L_S/L_U)_{home} > (L_S/L_U)_{foreign}$. The latter assumption implies, that in the absence of trade the relative price of the unskilled labor intensive commodity is greater in the home country than

in the foreign country. Moreover, the relative price of the unskilled labor intensive commodity will be lower in the presence of international trade than in the absence of trade in the home country.

The consequences of the change in relative good prices on relative factor prices can be described with reference to the Lerner diagram depicted in figure 1a. In the figure, the straight bold lines through the origin represent the factor proportions in the production of good A and good B prevailing at the factor price ratio w, which holds in the home country in the absence of trade. The isocost line drawn in correspondence with the factor price ratio w represents one Euro worth of output at the prevailing factor prices. The bold isoquants A-A and B-B represent the corresponding amounts of output of good A and good B and intersect the factor proportion lines for each good at the point of tangency with the isocost line.

A decline in the relative price of good B is depicted in the figure as an outward shift of the isoquant corresponding to one Euro worth of output at the relative factor prices prevailing in the home country in the absence of trade. The patterns of comparative advantage imply that in the new equilibrium the home country will specialize in the export of good A and in the import of good B. In turn, the proportion of skilled labor to unskilled labor employed in the production of both goods and the relative price of unskilled labor decrease.

The Lerner diagram provides a clear illustration of the well known Stolper-Samuelson factor price equalization theorem. In the conventional $2 \times 2 \times 2$ HO framework the Stolper-Samuelson theorem predicts that in the presence of international trade factor prices will be equal across countries. However, the theorem also predicts that the unskilled labor wage decreases in real terms and the skilled labor wage increases in real terms in the home country, as a consequence of international trade. The latter result follows from the changes in the proportions of skilled to unskilled labor employed in the production of each good in the home country.[2]

[2]The Stolper-Samuelson theorem was first advanced by Stolper and Samuleson (1941) and later reviewed by Samuleson (1948, 1949). For more on the Lerner diagram and related analytical tools see Dixit and Norman (1980) and Leamer (1995). We note also that when the model is extended to the case of many countries, many goods and many

The relation between relative good prices and relative factor prices that is provided by the $2 \times 2 \times 2$ HO model requires a number of different qualifications. We note first that the model predicts that trade occurs between skilled labor abundant and unskilled labor abundant countries. This contradicts the evidence that the greatest share of world trade is accounted mainly by trade flows within advanced countries. We presented above some evidence for the case of the EU15 area. The trade patterns between advanced countries can be accommodated by the model if the framework is extended in order to account for the presence of economies of scale in the production of some good. This is a subject that has been analyzed at some length by Helpman and Krugman (1985). For the present purposes suppose that good A rather than being an homogeneous commodity is a differentiated product. There are many varieties of the product in the market and the technology of production of each variety is characterized by increasing returns to scale. With this assumption in a condition of free trade the home country will continue to be a net exporter of good A and an importer of good B. However, the presence of economies of scale implies that each country will produce a subset of the product varieties and the production of each variety will be concentrated in either the home country of the foreign country. In this setting, the inter-industry trade pattern of the HO model is augmented by the intra-industry trade pattern of the differentiated product variety. Each country will export a subset of the differentiated product variety and import the complementary subset.

With this modification the model can explain the relatively high share of the trade flow within advanced countries that we observe in the data. Moreover, it is possible that the effect of a change in relative good prices on relative factor prices predicted by the Stolper-Samuelson theorem is reversed as a result of specialization of each country in the production of a defined subset of the differentiated product varieties and of the gains accruing from the exploitation of economies of scale. However, a more important source of wage inequality in this context may be the result of competition in the

factors of production relations of the type implied by the theorem are more ambiguous in their predictions.

market for differentiated product varieties.[3]

A second qualification regards the structure of the labor market. Both in the conventional HO model and in the augmented model it is assumed that labor markets are perfectly competitive. This in turn implies that in equilibrium there is full employment of all factors of production. The assumption of full employment does not provide however a correct representation of the European labor market. In figure 2, we report the average unemployment rate of the EU15 area in the 1980-2000 period, compiled on the basis of the Annual Labor Force Statistics database provided by OECD. The figure shows that the unemployment rate increased at the beginning of the sample period and remained thereafter at a relatively high level.

The movements of the European unemployment rate in the 1980-2000 period can be rationalized in terms of the interaction between shocks to each European economy during the sample period and institutions determining the response of each European economy to each shock. This is the approach that is followed for instance in Blanchard (1997, 1999), Blanchard and Wolfers (2000) and Nickell (2003). Two important shocks during the sample period were the productivity slowdown and the increase in real interest rates that occurred in the late 80s. Both shocks were common to European economies. Differences in labor market institutions between countries can be used to explain differences between countries in the patterns of adjustment to each shock. Rigid European labor market institutions are usually viewed as the main determinant of persistently high European unemployment rates.

We can use the evidence on the EU15 trade patterns during the 1980-2000 period provided in table 1 and the HO model to provide additional insights into the development of European unemployment during the sample period. Suppose, in particular, that wages of both skilled and unskilled labor are not allowed to adjust in the face of a terms of trade shock. The consequences for unemployment can be analyzed with reference to the Lerner diagram in figure 1b. Similarly to the perfectly competitive case, the decline in the

[3]The argument that the presence of economies of scale may reverse the consequences of changes of relative good prices on relative factor prices was advanced in Krugman (1981) in the context of a specific factor model that preserves the equalization of factor prices predicted by the Stolper-Samuelson theorem.

relative price of good B following from the shock implies an outward shift of the unit value isoquant for this good. However, because factor prices are not allowed to adjust to the shock, relative wages remain fixed at the pre-trade level. This in turn implies that for each Euro worth of output exchanged in international markets some labor will remain unemployed in the home country.

Following this line of reasoning, the shift of trade patterns of the EU15 countries towards European countries outside the EU15 and Asian countries observed in the 90s, could have contributed to increase the unemployment rate. In turn, the increase in unemployment would have limited the tendency towards greater wage inequality.

We finally describe the possible consequences of productivity growth on wage inequality. In particular, consider the effects of Hicks-neutral technical change in the production of good B. It is straightforward to show, using the above framework, that this type of shock would not have any consequence on relative factor prices. The increase in productivity would be compensated by a decline in the relative price of good B, while relative factor prices would remain unchanged. In order to determine a change in relative factor prices, an increase in productivity should therefore be characterized by a factor bias. While in the present work we propose a trade based analysis of movements European wage inequality, productivity related explanations are clearly complementary to ours.[4]

3 The Data

The principal source of data for the empirical analysis is provided by the Luxembourg Income Study. The LIS database is a collection of national income surveys covering a time period that begins in the early 80s. Currently, the LIS database collects income surveys for all former EU15 countries. Surveys are collected at intervals of five years from national governmental and statistical sources. In the time period 1980-2000 there are five waves of sur-

[4] An extensive survey of approaches and results in this field is provided in Hornstein, Krussel and Violante (2005).

veys that can be used in order to analyze developments in the EU15 area, although the number of EU15 countries included in each wave is relatively smaller at the beginning of the sample period.

In each wave the LIS database provides access to the income surveys of each country in a standardized form. The structure of the information provided in the LIS database is described by Atkinson, Rainwater and Smeeding (1995) and Förster and Vleminckx (2004). The statistical computations in the present work will be performed using the individual as the basic unit of analysis. For each country included in the LIS database in each wave the information at the individual level is organized along several dimensions. The main dimensions are defined by the sets of income variables and of demographic variables, in the more recent waves an additional set of labor market information is also provided.

For the purposes of the present work a first choice had to be taken with regard to the income concept to be used in the analysis. The LIS provides individual income information distinguishing between different concepts of income, ranging from wage and salary income to disposable income. Since the aim of the work is to study the movements of wage inequality over time, we decided to use an earnings concept of income and to analyze individual wage and salary income. For this reference income concept the LIS database provides information on both gross and net wage and salary income. Because over the sample period information on gross wage and salary income is available for a larger set of income surveys, we chose to use gross wage and salary income as the reference variable. The definition of gross wage and salary income adopted in the LIS conforms to the national accounts methodology and therefore excludes employer's contributions to social security and taxes and includes employee's contribution to social security and taxes. The number of EU15 countries for which information on gross wage and salary income is provided by the LIS ranges from five in Wave I - 1980 to eleven in Wave V - 2000.

In order to obtain for each LIS wave an earnings distribution for the EU15 area from the country distributions, a number of additional data preparation computations were carried out at this stage.

Income variables in the LIS database are denominated in units of national currency. In order to obtain a EU15 income distribution from the individual country distributions of each wave, the earnings variable of each country survey had to be converted into a common European unit of account. In order to calculate this conversion, the nominal values of the gross wage and salary income variable of each country were first converted in constant 2000 prices using each country household final consumption expenditure deflator. The household final consumption expenditure deflators for each country are taken from the OECD National Accounts Statistics. The values of gross wage and salary income at constant 2000 prices of each country in each wave were subsequently converted to a common EU15 unit of account using the purchasing power parities (PPP) for the EU15 area in the year 2000 provided by the European Statistical Agency (Eurostat). The PPPs provided by Eurostat are based on the Eltetö-Köves-Szulc (EKS) multilateral index method and are compiled for different national accounts expenditure aggregates. Consistently with our deflation procedure, for the conversion we used the household final consumption expenditure PPPs for the year 2000.

Secondly, in the LIS database each country survey contains information on the population weights that should be used in order to perform proper statistical calculations with the survey variables. The survey weights provided in each dataset are obtained as a result of the particular sampling design used by the country survey. In order to compile a EU15 distribution for each wave, the sampling weights of the country surveys included in each wave had to be converted into common EU15 population weights. For this purpose, the sampling weights of each country survey included in each wave were standardized to sum to the country population. The population data for each country represent average yearly estimates for the wave year and are obtained from Eurostat Demographic Statistics. The main characteristics of the sampling frame we have adopted are summarized in Table 2. The table reports for each LIS wave the population shares of each country included in the EU15 sample. The EU15 sample share is either close or greater than fifty per cent in all waves.[5]

[5]For an introduction to the statistical theory of survey analysis in the present work

For the purposes of economic analysis some additional specifications of the reference population had to be performed. The gross wage and salary variable reported in the LIS surveys refers to annual earnings. In order to relate this quantity to an actual gross wage concept it would be necessary either to limit the analysis to individuals in full-time, full-year employment or to normalize the LIS gross wage and salary income variable by annual work hours. This type of information is currently not provided in a standardized form across years and surveys in the LIS database. In order to obtain for each wave a EU15 sample representing as closely as possible the population of full-time, full-year workers, we therefore decided to restrict the analysis to the male population in the 25-54 years range. In addition, we dropped from the analysis the observations relating to self-employment income.

Finally, in order to correct for the possible presence of outliers a conventional bottom and top coding procedure was adopted. In each wave the gross wage and salary income variable for the observations falling either below the bottom one per cent or above the top one per cent of the earnings distribution were equalized to the values of the thresholds (Winsorization).

In table 3, we report for each wave the average real wage of the resulting EU15 earnings distribution. In order to asses the statistical properties of the EU15 distribution for each wave, bootstrap computations were performed on each wave sample and the corresponding standard errors and confidence intervals calculated. The bootstrap estimates for each sample reported in the table are based on 200 replications, stratified by country. The confidence intervals are based on the normal approximation and are compiled for a 95 per cent confidence level. The EU15 average gross wages and the corresponding confidence intervals resulting from this procedure are also reproduced in figure 3.

During the 1980-2000 sample period the EU15 average real wage has increased at an annual average rate of about one percentage point. The bootstrap standard error estimates show that in each wave the average real wage is estimated with a considerable amount of precision. The analysis of

we refer to Deaton (1997). Further details on the statistical procedures we adopted are reported in the appendix.

the confidence intervals shows that the overall growth over the sample period is significant.

4 Wage Inequality in Europe

In order to analyze the movements of wage inequality in the EU15 area over the 1980-2000 sample period, we report in table 4 the percentiles of the EU15 gross wage distribution for each LIS wave. Percentiles are denoted as a fraction of the median and for reference purposes the table also reports the median and the average real wage of the EU15 distribution in each wave. Bootstrap standard errors for each quantity are reported in parenthesis. The table shows that during the 1980-2000 period the gross wage has declined relative to the median in the lower half of the EU15 distribution and increased relative to the median in the upper half. Relative inequality in the distribution of EU15 gross wages has therefore increased.

In order to provide some further evaluation of relative inequality movements in the EU15 area over the 1980-2000 sample period, in table 5 we report a number of different inequality indexes. We consider in particular the variance of logarithm, the Gini coefficient, the Atkinson (1970) indexes with elasticity equal to 0.5 and to 1 and the Theil (1967) entropy indexes. In addition, for descriptive purposes we report also the 90/10, 90/50 and 50/10 percentile ratios. For each survey wave the table reports bootstrap standard errors in parentheses and confidence intervals based on the normal approximation at a 95 per cent confidence level. The variance of logarithm, the Gini coefficient and the 90/50 and 50/10 percentiles ratios are reproduced in figure 4. The table shows that there has been a tendency for gross wage inequality to increase in the EU15 over the sample period 1980-2000. Moreover, the increase in gross wage inequality appears to be significant, though at five year intervals the confidence intervals sometimes overlap. In addition, figure 4 shows that the Gini coefficient moves in parallel with the 90/50 and 50/10 ratios, relative transfers of gross wage income around the median appear thus to be more important than relative transfers at the bottom of the

distribution during the sample period.[6]

In order to assess whether the movements of inequality observed for the EU15 distribution over the sample period are determined by movements in the average gross wage between countries, rather than by movements of relative inequality within each country, we computed the within and between components of inequality of the variance of logarithm, the Theil entropy indexes and the Gini coefficient for each LIS wave. The decomposition of the variance of logarithm and the Theil entropy indexes shows that the between country component of inequality is small at the beginning of the sample period and declines over time while the within component is relatively more important and increase over time. For the variance of logarithm the between component accounts for a fraction equal to seventeen per cent of overall inequality in 1980 and declines to eight per cent in 2000. During the sample period the within component increases accordingly from eightythree to ninetytwo per cent.

The decomposition of the Gini coefficient provides some additional information. In particular, the Gini decomposition presents a residual component in addition to the within and between components, that in the present case depends on the degree of overlap between the parts of the EU15 gross wage distribution belonging to each country. The residual component of the Gini decomposition increases from thirty six per cent in 1980 to fiftyfive per cent in 2000.

These findings are consistent with the decision taken in the present paper to analyze the EU15 distribution rather than performing an analysis by individual country. The historical record of economic growth in the EU15 area supports the view that differences in average inequality between countries in the EU15 are relatively unimportant and was our principal reason for proceeding with the estimation of a EU15 gross wage distribution. In particular, a considerable amount of historical evidence shows that a substantial

[6] In order to recall the properties of the indexes we note that the variance of logarithm is sensitive to transfer at the lower end of the distribution, although it is not transfer sensitive. The Gini coefficient is sensitive to transfers around the median. The Atkinson indexes and the Theil entropy indexes are transfer sensitive. For a thouough review of their properties see Cowell (2000).

amount of catch-up and convergence between EU15 countries occurred during the golden age period that followed after World War II. The EU15 countries were as a consequence characterized by relatively similar levels of per-capita income at the beginning of the sample period.[7]

We should note finally, that the particular character of EU15 gross wage inequality movements in the EU15 area over the 1980-2000 sample period is a feature that differentiates the present study from recent works in the field by Bourguignon and Morrison (2002), Milanovic (2002, 2005), Sala-i-Martin (2006) and Pinkowskiy and Sala-i-Martin (2009). In the latter works the subject is the study of world inequality and therefore between country components have a much important role from a statistical point of view.

5 Human Capital and Wage Inequality

We analyze further the structure and movements over time of the EU15 gross wage inequality by skill level. For this purpose we define the skill level of a person in two alternative ways either in terms of his education level or in terms of his work experience.

The person education level is defined using the International Standard Classification of Education (ISCED) adopted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1997. The ISCED-97 education classification defines seven levels of education, that range from pre-primary school to advanced university education. A person is qualified as having a given education level if he or she has completed all the requirements of the educational curricula that characterizes that particular level. Curricula requirements present some country variation and the purpose of the classification is to provide a standardized framework, that can be used to produce comparable education statistics across countries.

For a subset of the surveys included of the LIS database it is possible to codify the country survey information on educational attainment at the

[7]For an overview of the process of growth and convergence in the EU15 countries over a relatively long period of time including the sample period of the present work we refer to Maddison (1995, 2001).

person level in terms of the ISCED-97 classification. The routine provided with the LIS documentation allows in particular to recode the information on educational level and occupational training provided in the country survey into a standardized LIS education classification. The standardized LIS education classification is defined according to three levels: (i) low - ranging from pre-primary to lower secondary education (ISCED-97 levels 0,1 and 2), (ii) medium - ranging from upper secondary education to post-secondary non university education (ISCED-97 levels 3 and 4) and (iii) high - comprising university education at both college and advanced level (ISCED-97 levels 5 and 6).

The informational requirements of the standardization routine imply a reduction in the number of individual country surveys that can be used to provide standardized education statistics in each LIS wave. The country surveys that could be used in each wave to provide standardized education statistics are marked with an asterisk in table 2. The bottom of the table also reports information on the EU15 population share that is covered by this restricted sample of surveys in each wave. The drop in representativeness of the restricted sample is particularly severe for the first LIS wave, where only one country survey remains in the sample.

We defined the person work experience in terms of his age using a simple classification in three ten years intervals over the age range 25-54. The classification defines therefore a person's experience: (i) low - 25-34 age range, (ii) medium - 35-44 age range and (iii) high - 45-54 age range. In order to ensure comparability with the analysis of skill level in terms of education, for the analysis of the experience variable we maintained the same restricted sample used in the analysis by education level.

Table 6 reports the average education and experience wage premiums obtained with this classification methods for the restricted EU15 gross wage distribution in each LIS wave. For reference purposes the last column of the table also reports the variance of logarithm of the restricted EU15 distribution. Bootstrap standard errors and confidence intervals at the 95 per cent confidence level based on the normal approximation are reported for each statistic. The education and experience wage premiums are reproduced in figure

5. According to the reported figures the EU15 medium/low education wage premium remained relatively stable over the 1980-2000 sample period, at the same time there has been a tendency for the high/medium education wage premium to increase over time. Both the medium/low and the high/medium experience wage premium instead remained relatively constant during the sample period.

When analyzed from both the education level classification and from the experience level classification, changes in the EU15 wage skill premium appear to be relatively modest over the sample period. The observed increase in gross wage inequality does not appear to be explained by movements of relative wages between skilled and unskilled labor. A simple HO based explanation of the increase in EU15 gross wage inequality during the 1980-2000 sample period seems therefore to be not supported by the evidence regarding the movements in average skilled/unskilled wage ratios.

In order to further analyze this result, we performed a decomposition of inequality indexes into within and between components. For this purpose we used again the properties of the variance of logarithm, the Theil entropy indexes and the Gini coefficient and the classification of the labor population by level of education. The results of this calculation confirm the view that between group inequality accounts for a lower part of overall inequality and within group inequality for a greater part during the sample period. In particular, for the variance of logarithm index the fraction of inequality accounted by the between group component declines from twentytwo per cent in 1980 to fifteen per cent in 2000. Moreover, both between group and within group inequality increase over the 1980-2000 period. However, the increase in within group inequality appears to be the main factor behind the increase in EU15 gross wage inequality during the sample period. Similar results are obtained with the Theil entropy indexes. In addition, the residual component of the Gini coefficient depends in this case on the degree of overlap between the gross wage distributions of the sub-groups of the population defined by each level of education. This component increases from eighteen per cent in 1980 to twentyfour per cent in 2000.[8]

[8]Because the computations for this decomposition are performed on a restricted sample,

We provide some additional evidence on these observations using a conventional wage regression framework. In table 7 we report the results obtained with the restricted EU15 sample in each LIS wave in a wage regression using as dependent variable the natural logarithm of gross wages and as independent variables indicator variables for the education level, a quadratic term in an experience variable defined as the difference between the person age and 25 years and interaction terms between the education and the experience variables. Country indicator variables are included in each regression. Bootstrap standard errors are reported in parentheses. The results reported in the table confirm the view that education and experience have on average a positive effect on gross wages, although the coefficients are not always statistically significant. The interaction terms between education and experience similarly provide additional information. However, the explanatory power of the wage regressions remains relatively low during the 1980-2000 sample period. The R^2 coefficient declines from 32.8 per cent in 1980 to 28.6 per cent in 2000. This shows that residual inequality accounts for the greater part of overall inequality in the restricted EU15 sample. Moreover, the fraction of residual inequality increases during the sample period.

The residual inequality index obtained from the wage regression as the variance of the residual is reproduced graphically in figure 6. From the figure it is again apparent that a substantial amount of the increase of EU15 gross wage inequality is accounted by the behavior of residual wage inequality over the sample period.[9]

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the level of inequality given by each index is different from the one prevailing in the full sample. A comparison between the variance of logarithm indexes reported in table 5 and table 6 shows in particular, that in the restricted sample inequality drops considerably in the first wave. Differences for the other waves appear to be less important from a statistical point of view.

[9] This result is common to a number of different studies that have been performed at the individual country level. Recent evidence for european countries is provided in particular by Blundell and Etheridge (2010), Fuchs-Schündeln, Krueger and Sommer (2010), Jappelli and Pistaferri (2010), Pijoan-Mas and Sanchez Marcos (2010) and Domeij and Floden (2010).

6 Conclusions

The paper has provided an analysis of movements of wage inequality in the EU15 area during the 1980-2000 period. The main source of data for the analysis was the set of country income surveys collected within the Luxembourg Income Study. The main results of the analysis have been interpreted in terms of the traditional HO model of international trade and its extensions to accounts for the presence of economies of scale.

For each wave of the LIS dataset a EU15 gross wage distribution has been estimated on the basis of the individual country surveys with complete information on this variable. The analysis of the movements in the EU15 gross wage distribution shows that relative inequality has increased during the 1980-2000 sample period in the EU15 area. While this finding appears to conform to the prediction of the traditional $2 \times 2 \times 2$ HO model, further analysis of the movements in the EU15 gross wage distribution by skill level does not support the view that movements of EU15 gross wage inequality are determined by movements of relative prices.

During the 1980-2000 sample period both the education wage premiums and the experience wage premiums remained relatively constant. Moreover, the analysis of the determinants of wage inequality in terms of inequality indexes decompositions and of a conventional wage regression framework shows that in each of the five LIS survey waves considered in the present study a substantial fraction of wage inequality is accounted for by residual inequality. In addition, residual inequality shows a tendency to increase over time. These results conform with similar findings obtained in several individual country studies for the same period of time.

Taken together these results confirm the view that movements of relative prices have little explanatory power for the analysis of wage inequality. Movements of gross wage inequality in the EU15 area during the sample period do not appear to be driven by changes in relative factor prices occurring as a consequence of trade with less advanced world regions. A more plausible explanation is that these movements are instead determined by intra-industry competition in differentiated product industries. The HO model modified

in order to account for the presence of economies of scale in the production of differentiated product varieties can provide more insights into gross wage inequality developments in the EU15.

We should note that the evidence we present is circumstantial and further and more in depth research would be required in order to evaluate these findings with more clarity. We also emphasize that while evidence concerning the relation between international trade and wage inequality is sometimes used in order to advocate protectionist measures, we consider this view as fundamentally incorrect. In the discussion of the implications of free trade for wage inequality we have abstracted entirely from the analysis of the question of the gains from trade. Well established results show however that gains from trade in the modified HO model are greater than in the traditional HO framework, due to the presence of economies of scale. The extension of the HO model to account for the presence of differentiated product varieties and economies of scale therefore provides even less ground for the endorsement of protectionists policies than the traditional HO model does.

Tables and Figures

Table 1: EU15 Trade/GDP Ratio and Shares of Merchandise Imports and Exports by World Region

	1980	1985	1990	1995	2000
			Imports		
EU15	-	-	0.602	0.603	0.573
Other Europe	-	-	0.097	0.106	0.115
North America and Oceania	-	-	0.099	0.096	0.102
Africa and Middle East	-	-	0.068	0.050	0.054
Asia	-	-	0.109	0.122	0.138
Latin America	-	-	0.025	0.022	0.018
			Exports		
EU15	-	-	0.642	0.622	0.618
Other Europe	-	-	0.107	0.114	0.119
North America and Oceania	-	-	0.102	0.089	0.119
Africa and Middle East	-	-	0.065	0.058	0.051
Asia	-	-	0.070	0.096	0.075
Latin America	-	-	0.014	0.021	0.018
Trade/GDP Ratio	0.532	0.581	0.529	0.570	0.707

Note: OECD, International Trade by Commodity Statistics. The Trade/GDP ratio is compiled with reference to total imports and exports in goods and services. The import and export shares by world region are compiled with reference to total trade in goods.

Table 2: LIS Sample Population Shares

	1980		1985		1990		1995		2000	
Austria	-		-		-		-		0.021	*
Belgium	-		-		0.027	*	0.027	*	0.027	*
Denmark	-		0.014	*	0.014	*	0.014	*	0.014	*
Finland	-		0.014		0.014		0.014	*	0.014	*
France	0.152		0.154		-		-		-	
Germany	0.220		0.217	*	0.218	*	0.220	*	0.218	*
Greece	-		-		-		-		0.029	*
Ireland	-		-		-		-		0.010	*
Italy	-		-		-		-		-	
Luxembourg	-		-		-		-		-	
Netherlands	0.040	*	0.040		0.041	*	0.042	*	0.042	*
Portugal	-		-		-		-		-	
Spain	-		-		-		-		0.107	*
Sweden	0.023		0.023		0.023	*	0.024	*	0.024	*
United Kingdom	0.158		0.158		0.157		0.156		0.156	
EU15 sample	0.594		0.620		0.495		0.497		0.663	
Restricted EU15 sample	0.040		0.231		0.324		0.341		0.507	
Total EU15 Population	355'313'054		358'675'209		364'278'009		371'167'072		376'319'952	

Note: Eurostat Demographic Statistics. The countries included in the restricted EU15 sample of each LIS wave are denoted with an asterisk.

Table 3: EU15 Average Gross Wages

			C.I.		
	Mean	S.E.	Lower	Upper	Obs.
1980	25'381.3	168.4	25'051.4	25'711.3	13'146
1985	26'199.7	251.8	25'706.2	26'693.3	24'046
1990	30'959.8	416.8	30'142.9	31'776.8	22'174
1995	30'923.7	410.7	30'118.8	31'728.6	46'759
2000	31'304.5	260.6	30'793.7	31'815.4	41'507

Note: Gross wages in constant 2000 EKS EU15 prices. LIS nominal gross wages for each country are converted in 2000 constant prices using OECD Household Final Consumption Expenditure deflators. Values in national currency units are converted in 2000 EU15 units of account using Eurostat Household Final Consumption Expenditure purchasing power parities. Bootstrap computations for standard errors and confidence intervals based on 200 replications, stratified by country. Confidence intervals based on the normal approximation at a 95 per cent confidence level.

Table 4: Percentile Ratios of the EU15 Gross Wage Distribution

Year	1	5	10	25	50	75	90	95	99	Median
1980	0.219	0.475	0.577	0.766	1.000	1.297	1.694	2.041	2.884	23'400.1
	(0.007)	(0.007)	(0.006)	(0.005)		(0.010)	(0.019)	(0.023)	(0.052)	(161.9)
1985	0.158	0.408	0.528	0.746	1.000	1.337	1.794	2.131	3.293	23'831.6
	(0.009)	(0.009)	(0.006)	(0.006)		(0.009)	(0.016)	(0.029)	(0.089)	(143.5)
1990	0.119	0.451	0.607	0.791	1.000	1.310	1.732	2.097	3.235	28'039.1
	(0.018)	(0.024)	(0.010)	(0.005)		(0.010)	(0.017)	(0.038)	(0.086)	(207.9)
1995	0.143	0.406	0.556	0.769	1.000	1.336	1.782	2.164	3.131	27'965.0
	(0.007)	(0.018)	(0.009)	(0.006)		(0.011)	(0.027)	(0.049)	(0.047)	(231.1)
2000	0.153	0.385	0.509	0.722	1.000	1.354	1.864	2.296	3.669	27'996.4
	(0.006)	(0.008)	(0.006)	(0.005)		(0.008)	(0.017)	(0.028)	(0.059)	(156.1)

Note: Gross wages in constant 2000 EKS EU15 prices. LIS nominal gross wages for each country are converted in 2000 constant prices using OECD Household Final Consumption Expenditure deflators. Values in national currency units are converted in 2000 EU15 units of account using Eurostat Household Final Consumption Expenditure purchasing power parities. Bootstrap computations based on 200 replications, stratified by country. Bootstrap standard errors are reported in parentheses.

Table 5: Inequality Indexes

	Variance of Logarithm	Gini	A(0.5)	A(1)	Theil	Mean Logarithmic Deviation	90/10	90/50	50/10
1980	0.200	0.236	0.046	0.091	0.092	0.095	2.936	1.694	1.733
	(0.005)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.040)	(0.019)	(0.017)
Lower	0.191	0.231	0.044	0.087	0.088	0.091	2.858	1.658	1.699
Upper	0.209	0.241	0.047	0.094	0.095	0.099	3.014	1.731	1.766
1985	0.264	0.262	0.057	0.115	0.114	0.122	3.398	1.794	1.894
	(0.006)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.044)	(0.016)	(0.022)
Lower	0.252	0.258	0.055	0.110	0.110	0.117	3.311	1.764	1.851
Upper	0.276	0.267	0.059	0.119	0.118	0.126	3.485	1.825	1.936
1990	0.250	0.243	0.051	0.105	0.102	0.110	2.855	1.732	1.648
	(0.014)	(0.004)	(0.002)	(0.004)	(0.003)	(0.005)	(0.057)	(0.017)	(0.028)
Lower	0.223	0.236	0.048	0.097	0.095	0.102	2.744	1.699	1.593
Upper	0.276	0.251	0.055	0.113	0.108	0.119	2.966	1.765	1.703
1995	0.265	0.256	0.055	0.113	0.110	0.119	3.205	1.782	1.799
	(0.007)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.069)	(0.027)	(0.029)
Lower	0.250	0.250	0.053	0.107	0.105	0.114	3.070	1.729	1.742
Upper	0.280	0.262	0.058	0.118	0.115	0.125	3.340	1.835	1.856
2000	0.299	0.282	0.066	0.131	0.133	0.140	3.664	1.864	1.966
	(0.005)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.051)	(0.017)	(0.022)
Lower	0.289	0.278	0.064	0.127	0.129	0.136	3.563	1.830	1.923
Upper	0.309	0.286	0.068	0.134	0.137	0.144	3.765	1.898	2.008

Note: The Atkinson indexes with elasticity equal to 0.5 and 1 are denoted with A(0.5) and A(1). Bootstrap computations based on 200 replications, stratified by country. Bootstrap standard errors are reported in parentheses. Confidence intervals based on the normal approximation at a 95 per cent confidence level.

Table 6: Education and Experience Wage Premiums

	Education		Experience		
	Medium/ Low	High/ Medium	Medium/ Low	High/ Medium	Variance of Logarithm
1980	1.30	1.36	1.21	1.02	0.127
	(0.02)	(0.04)	(0.02)	(0.03)	(0.006)
Lower	1.26	1.28	1.17	0.97	0.115
Upper	1.34	1.44	1.26	1.07	0.139
1985	1.21	1.33	1.27	1.01	0.225
	(0.03)	(0.03)	(0.03)	(0.03)	(0.013)
Lower	1.15	1.27	1.21	0.96	0.201
Upper	1.26	1.39	1.34	1.07	0.250
1990	1.20	1.34	1.24	1.10	0.251
	(0.03)	(0.03)	(0.03)	(0.03)	(0.018)
Lower	1.14	1.29	1.19	1.04	0.216
Upper	1.25	1.40	1.30	1.15	0.285
1995	1.07	1.41	1.21	1.10	0.272
	(0.02)	(0.03)	(0.03)	(0.03)	(0.010)
Lower	1.03	1.35	1.16	1.05	0.252
Upper	1.10	1.46	1.27	1.15	0.293
2000	1.28	1.44	1.26	1.08	0.289
	(0.02)	(0.02)	(0.02)	(0.02)	(0.006)
Lower	1.24	1.40	1.22	1.05	0.277
Upper	1.31	1.48	1.30	1.12	0.300

Note: Person education level defined according to the ISCED-97 classification as low (ISCED-97 levels 0,1 and 2), medium (ISCED-97 levels 3 and 4) or high (ISCED-97 levels 5 and 6). Person experience defined according to person age as low (25-34 years), medium (35-44 years) or high (45-54 years). Bootstrap computations based on 200 replications, stratified by country. Bootstrap standard errors are reported in parentheses. Confidence intervals based on the normal approximation at a 95 per cent confidence level.

Table 7: Wage Regressions

	1980		1985		1990		1995		2000	
Medium	0.0373		0.2249	**	0.1069		-0.0039		0.1127	***
	(0.0342)		(0.1047)		(0.1206)		(0.0513)		(0.0388)	
High	-0.0121		0.2032	*	0.2005	*	0.2036	**	0.1158	**
	(0.1045)		(0.1196)		(0.1093)		(0.0888)		(0.0525)	
(Age-25)	0.0144	***	0.0520	***	0.0227		0.0269	***	0.0252	***
	(0.0036)		(0.0149)		(0.0152)		(0.0056)		(0.0052)	
Medium*(Age-25)	0.0275	***	-0.0193		0.0142		0.0119		0.0070	
	(0.0060)		(0.0165)		(0.0183)		(0.0083)		(0.0060)	
High*(Age-25)	0.0687	***	0.0117		0.0224		0.0116		0.0485	***
	(0.0151)		(0.0180)		(0.0173)		(0.0127)		(0.0083)	
$(Age-25)^2$	-0.0004	***	-0.0016	***	-0.0004		-0.0006	***	-0.0005	***
	(0.0001)		(0.0005)		(0.0004)		(0.0002)		(0.0002)	
Medium*$(Age-25)^2$	-0.0006	***	0.0008		-0.0004		-0.0003		-0.0002	
	(0.0002)		(0.0006)		(0.0005)		(0.0003)		(0.0002)	
High*$(Age-25)^2$	-0.0016	***	0.0002		-0.0003		0.0001		-0.0013	***
	(0.0005)		(0.0006)		(0.0005)		(0.0004)		(0.0003)	
Constant	10.0521	***	9.6163	***	9.8092	***	9.8222	***	9.5776	***
	(0.0205)		(0.0995)		(0.0985)		(0.0387)		(0.0349)	
Country Effects	-		1		4		5		9	
R^2	0.3284		0.2118		0.2194		0.2153		0.2863	
Root MSE	0.2932		0.4217		0.4425		0.4622		0.4540	
Obs.	1'874		6'223		14'516		43'557		32'591	

Note: The dependent variable is the natural logarithm of gross wage at constant 2000 EKS EU15 prices. Independent variables include indicator variables for medium or high education level, a quadratic term in experience defined as the difference of the person's age from 25 and interaction terms between the education indicator variables and the quadratic term in experience. Country indicator variables are included in all regressions. Bootstrap computations based on 200 replications, stratified by country. Bootstrap standard errors are reported in parentheses. One, two or three asterisks denote statistical significance at 10, 5 or 1 per cent significance level.

Figure 1a: Lerner Diagram for Perfectly Competitive Labor Market

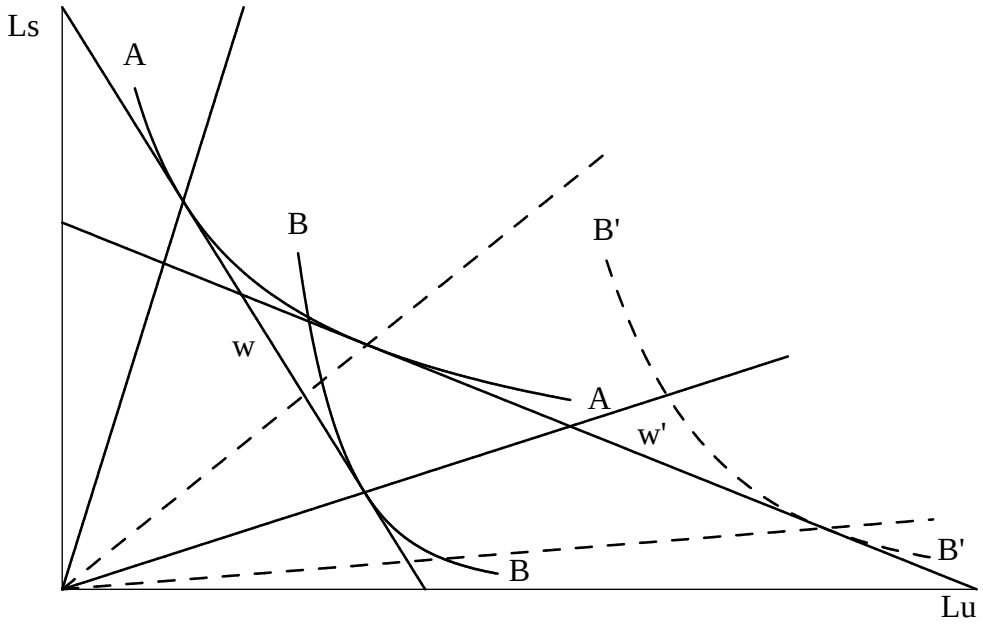


Figure 1b: Lerner Diagram for Imperfect Labor Market

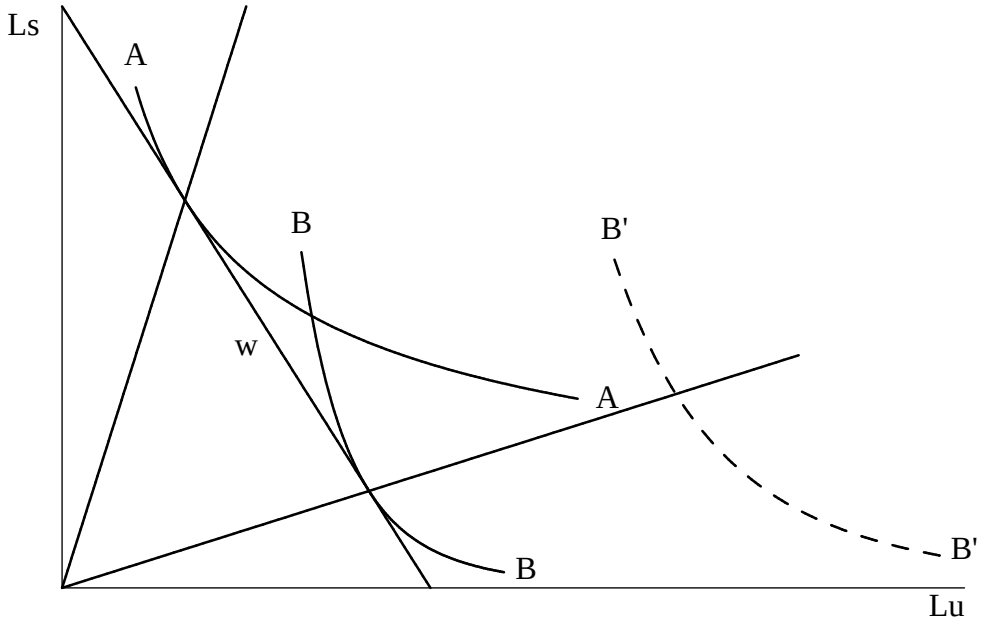
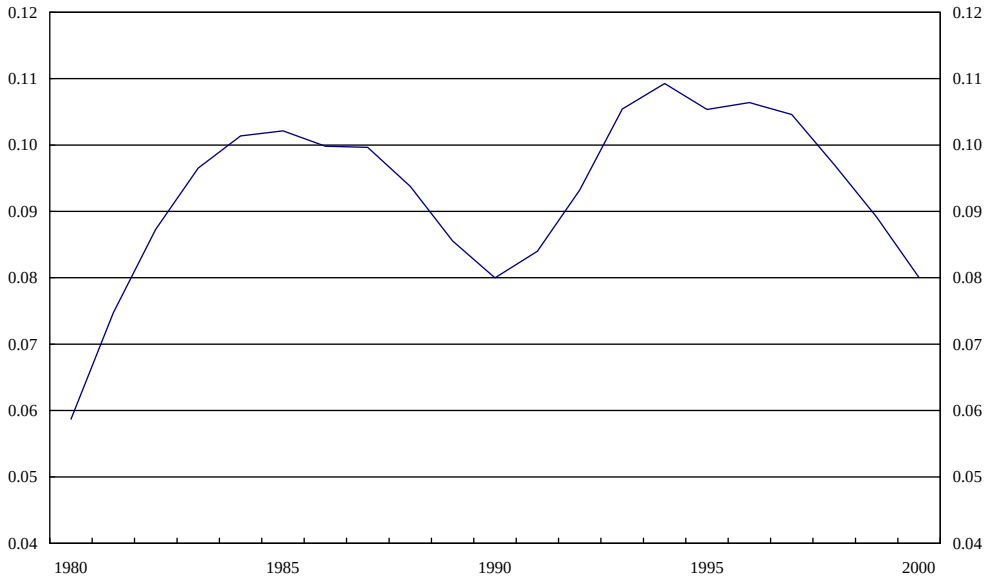
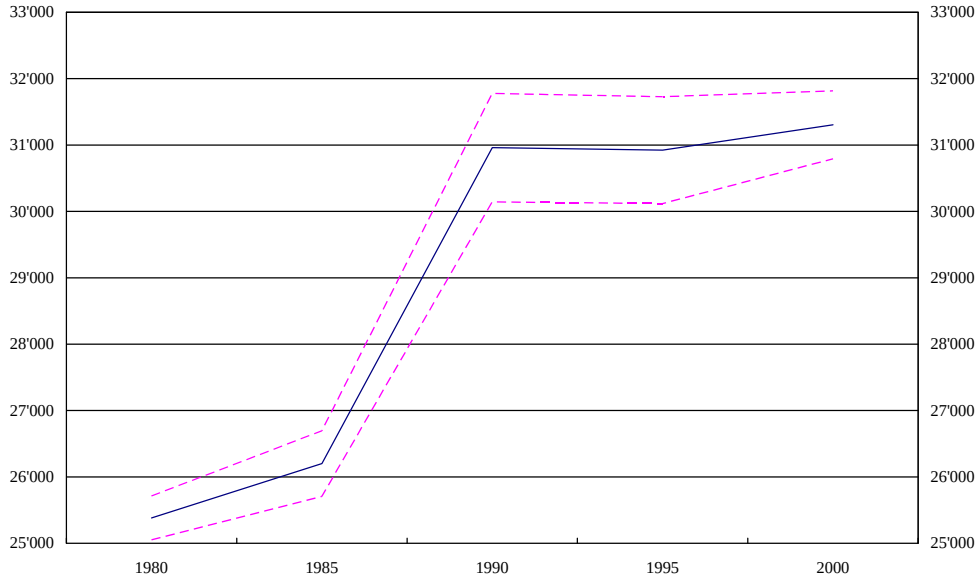


Figure 2: EU15 Rate of Unemployment



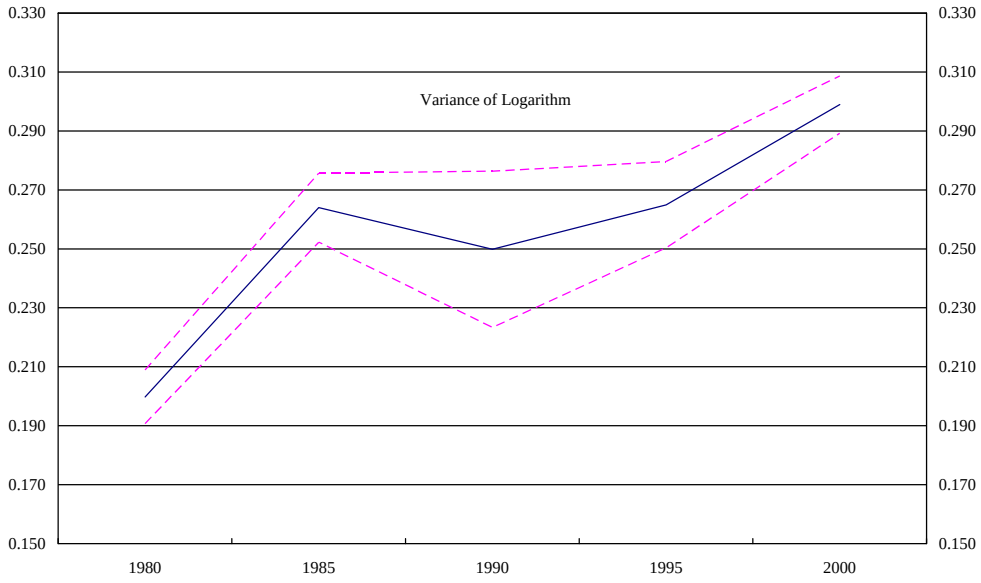
Note: OECD Annual Labor Force Statistics. The rate of unemployment is defined by the ratio of unemployed individuals to the total EU15 labor force.

Figure 3: EU15 Average Gross Wages



Note: Gross wages in constant 2000 EKS EU15 prices are drawn with the bold line. The dashed lines represent the corresponding bootstrap confidence intervals. LIS nominal gross wages for each country are converted in 2000 constant prices using OECD Household Final Consumption Expenditure deflators. Values in national currency units are converted in 2000 EU15 units of account using Eurostat Household Final Consumption Expenditure purchasing power parities. Bootstrap computations based on 200 replications, stratified by country. Confidence intervals based on the normal approximation at a 95 per cent confidence level.

Figure 4: Inequality Indexes



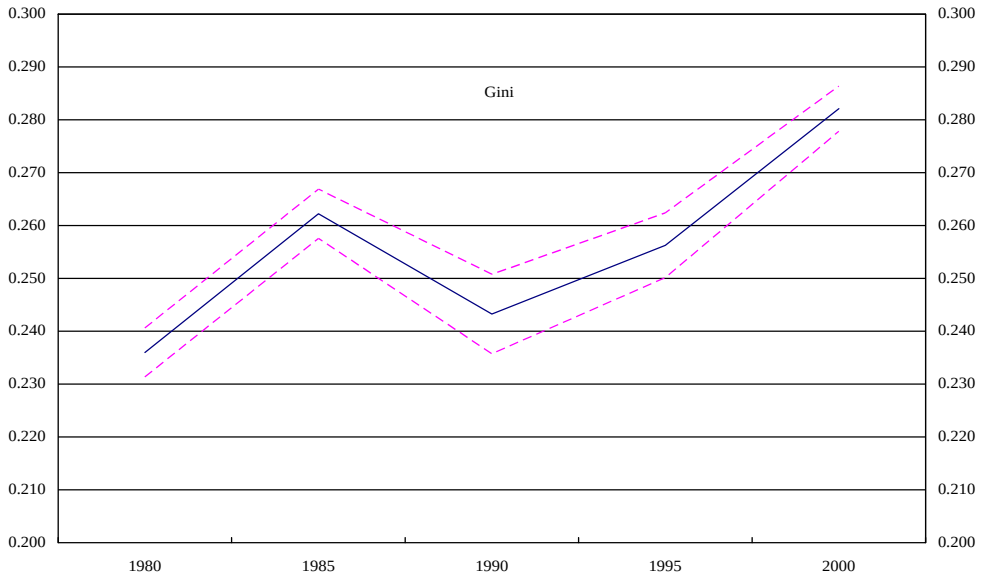
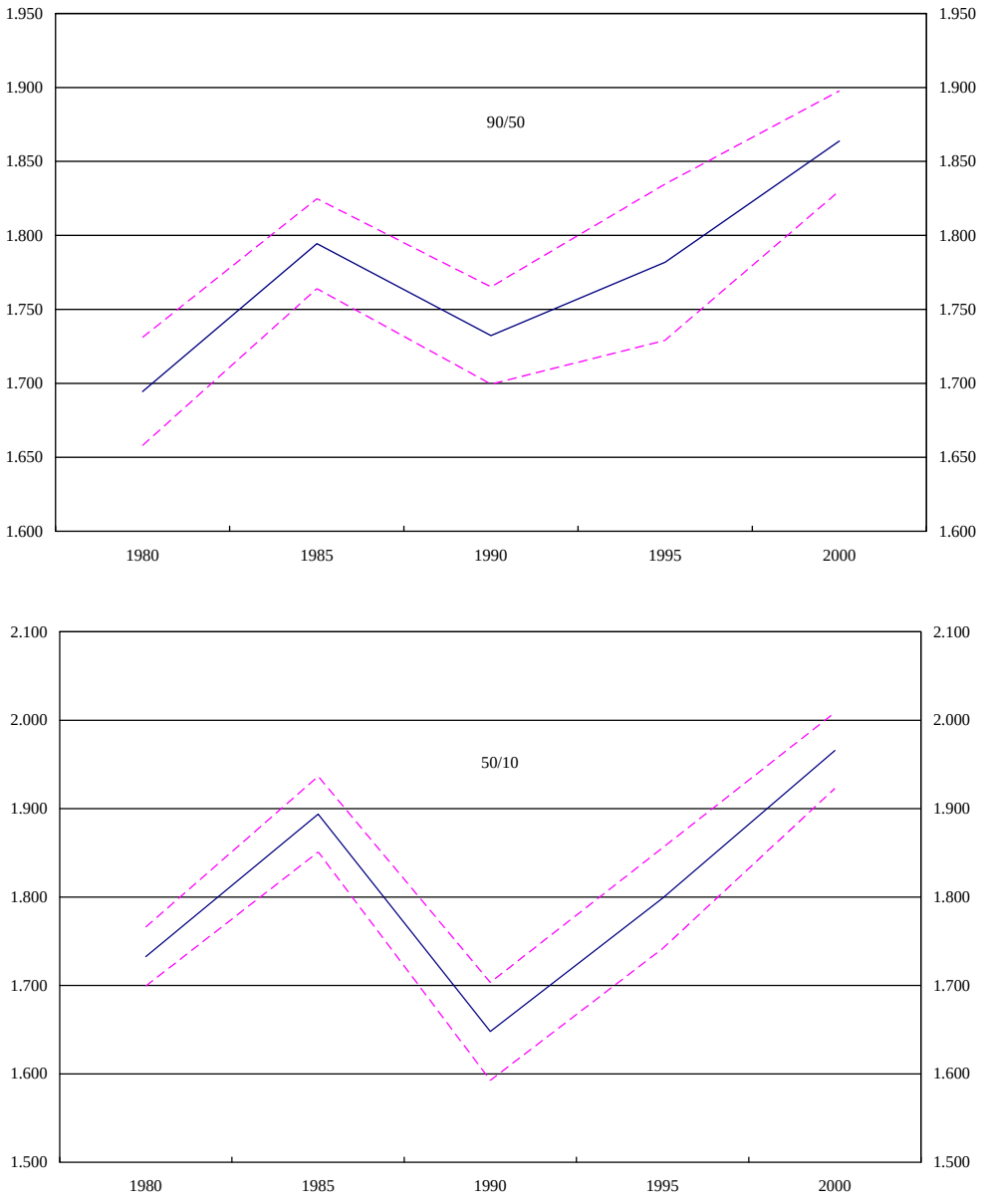
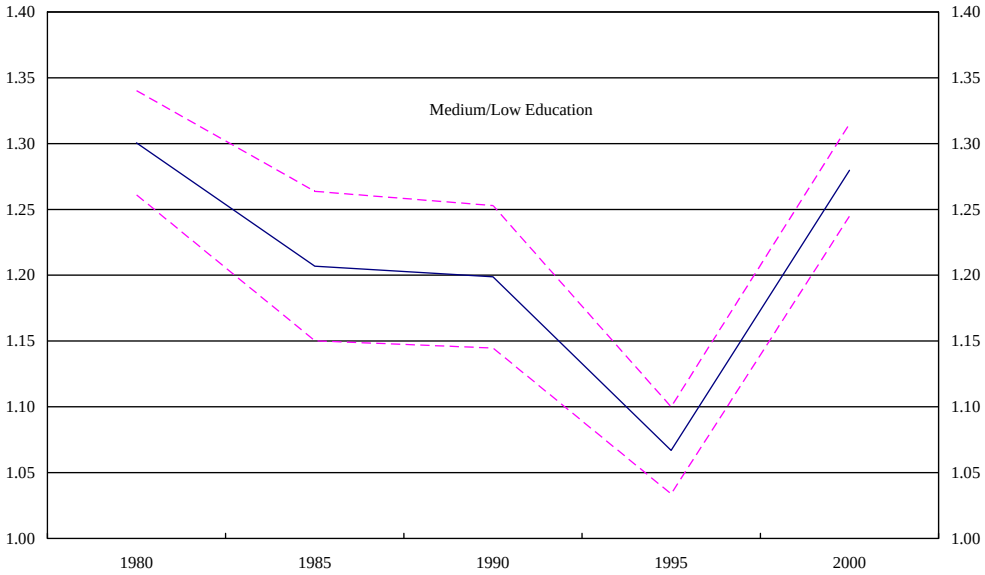


Figure 4: (continued)



Note: Each inequality index is drawn with a bold line. The dashed lines represent the corresponding bootstrap confidence intervals. Bootstrap computations based on 200 replications, stratified by country. Confidence intervals based on the normal approximation at a 95 per cent confidence level.

Figure 5: Education and Experience Wage Premiums



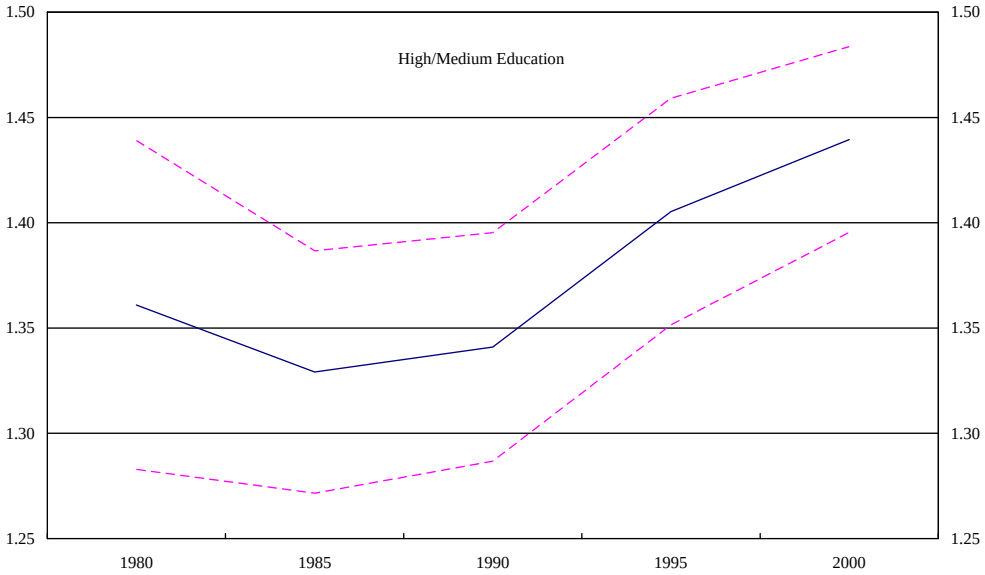
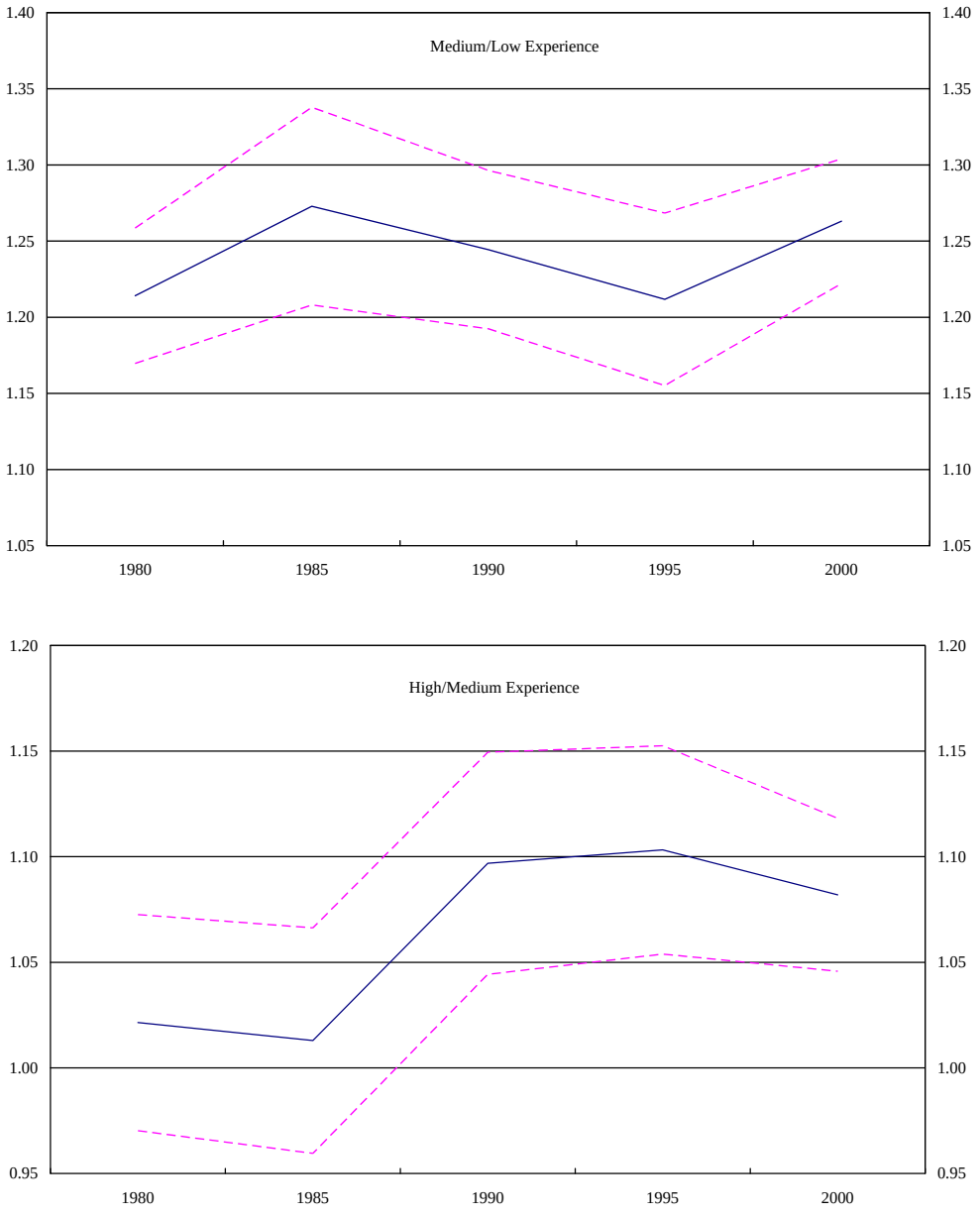
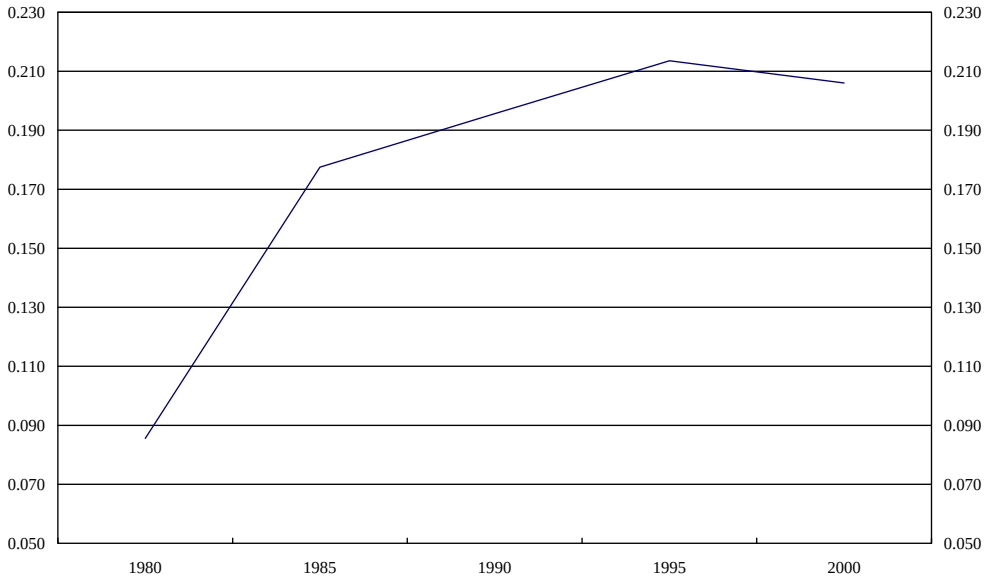


Figure 5: (continued)



Note: Average EU15 education and experience wage premiums are drawn with a bold line. The dashed lines represent the corresponding bootstrap confidence intervals. Bootstrap computations based on 200 replications, stratified by country. Confidence intervals based on the normal approximation at a 95 per cent confidence level.

Figure 6: Residual Inequality Index



Note: The residual inequality index is compiled as the variance of the residual of the wage regression calculated for each LIS wave. In each wage regression the dependent variable is the natural logarithm of gross wage at constant 2000 EKS EU15 prices. Independent variables include indicator variables for medium or high education level, a quadratic term in experience defined as the difference of the person's age from 25 and interaction terms between the education indicator variables and the quadratic term in experience. Country indicator variables are included in all regressions.

A Statistical Appendix

The list of country surveys used for each LIS wave for the analysis in the present paper is the following:

Wave I -1980: France, Survey of Individual Income Tax Returns, 1979; Germany, German Transfer Survey, 1981; Netherlands, Additional Enquiry on the Use of Public Services, 1983; Sweden, Income Distribution Survey, 1981; United Kingdom, Family Expenditure Survey, 1979.

Wave II - 1985: Denmark, Income Tax Register, 1987; Finland; Income Distribution Survey, 1987; France; Survey of Individual Income Tax Returns, 1984; Germany, German Social Economic Panel Study, 1984; Netherlands, Additional Enquiry on the Use of Public Services, 1987; Sweden, Income Distribution Survey, 1987; United Kingdom, Family Expenditure Survey, 1986.

Wave III - 1990: Belgium, Socio-Economic Panel, 1992; Denmark, Income Tax Register, 1992; Finland, Income Distribution Survey, 1991; Germany, German Social Economic Panel Study, 1989; Netherlands, Socio-Economic Panel, 1991; Sweden, Income Distribution Survey, 1992; United Kingdom, Family Expenditure Survey, 1991.

Wave IV - 1995: Belgium, Socio-Economic Panel, 1997; Denmark, Income Tax Register, 1995; Finland, Income Distribution Survey, 1995; Germany, German Social Economic Panel Study, 1994; Netherlands, Socio-Economic Panel, 1994; Sweden, Income Distribution Survey, 1995; United Kingdom, Family Expenditure Survey, 1995.

Wave V - 2000: Austria, European Household Panel, 2000; Belgium, Panel Study of Belgian Households, 2000; Denmark, Income Tax Register, 2000; Finland, Income Distribution Survey, 2000; Germany, German Social Economic Panel Study; 2000; Greece, Household Income and Living Conditions Survey, 2000; Ireland, Living in Ireland Survey, 2000; Netherlands,

Socio-Economic Panel, 1999; Spain, Spanish European Community Household Panel, 2000; Sweden, Income Distribution Survey, 2000; United Kingdom, Family Resources Survey, 1999.

The gross wage data for each country in each of the survey waves are denominated in national currencies. In order to estimate a EU15 distribution for each wave the country data were first converted at constant 2000 prices using each country's household final consumption expenditure deflator. The household final consumption expenditure deflators were taken from OECD, National Accounts of OECD Countries, Vol. II. Secondly, the country constant price gross wage data were converted in a common EU15 unit of account using the official purchasing power parities compiled by Eurostat for the year 2000 and relating to the household final consumption expenditure aggregate.

Eurostat PPPs are compiled on the basis of the Eltetö-Köves-Szulc multilateral index number method. In order to assess the sensitivity of the analysis to the choice of the PPP conversion method, we also compiled an alternative set of PPP indexes using the Geary-Khamis method. This comparison is of some interest, because the latter method is more widely used in international comparisons. Similarly to the official Eurostat PPPs the Geary-Khamis PPPs relate to household final consumption expenditure for the year 2000. The PPPs were compiled using basic heading level data on prices and household final consumption expenditure in year 2000 provided to us by Eurostat. The basic heading data are the same used by Eurostat for the compilation of the official EKS EU15 PPPs. For each country the data include a set of PPP conversion rates for the EU15 area at the basic heading level of classification of household final consumption expenditure and a corresponding set of expenditure weights. The household final consumption expenditure classification at the basic heading level is composed of 148 basic expenditure items.

The official Eurostat EKS PPPs used in the present study and the alternative Geary-Khamis PPPs are reported in table A1. The PPPs are denominated in units of each country's national currency. For comparison purposes

the table also reports the Euro conversion rates for each EU15 country in the year 2000. The exchange rates are obtained from Eurostat Exchange Rate Statistics. For the EU15 countries that in 2000 were already Euro members the Euro exchange rates are the official Euro parities, for Denmark, Greece, Sweden and United Kingdom they are compiled as annual averages of official central bank rates.

The EKS and Geary-Khamis PPP indexes are characterized by different axiomatic and economic properties, a review of this subject is provided in Deaton and Heston (2008) and Diewert (1999). We recall in particular that the EKS method is superlative and therefore it is exact up to the second order for homothetic aggregator functions. In the EKS PPPs however each country enters symmetrically in the calculations. This implies that small countries with a particular price structure might have a significant impact on the EKS indexes. The Geary-Khamis method is instead characterized by less desirable economic properties, since it is exact only for linear aggregator functions. However, its additivity properties make the method usually preferred in international comparisons

Table A1 shows that in the context of the present application relating to the EU15 area the differences between the two sets of PPPs are relatively unimportant. The differences between the Euro conversion rates and both the EKS and the Geary-Khamis PPPs are more important. The Euro conversion rates actually refer to tradeable goods and services, while the PPP conversion rates are compiled with reference to both tradable and non-tradable goods and services. As a result the PPP conversion rates tend to be lower than the Euro conversion rates for the lower income countries of the EU15 area and greater than the Euro conversion rates for the richer countries.

In the analysis of gross wage inequality for the EU15 area we produced several calculations using both the EKS and the Geary-Khamis PPPs and verified that the results were not qualitatively different between the two methods.

Table A1: EU15 Purchasing Power Parities and Euro Exchange Rates

	EKS	Geary-Khamis	Euro
Austria	13.35	13.38	13.76
Belgium	39.20	38.96	40.34
Denmark	9.25	9.20	7.45
Finland	6.85	6.83	5.95
France	6.62	6.68	6.56
Germany	1.99	1.97	1.96
Greece	268.78	273.37	336.63
Ireland	0.86	0.86	0.79
Italy	1798.73	1819.30	1936.27
Luxembourg	39.01	39.96	40.34
Netherlands	2.10	2.09	2.20
Portugal	158.55	160.20	200.48
Spain	134.81	138.20	166.39
Sweden	10.27	9.97	8.45
United Kingdom	0.70	0.69	0.61

Note: Household final consumption expenditure purchasing power parities in units of national currencies and Euro exchange rates in year 2000. For the original Euro member countries the Euro exchange rates are the official Euro parities, for Denmark, Greece, Sweden and United Kingdom they are compiled as annual averages of daily rates.

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