Employment and productivity: disentangling employment structure and qualification effects

Renaud Bourlès[a,1], Gilbert Cette[b] and Anastasia Cozarenco[c]

a. Ecole Centrale Marseille and GREQAM-IDEP
b. Banque de France (DEMS) and Université de la Méditerranée (DEFI)
c. Université de la Méditerranée and GREQAM

27 January 2010

Abstract:

This paper studies the effect of changes in the employment rate on labour productivity per hour, taking an empirical approach. By splitting the workforce into three qualification categories, this study allows us to distinguish the effects of changes in the employment rate structure from those of changes in the qualification structure. With the results obtained, we are then able to emphasise the mechanical effect on GDP, for each country in our panel, of a catch-up with the best practice with respect to employment rate structure and qualification level. It appears that the two effects are more or less of the same magnitude. Moreover, this methodology allows us to rank the countries in our panel depending on the gains they could expect from adopting the best practices in each of the two areas.

Keywords: Productivity; Growth; Employment; Education
JEL codes: O47; J24; J68; L40; 057

The authors are indebted, with the usual disclaimers, to Hervé Boulhol for providing data on employment by classification and to Lionel Fontagné, Jimmy Lopez and Etienne Wasmer for useful discussion.

[1] Corresponding author. Address correspondance to: GREQAM, Centre de la Vieille Charité, 2 rue de la Charité, 13236 Marseille cedex 02, France. Tel: +33 (0) 4 91 14 07 70. Fax : +33 (0)4 91 90 02 27 Email: renaud.bourles@centrale-marseille.fr

1. Introduction

Which employment-based policy would lead to the largest GDP per capita gains? Countries can increase either the employment rate, working time or qualifications within the employed population. GDP per capita levels vary among industrialised countries, and at the same time we observe huge varieties in employment rates, working time and qualifications of the working-age population. For example, GDP per capita, the employment rate and working time are higher in the United States than in Continental Europe (see Prescott, 2004). This explains why improving the employment rate and the knowledge-based economy across Europe were two of the three pillars of the Lisbon Strategy[2], the implicit goal being to catch up with the US GDP per capita level. However, supposing trade-offs between productivity and the employment rate and between productivity and working time, the differences observed among countries in the employment rate and in working time cannot explain differences in GDP per capita in the same proportion.

A growing amount of economic literature studies the relationship between productivity and the employment rate, and between productivity and working hours, using country panel data. Most find a negative elasticity of hourly productivity with regard to the employment rate and to working time. The explanation usually given for the negative elasticity with regard to the employment rate is that the more productive and skilled people are hired first. Concerning working time, it is argued that the effects of fixed costs (which produce increasing returns to hours worked) are outweighed by the effects of fatigue (which produce diminishing returns)[3].

Initially, this literature aims mainly to study the role of producing and using ICT (*Information and communication technologies*) on productivity. Starting with Gust and Marquez (2004), recent papers highlight the role of differences in the employment rate to explain to some extent the international disparities in productivity levels. Adding hours worked into the model and using a more sophisticated method (the Generalized Method of Moments, rather than the Generally Least Squares method used in Gust and Marquez, 2004), Belorgey et al. (2006) find an elasticity of hourly productivity with regard to the employment rate of around -0.3 and with regard to working time of around -0.65.

Focusing on the impact of the employment rate and working hours on productivity (rather than of ICT as in the two previous papers), Bourlès and Cette (2005, 2007) confirm this negative relationship between the changes in the employment rate and the changes in hourly labour productivity. They estimate both a static and a dynamic relationship, using Ordinary Least Squares (OLS) and Instrumental Variables (IV) methods to control for various biases as endogeneity or measurement errors. They find an elasticity of hourly productivity of around -0.65 with regard to the employment rate and of around -0.55 with regard to hours worked. In parallel, McGuckin and van Ark (2005) analyse through OLS the long-term relationships between labour participation and productivity. They also find a negative trade-off over short periods, estimated at less than 0.3 in absolute terms. In their study, elasticity with regard to working time is greater than in previous studies, between -0.5 and -0.77. However, the latter result is considered less relevant by the authors because of a strong relationship between productivity and per capita income.

The same kind of results as those of Bourlès and Cette (2005, 2007) are obtained with IV methods by Aghion et al. (2009), who mainly focus on the impact of education and market rigidities on productivity. These negative trade-offs are also present in Dew-Becker and Gordon (2008). The authors also perform a static estimation deploying IV methods. The employment rate effect on productivity is estimated to be almost -0.6. In a recent study using IV methods, Cette, Chang and Konte (2009) find decreasing returns to working time and confirm the hypothesis of their decrease

[2] The other pillar was the environment, with the aim of reducing greenhouse gas emission.

[3] One of the first empirical studies obtaining a negative elasticity of hourly productivity with regard to working time is Malinvaud (1973), on a firm panel dataset. The estimated elasticity was close to -0.5.

with the working time itself. This means that the elasticity of the productivity per hour with regard to working time is negative and would be itself decreasing with working time, via an increasing fatigue effect.

However, these results are contradicted by Van der Horst, Rojas-Romagosa and Bettendorf (2009). Using a 3SLS method (with demographic variables used as instruments), the authors find a positive trade-off between the employment rate and productivity. Nevertheless, they concede that the productivity elasticity with regard to hours worked is unstable. Moreover, they note that the risk of productivity slowdown is higher if the number of hours worked increases intensively.

Although the relationship between productivity and employment is often intuitively explained in the literature by skills or demography, few papers closely look at this issue empirically. The first attempt to explore this explanation is made by Bourlès and Cette (2005) who break down the employment rate into six categories crossing three age groups with the two genders. They find differences between the age groups: an increase in the employment rate due to an increase in employment among 25 to 54 year-olds slows down productivity by a lower amount than if it comes from a population aged 15 to 24 or 55 to 64. This may reflect two human capital effects: a lack of experience in the young unemployed population and an erosion of human capital in the older bracket of the unemployed population.

Boulhol (2009) and Boulhol and Turner (2009) complete the analysis by integrating different qualification groups. They distinguish 30 categories, crossing 3 dimensions (2 genders x 5 age groups x 3 education levels) and show that the effect of the working-age population structure is dominated by the effect of educational composition. However, they use data on relative wages to evaluate productivity changes beyond these 30 categories. This approach has the advantage of distinguishing a specific effect for each country, but has the disadvantages of having to assume a perfect labour market and to rely on data concerning wages, employment structures and working-age population structures at the limit of their accuracy capacities, or beyond.

The present study aims to distinguish, within the trade-off between productivity and the employment rate, (i) the specific role of the education structure, assuming a constant overall employment rate, and (ii) the specific role of a pure employment rate change, assuming a constant education structure. To do so, the working-age population and the employed population are broken down into three categories, according to their education level. Unlike Boulhol and Turner, we rely on econometric methods to evaluate the effect on productivity of a change in the employment rate of each of the three education levels. This then allows us to study the impact on GDP of a catch up with the best practice in the employment structure and in the qualification level respectively. For European countries, the topic of the paper is therefore closely linked with two of the three pillars of the Lisbon Strategy: to improve Europe's knowledge-based economy and employments rates.

Our empirical analysis is carried out on a panel of twenty-one OECD countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Iceland, Italy, Japan, Korea, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States. The annual macroeconomic data span the 1980-2007 period. The main data sources are the OECD databases. Data are detailed in Appendix A.

Regarding the overall employment rate, we confirm the results of most papers listed above, since we find elasticity of hourly productivity with regard to the employment rate and to hours worked of around -0.5. By splitting the workforce into three qualification categories we can show that the effect of an increase in the employment rate is greater (in absolute terms) if coming from an increase in the employment of low qualification groups ("less than secondary education" or "some secondary education") than if coming from an increase in the employment of the population with higher education. In addition we find that the effects coming from the first two qualification groups are not significantly different from each other. Turning to policy implications, and the effect on GDP of a catch-up with best practice in employment structure and qualifications, it appears that (i) both effects are generally of the same magnitude, but (ii) countries in our panel can be ranked on the gains they can expect from adopting the best practices in each of the two areas.

The paper is organised as follows. Section 2 reviews the main differences among countries in qualification structure, employment rate and the contribution of each of the qualification groups to the employment rate. Section 3 and section 4 give estimation results of productivity elasticity with regard to the overall employment rate and to the employment rate of each of the three qualification groups respectively. Section 5 gives policy implications of these results, in terms of the mechanical potential GDP gains, which could be obtained in each country by adopting the best practices for the qualification structure of the working-age population and for the employment rate structure. Section 6 concludes.

2. Descriptive Statistics: unequal employment and qualification structures

This section is devoted to comparative statistics on a panel of 22 OECD countries: the 21 named in the introduction and Switzerland. More precisely, we highlight the significant differences between countries concerning the qualification structure (section a) and the employment rate structure (section b) of the working-age population.

a. The qualification structure

As stated in the introduction, we distinguished three levels of qualification in the working-age population (i.e. population aged 15 to 64 years): below secondary education, secondary education (completed or not) and higher education (completed or not). The qualification structure differs strongly among countries (see Chart 1).

In 2005, the proportion of third-level education among the working-age population exceeds 30% in only four countries: Canada (40%), Japan (35%), the United States (33%) and Norway (30%). Conversely, this proportion is below 20% in four countries: Greece (18%), Austria (15%), Italy (11%) and Portugal (11%). Similarly, the proportion of the lowest education level is very sparse. It is below 20% in four countries: Japan (13%), the United Kingdom (14%), Canada (19%) and the United States (19%). Conversely, it is above 30% in ten countries: the Netherlands (32%), France (36%), Iceland (36%), Ireland (36%), Belgium (36%), Australia (37%), Greece (41%), Italy (50%), Spain (52%) and Portugal (72%).

Still, from the various proportions of the population with secondary education, it appears that the differences in the proportions of the population with the lowest level education do not necessarily reflect similar differences in that with the highest level. Among the ten countries with a working-age population with the lowest education level of above 30%, we can distinguish three groups:

- Seven countries are slightly lagging in their secondary and third-level education, the proportion of each of these two groups exceeding 20% of the working-age population: Australia, Belgium, France, Iceland, Ireland, the Netherlands and Spain;

- Two countries are predominantly lagging in their third-level education, the proportion of the secondary and third-level education in the working-age population being respectively above and below 20%: Greece and Italy;

- One country is suffering from a significant lack in both secondary and third-level education, the proportion of each of these two groups being below 20% of the working-age population: Portugal. Not surprisingly, we will see that Portugal is the country which benefits the most, in terms of GDP gains, from the adoption of the best practice for qualification structure.

b. The employment rate structure

In all countries, the employment rate of the population with the lowest education level is below that of the population with secondary education which is itself lower than that of the population with third-level education. In 2005, the employment rate of the population with third-level education is below 75% in only one country: Germany (72%). In contrast, for the population with secondary education it is above 75% in only six countries: Iceland (86%), Norway (80%), Sweden (79%), Denmark (78%), Australia (77%) and the Netherlands (76%). Finally, for the lowest education level, the employment rate is above 75% in only one country: Iceland (79%).

Moreover, the range of the employment rates over the countries in our dataset appears larger for the population with the lowest education level (from 40% in Belgium to 79% in Iceland) than for the population with secondary education (from 61% in Greece to 80% in Norway) which is itself larger than for that of the population with third-level education (from 75% in Japan to 90% in Iceland).

Overall, the employment rate of the working-age population is very diverse among the countries in our dataset (see Chart 2). It is particularly high (over 75%) in three countries: Norway (75%), Denmark (76%) and Iceland (84%). It is low (below 65%) in five countries: Italy (57%), Greece (60%), France (63%), Korea (64%) and Spain (64%). Not surprisingly, we will see that Italy is the country which benefits the most, in terms of GDP gains, from the adoption of the best practice in terms of employment rate structure. The employment rate is intermediate (within the range of 65% to 75%) in the other thirteen countries. We observe that the employment rate is higher in Anglo-Saxon and Nordic countries and Japan compared to Continental European countries. This development (it was not the case in the early 70's) was stressed for the United States compared to Continental European countries by Prescott (2004).

The contributions of the different education groups towards the overall employment rate (defined as the ratio between the numbers of employed in the education group and the total working-age population[4]) depend both on the qualification structure of the working-age population and on the employment rate of each group (see Chart 2). The contribution of the population with third-level education is very low (below 15 percentage points) in four countries: Italy (8 pts), Portugal (10 pts), Austria (13 pts) and Greece (14 pts). It is on the contrary particularly high (over 25 percentage points) in six countries: Denmark (26 pts), Iceland (26 pts), Japan (26 pts), Norway (26 pts), the United States (28 pts) and Canada (33 pts). The contribution of the population with the lowest level of education is very small (below 10 percentage points) in four countries: the United Kingdom (7 pts), Japan (8 pts), the United States (8 pts) and Canada (9 pts). It is on the contrary particularly large (over 25 percentage points) in three countries: Iceland (29 pts), Spain (29 pts) and Portugal (48 pts).

From these observations, we may already guess that for some countries, GDP gains from adopting the best practice in terms of qualification structure or of employment rate structure can be significant. In order to evaluate these gains, it is necessary to first estimate the potential GDP gains from an increase in the employment rate or from a shift upwards in the qualification structure.

3. Employment and productivity: an aggregate approach

Before trying to break down the respective effects of changes in qualification level and in employment structure on productivity (effects on GDP immediately follow), let us first analyse in the following section the overall effect on hourly productivity of an increase in the employment rate. After having

[4] The contribution of an education group to the employment rate is therefore different from the employment rate of this education group (that is the ratio between the number of employed in the education group and the number of working-age individuals in this group.)

defined the estimated relationship (section a), we carry out the estimates using the Ordinary Least Squared (OLS) (section b) and the Instrumental Variables (IV) methods (section c).

a. Estimated relationship

The first model we estimate in this paper aims to characterise the effect of changes in the employment rate (ER) on hourly labour productivity (LP) growth. Based on previous empirical studies (see for example Gust and Marquez, 2004, Bourlès and Cette, 2005, 2007 or Belorgey et al., 2006) and according to economic theory, we also control in the estimates (i) for changes in the logarithm of hours worked (h) to control for the decreasing returns of this variable on hourly productivity and (ii) for changes in the capacity utilisation rate (CUR), to reflect the effects of the economic cycle. We moreover allow for these relationships to be dynamic through the inclusion of an auto-regressive term (Δlp_{-1}). In the following, variables in lower case correspond to logs, Δ corresponds to a first order difference and a subscript -i indicates that the variable is lagged by i period. Finally we test for many other controls (X_i) amongst which country fixed effects that take into account all omitted variables that are constant by country throughout the period. The estimated relationship can then be presented as follows:

$$\Delta lp = \alpha . lp_{-1} + \beta . \Delta ER + \gamma . \Delta h + \varphi . \Delta CUR + \sum_i \eta_i . X_i + cte + u \qquad (1)$$

In the following, the only presented extra control variable we use – except for country fixed effects – will be the share of ICT production in total value added (IPTR). This is consistent with previous studies (e.g. Bourlès and Cette, 2005, 2007) that indicate this variable as the only other significant one amongst all alternative explanatory variables (investment rate, R&D spending, rate of self-employment, share of part time in employment, etc.).

The expected signs are: $-1 < \beta$, $\gamma \leq 0$ and $\varphi \geq 0$. The estimated coefficient for the impact of IPTR is also expected to be positive. Regarding α – the coefficient of the autoregressive term – a negative (resp. positive) sign would imply that our explanatory variables have a lower (resp. higher) impact on the long term than on the short term.

The empirical analysis is carried out on annual data across a panel of 22 countries in the OECD, for the period 1986-2006. Let us first expose the result for the estimates of relationship (1) using the OLS method before turning to the instrumental variables method, which may correct for measurement errors or simultaneity issues.

b. Estimation results using the OLS method

Table 1 presents the estimates of relationship (1) obtained using the ordinary least squares (OLS) method. Several specifications are tried: static/dynamic, with/without country fixed effects and with/without controlling by ITPR, all variants leading to similar results that can be summarised as follows.

When present, the autoregressive term appears to be significantly positive. This would mean that long-term effects are greater than short-term ones. This result seems rather odd in the case of the employment rate. Indeed, a noteworthy explanation given to decreasing returns of the employment rate is the erosion of human capital. To that extent at least, a negative coefficient for the autoregressive term would seem more natural. This may indicate that the OLS estimate may be biased due to simultaneity issues.

The coefficient estimated for the effect of a change in the employment rate is always significant with a short-term (or static) effect of around -0.5. This is consistent with economic theory and with previous empirical findings. Surprisingly, whereas in previous studies (Belorgey et al., 2004 or Bourlès and Cette, 2005, 2007) this result was obtained with a sophisticated method (Generalized Method of Moment or Instrumental Variables), we obtain here the elasticity with the OLS method, which may indicate that the enlargement of the sample has reduced some of the biases.

The results are less satisfying, however, regarding the effect of hours worked. Although we do find a significant negative effect, the estimated coefficient for Δh appears to be slightly high (in absolute terms) with an elasticity of hourly productivity with regard to hours worked of around -0.8. As previous studies agree instead on an effect of around -0.5, this again seems to indicate the presence of some bias.

The other estimated coefficient seems fair as we find a positive and significant effect for the capacity utilisation rate (with an acceptable magnitude) and ICT production. Moreover, one can see from columns [7] and [8] that country fixed effects have little impact on the estimates. As our methodology then amounts to a difference in difference, it has no impact even when the autoregressive term is present (columns [5] and [7]).

As the estimates for the effect of the autoregressive term and hours worked seem to be biased, in the next section we perform the estimates of relationship (1) using the instrumental variables (IV) method.

c. Estimation results using the IV method

The implementation of instrumental variables may indeed correct some of the measurement errors and simultaneity issues present in the model. Two tests are used to evaluate adjustment quality: the Sargan test (1958), which assesses the overall quality of the adjustment and relevance of the instruments, and the Durbin-Wu-Hausman test (or the Davidson and MacKinnon, 1993, test in the case of regression with country fixed effects) to check the exogeneity of the instruments.

Table 2 presents the results of the estimates of regression (1) using the instrumental variables method. We again implement the regression (i) with and without the autoregressive term, (ii) with and without country fixed effects and (iii) with and without the control of ITPR. We consider column [6] as the one giving the best results. This specification corresponds to a regression with the control of ITPR, without country fixed effects and without the autoregressive term (that would have been non-significant if apparent, see column [5]). It satisfies all the considered tests – which notably justifies the use of instrumental variables – and gives the "best" (nearest to -0.5) elasticity of hourly productivity with regard to hours worked.

As in Bourlès and Cette (2005, 2007), the use of instrumental variables reduces the elasticity with regard to hours worked. Moreover, the presence of ITPR as an explanatory variable seems to be crucial for the Durbin-Wu-Hausman (or Davidson-McKinnon) test to be satisfied.

In the specification of column [6] ΔER and ITPR are instrumented. The choice of the instruments, ΔER lags, GDP lags and the investment rate is consistent with both theoretical and empirical theory. The lags of the employment rate tend to reduce the bias due to measurement errors whereas the biases due to co-linearity driven by cycles can be reduced by the introduction of GDP as an instrumental variable.

The estimates of column [6] give the following results: (i) a one-point variation in the employment rate changes hourly productivity by -0.51%; (ii) a 1% variation in hours worked changes hourly productivity by -0.50%; (iii) a one-point change in the utilisation rate raises hourly productivity by 0.2%; (iv) a one-point change in ICT production as a share of GDP raises the growth in hourly productivity by 1.49%.

4. Disentangling employment structure and qualification effects

We present successively the methodology adopted (a) and the results (b).

a. Methodology

As pointed out by Boulhol (2009), the above analysis (and its interpretation in terms of productivity changes due to overall employment rate variations) is silent on a key aspect of productivity: qualifications. Indeed, depending on the structure of outside workers (who become employed after an increase in the employment rate) in terms of qualifications, the change in productivity caused by an increase in employment rate could be very different.

In a previous study, Bourlès and Cette (2005) have analysed the effect of population structure in terms of age and gender. They have shown that the effect on productivity of a catch-up with the United States' employment rate is independent of the breakdown of the workforce according to gender and age.

Here, we choose to split the workforce into three groups according to qualification level: 1) less than secondary education, 2) some secondary education and 3) some higher education. This allows us to split the previous effect of the employment rate into two parts: the effect of the qualification structure in the workforce (for a constant employment structure) and the effect of employment structure (for a given qualification structure). This methodology differs from the one used by Boulhol and Turner (2009) who estimate the same effects using the wages differential as a proxy for the productivity differential between qualification groups.

Instead, here we break down the employment rate into three contributions: $\frac{E}{P} = \frac{E_1}{P} + \frac{E_2}{P} + \frac{E_3}{P}$ where E_i represents the number of employed with a level of qualification i and P represents the working-age population (see Chart 2 for comparative statistics on these variables). Note here that each contribution $\frac{E_i}{P}$ does not correspond to the employment rate of the qualification group concerned $\frac{E_i}{P_i}$. This allows us to have an interesting additive property. In the following we will note: $ER_i = \frac{E_i}{P}$.

Given this breakdown, the relationship (1) chosen in the previous section (Table 2 Column 6) becomes:

$$\Delta lp = \sum_i \beta_i . \Delta ER_i + \gamma . \Delta h + \varphi . \Delta CUR + \eta . ITPR + cte + u \qquad (2)$$

b. Employment rate effects by qualification

The additive property described above allows us to verify the quality of our estimation in at least two respects:

- The consistence of the 3 coefficients for ΔER_i with the one found in the previous section for ΔER;
- The relative stability of the coefficients of control variables γ, φ and η with respect to those found for equation (1).

The results of the estimates of relationship (2) using the OLS and the instrumental variables method are given in Table 3.

As employment data by qualification level are available for fewer observations than total employment, this relationship is performed on 163 observations, concerning 21 countries (Switzerland disappears from our dataset).[5]

In column [1] of Table 3, we first reproduce the estimates of the previous section on this reduced sample. It then appears that our main results are preserved and that this outcome can be obtained with fewer instruments. We are indeed able to obtain estimates near those of Table 2 Column [6] without instrumenting by the investment rate and with fewer lags on ΔER. This may indicate that there is less bias in the reduced sample. The main change between the two samples being the time period covered (due to time availability of employment rate by qualification), this could denote lower measurement errors in the latest years of our initial sample.

Columns [2] and [3] of Table 3 are devoted to the estimates of relationship (2) with the OLS method. Once again this method gives pretty good results but – due to various biases – seems to overestimate the effect of hours worked. Still, this first estimation indicates that the negative effect of an increase in the employment rate is larger (in absolute terms) when coming from an increase in the employment of low qualification groups ("less than secondary education" or "some secondary education") than when coming from an increase in the employment of the part of the population with higher education.

This effect is confirmed by the estimates with the instrumental variables method (Columns [4] to [9]). All of the presented specifications (of instruments) verifies the performed tests and presents similar results, but for the sake of clarity we will mainly discuss the results of columns [6] and [7] that give in our view the best estimates and rely on the shorter list of instruments.

As in the previous section, one of the major effects of the IV method is the reduction (in absolute terms) of the elasticity of hourly productivity with regard to hours worked, this elasticity being now close to -0.5 (-0.555 in column [6]). Regarding the effect of variations in the contribution to the employment rate, it appears that (i) an increase in the employment rate caused by an increase in the employment of workers with less than higher education is significant with an elasticity of around -0.6 (respectively -0.600 for the population with less than secondary education and -0.589 for people with some secondary education, see Column [6]); (ii) the difference between these two effects is not significant; (iii) the effect of an increase in the employment rate due to an increase in the contribution of high-skilled workers (with higher education) is negative, non-significantly different from zero and significantly different from the one of the other categories.

These results allow us to aggregate together (in Column [7]) qualification groups 1 and 2 (that is the part of the population with secondary education and less). It then turns out that an increase of one percentage-point in the contribution of groups 1 and 2 significantly reduces productivity growth by -0.594 percent when an increase in the contribution of high-skilled workers does not have a significant impact on growth.

These effects cannot however be directly interpreted as information on the productivity of that particular qualification group, in respect of either those in the category who are employed or all those of working age. The differences between categories should not be directly interpreted as productivity gaps between the two categories but rather as productivity gaps between people in each category who are currently not employed but would be the first to move into employment. Such comparisons require caution since the effects are an average for all countries in our sample and may mask differences between countries that stem from salient features such as the employment rates in each category. This is because the actual impact of a change in a particular category's contribution to the aggregate

[5] The authors are grateful to Hervé Boulhol for providing the data.

employment rate is likely to vary from one country to another, depending on the initial level of the employment rate in that category.

The estimation results for our other explanatory variables appear to be strongly stable relative to the aggregate approach. This denotes the fair robustness of our analysis. Still, one can notice that the effect of ICT production largely decreases (from 1.49 in Table 2 Column [6] to 0.77 in Table 3 Column [6] and [7]) as we break down employment by qualification. This can be explained by the strong link between ICT production and skilled labour, due to the specific skills needed for the production of ICT. Correcting for the effect of qualifications therefore decreases the apparent effect of ICT production.

5. Policy implications: the effects of increasing the education level and the employment rate

The above analysis appears to be very interesting as it allows us to calculate for each country in the dataset the mechanical impact on the GDP level as a result of adopting: (i) the population's qualification structure and (ii) the employment rate structure by education level of the United States or of the country considered as the one with the best practices[6]. The estimation results given in Table 3, column [7], have been used here to perform these calculations. To be consistent with the estimation results (and particularly with the equality tests), two education levels are distinguished from the three initial ones, the lower and medium being combined and the highest level left apart.

We successively present the impact of adopting the best practices for the population's qualification structure (a) and for the employment rate (b), before giving an overall analysis of policy implications (c).

a. *Change in the population's qualification structure*

Concerning the impact of a change in the population's qualification structure, we assume the observed employment rates are constant per education level. The mechanical impact on the GDP level stems from the change in the population structure by education group, since changes in the contribution of the different education groups have distinct productivity consequences. For accounting reasons, the overall impact of this change in the GDP level is exactly equivalent to the mechanical impact on the hourly productivity level.

The mechanical gains in GDP resulting from adopting the US qualification structure are above 5% for three countries, Austria, Italy and Portugal, and above 2.5% for three additional countries, France, Germany and Greece (see Chart 3). Portugal has the highest gains: 6.3%. Gains are negative in two countries where the education level of the working-age population is higher than in the United States: Canada and Japan. As a whole, gains seem lower to the ones calculated by Boulhol and Turner (2009, Figure 8.4.A), essentially for two reasons. The first one is that Boulhol and Turner distinguish 30 groups, crossing 3 dimensions (2 genders x 5 age classes x 3 education levels), whereas we distinguish only two groups in one dimension, the education level. The second reason is that we estimate the productivity–education elasticity, assuming that the elasticity is constant over all countries, whereas Boulhol and Turner (2009) vary it per country by the wage costs, under the assumption of a perfect and efficient labour market. This assumption may lead to an overestimation of the productivity of

[6] Using the previous notations, the impact on the GDP level in country j as a result of adopting the education level (MIES) and the employment rate structure (MIER) of a reference country r is calculated as follows:

$$MIES = \sum_i \beta_i . \frac{E_{ij}}{P_{ij}} . \left(\frac{P_{ir}}{P_r} - \frac{P_{ij}}{P_j}\right) \text{ and } MIER = \sum_i (1+\beta_i) . \frac{P_{ij}}{P_j} . \left(\frac{E_{ir}}{P_{ir}} - \frac{E_{ij}}{P_{ij}}\right)$$

high-skilled workers who may extract rent from the employer and be paid over their marginal productivity.

Canada is considered to be the best-practice country for the population's education structure in this study. In the dataset, it is the country with the highest proportion of third-level education in the working-age population, with 40% (the second country being Japan with 35%). GDP gains are higher when adopting Canada's qualification structure than when adopting that of the United States. These gains are above 5% for four countries: Greece, Austria, Italy and Portugal. Once again, they are highest in Portugal: 8.6%. They are below 2.5% in only three countries: the United States, Canada and Japan. The results demonstrate that improving the education level of the working-age population is an effective policy to positively impact GDP, for all countries except for the last three listed.

b. Change in the employment rate

Let us now turn to the impact of a change in the employment rate structure while keeping the population's education level constant.

Due to decreasing returns of the employment rates (that may for example be due to an erosion of human capital during episodes of unemployment), a general increase in the employment rate mechanically decreases the productivity level. This decrease is greater when due to an increase in the employment rate of those with low level education than in the employment rate of those with higher education. This decrease in productivity reduces the positive impact on the GDP level of the increase in the employment rate. The mechanical impact on GDP of an increase in the employment rate is calculated by taking into account this negative impact on productivity.

The GDP gains obtained by adopting the United States' employment rate structure are never above 5%. They are above 2.5% for eight countries: Japan, Spain, Germany, France, Greece, Korea, Belgium and Italy (see Chart 4). In Italy, they are the highest: 4.2%. Gains are negative in nine countries, where the employment rate is higher than in the United States: Iceland, Denmark, Norway, Sweden, the United Kingdom, the Netherlands, Australia, Austria and Portugal. These results are consistent with those of Bourlès and Cette (2005, 2007) who calculate for a set of OECD countries the productivity impact of the employment rate gap vis-à-vis the United States.

The highest employment rate is observed in Iceland (84.4% for the whole working-age population). This cannot however be considered as representative since the country is very small and specific (the working-age population is less than 200 thousand). Denmark, with the second highest employment rate (75.5%), is therefore considered as the best practice country, the third and fourth countries being Norway (75.2%) and Sweden (73.9%). The GDP gains obtained by adopting Denmark's employment rate structure (of each educational level) are higher than those obtained by adopting that of the United States. The gains are above 5% for seven countries: Spain, Germany, France, Greece, Korea, Belgium and Italy. They are above 2.5% for four more countries, Canada, Finland, Ireland and Japan. They are the highest in Italy: 6.7%. These results demonstrate that increasing the employment rate of the working-age population is also an effective policy to increase GDP.

c. An overall analysis of policy implications

Based on the results, we classify the countries in the dataset in terms of GDP gains that can be expected from endorsing best practices for education and for the employment rate of the working-age population (see Table 4).

- The United States is the only country where no significant GDP gains can be expected from adopting best practices for education and the employment rate (less than 2.5% for each of the two policies).

- On the contrary, for Greece and Italy, the potential GDP gains are significant (more than 5%) for each of the two policies. Both policies are very effective for these two countries.

- In Austria and Portugal, the most effective policy is to improve the education level. Endorsing best practices gives GDP gains of more than 5% for education but of less than 2.5% for the employment rate. The same policy hierarchy is observed but with lower gains in seven countries: Australia, Denmark, Iceland, the Netherlands, Norway, Sweden and the United Kingdom. In these countries, adopting the best practices gives GDP gains of less than 5% but more than 2.5% for education and of less than 2.5% for the employment rate.

- For Belgium, France, Germany, Korea and Spain, the most effective policy seems to be an increase in the employment rate. Endorsing best practices leads to GDP gains of more than 5% for the employment rate but of less than 2.5% for education. The same is true but to a lesser extent for Canada and Japan. In these countries, adopting the best practices gives GDP gains of less than 5% but more than 2.5% for the employment rate but of less than 2.5% for education.

- For Finland and Ireland, the two policies are effective with minor gains (more than 2.5% but less than 5% for each of the two policies).

6. **Conclusion**

The results presented in this paper confirm the effects of the employment rate on productivity. We find clear evidence indicating that an increase of one percentage point in the employment rate decreases hourly productivity by about half a percent.

We contribute to the existing literature by refining these effects, by taking into account the workforces' qualification levels. We provide estimates showing that the negative effect on productivity of an increase in the employment rate is greater (in absolute terms) if coming from an increase in the employment of low qualification groups than if coming from an increase in the employment of the population with higher education. In addition, we show that the effects coming from the two first qualification groups ("less than secondary education" or "some secondary education") are not significantly different from each other, and that an increase in the employment rate coming from highly-skilled labour does not significantly lead to productivity losses.

Our paper also has useful policy implications, as we are able to point out for each country in the sample the GDP gains they could expect from endorsing best practices for education and for the employment rate. For European countries, it gives some indication of the priority for each country to implement a strategy such as the Lisbon Strategy: what can be expected, in terms of GDP per capita, from a catch up with the United States or with best practices concerning the employment rate or education?

The analysis we make should of course be viewed with caution, as it relies on inevitably fragile estimates conducted on a small panel of industrialised countries. Each country has specific institutions and labour market regulations (such as the existence of a national minimum wage and its relative level) which can explain specific effects. The estimates, nevertheless, suggest promising gains in GDP, which may be achieved in some industrialised countries after undertaking ambitious reforms to increase the education level in the workforce and/or to increase the employment rate. A next step in this analysis could be to look at the impact of the interactions between changes to the qualification structure and (i) rigidities in labour and product markets, (ii) the productivity level itself.

Appendix: **Sources and definition of the variables used**

	Description	Sources	Mean 22 countries* (400 obs)	Standard-deviation 22 countries* (400 obs)	Mean 21 countries* (163 obs)	Standard-deviation 21 countries* (163 obs)
LP	GDP constant prices per hour worked	Calculus using OECD data	32.65	8.57	35.20	8.82
H	Average annual hours actually worked per worker	OECD: Labour market	1 760.99	262.06	1 744.67	271.64
ER	Employment/population ratio	OECD: Labour market	0.66	0.08	0.67	0.07
CUR	Capacity utilisation rate	OECD: Monthly economic indicators	81.78	3.56	81.69	3.75
ITPR	Share of ICT production in total value added	STAN data	0.06	0.02	0.06	0.02
INVR	Total investment in volume as a % of GDP	OECD: Economic Outlook	0.21	0.04	0.22	0.04
GDP	Gross domestic product in USD millions, constant prices, constant PPPs, reference year 2000,	OECD: National accounts	1 127 343	1 936 387	1 131 987	1 948 684
SER	Self employment rate as a percentage of total civilian employment	OECD			0.17	0.09
RD	R&D expenditure relative to GDP	OECD			2.04	0.84
ERp	Employment rate of population with below upper secondary education.	OECD: Boulhol			0.53	0.08
ERs	Employment rate of the population with upper secondary education.	OECD: Boulhol			0.70	0.08
ERt	Employment rate of the population with tertiary education.	OECD: Boulhol			0.81	0.05
ER1	The contribution to the employment rate of the group with "below upper secondary" education	Calculus using OECD data			0.19	0.10
ER2	The contribution of the employment rate of the group with "upper secondary" education	Calculus using OECD data			0.30	0.09
ER3	The contribution to the employment rate of the group with "tertiary" education	Calculus using OECD data			0.18	0.06
P1/P	Population with less than upper secondary education - total population ratio	Calculus using OECD data			0.35	0.15
P2/P	Population with upper secondary education - total population ratio	Calculus using OECD data			0.42	0.11
P3/P	Population with tertiary education - total population ratio	Calculus using OECD data			0.23	0.08

* : The 21 countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Iceland, Italy, Japan, Korea, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States. The 22 countries are these 21 and Switzerland.

7. References

Aghion, P., Askenazy, P., Bourlès, R., Cette, G. and Dromel, N., 2009, "Education, market rigidities and growth", *Economics Letters*, 102.

Belorgey, N., Lecat, R. and Maury, T., 2006, "Determinants of productivity per employee: An empirical estimation using panel data", *Economics Letters*, 91(2).

Boulhol, H., 2009, "The effects of population structure on employment and productivity", *OECD Economics Department Working Paper*, No. 684.

Boulhol, H. and Turner, L., 2009, "Employment - productivity trade-off and labour composition", *OECD Economics Department Working Paper*, No. 698.

Bourlès, R. and Cette, G., 2006, "A comparison of structural productivity levels in the major industrialised countries", *OECD Economic Studies*, 41.

Bourlès, R. and Cette, G., 2007, "Trends in Structural Productivity Levels in the Major Industrialised Countries", *Economic Letters*, 95.

Cette, G., Chang, S. and Konte, M., 2009, "The decreasing returns of working time: an empirical analysis on panel country data", mimeo, November.

Davidson, R. and J. McKinnon, 1993, Estimation and Inference in Econometrics, Oxford University Press, New York.

Dew-Becker, I. and Gordon, R., 2008, "The Role of Labor Market Changes in the Slowdown of European Productivity Growth", *NBER working paper*, 13840.

Durbin, J., 1954, "Errors in Variables", *Review of the Internationnal Statistical Institute*, 22.

Gust, C. and J. Marquez, 2004, "International Comparisons of Productivity Growth: The Role of Information Technology and Regulatory Practices", *Labour Economics*, 11.

Hausman, J., 1978, "Specification Tests in Econometrics", *Econometrica* 46 (3).

Malinvaud, E., (1973) : "Une explication de la productivité horaire du travail", *Economie et Statistique*, n° 48, September.

McGuckin, R. and van Ark, B., 2005, "Productivity and participation: an international comparison", University of Groningen, *GGDC Research Memorandum*, 200578.

Sargan, J., 1958, "The Estimation of Economic Relationships Using Instrumental Variables", *Econometrica*, 26 (3).

Van der Horst, A., Rojas-Romagosa, H. and Bettendorf, L., 2009, "Does employment affect productivity?", CPB Discussion Paper, 119.

Wu, D.M. (1973), "Alternative Tests of Independence between Stochastic Regressors and Disturbance", *Econometrica*, 42 (3).

Tables and Charts

Table 1

Relation (1) estimates with the OLS method.

Explained Variable: Δlp

	[1]	[2]	[3]	[4]	[5]	[6]
Δlp_{-1}	0.155***		0.140***		0.140***	
	(0.045)		(0.045)		(0.045)	
ΔER	-0.600***	-0.571***	-0.607***	-0.582***	-0.607***	-0.576***
	(0.088)	(0.089)	(0.088)	(0.088)	(0.088)	(0.085)
Δh	-0.767***	-0.830***	-0.746***	-0.798***	-0.746***	-0.709***
	(0.093)	(0.093)	(0.093)	(0.092)	(0.093)	(0.088)
ΔCUR	0.002***	0.003***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ITPR			0.135***	0.156***	0.135***	0.067***
			(0.052)	(0.052)	(0.052)	(0.070)
Constant	0.016***	0.019***	0.009***	0.011***	0.009***	0.016***
	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.004)
Country fixed effects	No	No	No	No	Yes	Yes
Number of observations	400	400	400	400	400	400

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2

Relation (1) estimates with the IV method.

Explained Variable: Δlp

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Δlp_{-1}	0.147***		-0.058		-0.035		-0.063	
	(0.046)		(0.047)		(0.108)		(0.048)	
ΔER	-0.428***	-0.513***	-0.408***	-0.401***	-0.505**	-0.509**	-0.368**	-0.368**
	(0.157)	(0.165)	(0.140)	(0.138)	(0.255)	(0.238)	(0.150)	(0.147)
Δh	-0.743***	-0.821***	-0.660***	-0.645***	-0.488**	-0.503***	-0.655***	-0.639***
	(0.095)	(0.095)	(0.090)	(0.090)	(0.195)	(0.177)	(0.090)	(0.090)
ΔCUR	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
ITPR					1.634**	1.492***	-0.070	-0.063
					(0.645)	(0.448)	(0.096)	(0.095)
Constant	0.016***	0.019***	0.021***	0.020***	-0.071**	-0.064**	0.025***	0.023***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.035)	(0.025)	(0.006)	(0.005)
Country fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Number of obs.	400	400	400	400	400	400	400	400
Sargan stat.	0.31	0.639	10.648	5.944	11.008	12.675	8.963	4.460
P-value	0.8531	0.7266	0.1547	0.5462	0.2012	0.1779	0.1106	0.4853
Durbin-Wu-Hausman stat.	1.82648	0.17595			19.6780	28.46148		
P-value	0.17654	0.67487			0.00005	0.00000		
Davidson, Mac-Kinnon stat			1.793087	2.345422			2.240733	2.740789
P-value			0.1814	0.1265			0.1353	0.0987

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

List of instruments:

Column 1: Δlp_{-1} ; Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ;

Column 2: Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ;

Column 3: Δlp_{-1} ; Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ; ΔER_{-4} ; ΔER_{-5} ; Δgdp_{-1} ; Δgdp_{-2} ; ITPR;

Column 4: Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ; ΔER_{-4} ; ΔER_{-5} ; Δgdp_{-1} ; Δgdp_{-2} ; ITPR;

Column 5: Δlp_{-1} ; Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ; ΔER_{-4} ; ΔER_{-5} ; Δgdp_{-1} ; Δgdp_{-2} ; INVR

Column 6: Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ; ΔER_{-4} ; ΔER_{-5} ; Δgdp_{-1} ; Δgdp_{-2} ; Δgdp_{-3} ; Δgdp_{-4} ; INVR ;

Column 7: Δlp_{-1} ; Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ; ΔER_{-4} ; Δgdp_{-1} ; Δgdp_{-2} ; ITPR;

Column 8: Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ; ΔER_{-4} ; Δgdp_{-1} ; Δgdp_{-2} ; ITPR;

Table 3

Relation (2) estimates

Explained Variable: Δlp

Method	[1] IV	[2] OLS	[3] OLS	[4] IV	[5] IV	[6] IV	[7] IV	[8] IV	[9] IV
ΔER	-0.529***								
	(0.177)								
ΔER_1		-0.590***		-0.530**		-0.600***		-0.600***	
		(0.155)		(0.208)		(0.200)		(0.189)	
ΔER_2		-0.562***		-0.607***		-0.589***		-0.580***	
		(0.141)		(0.189)		(0.181)		(0.170)	
$\Delta ER_{1,2}$			-0.573***		-0.578***		-0.594***		-0.588***
			(0.133)		(0.173)		(0.163)		(0.153)
ΔER_3		-0.298	-0.294	-0.188	-0.203	-0.112	-0.108	-0.162	-0.155
		(0.198)	(0.196)	(0.267)	(0.259)	(0.294)	(0.285)	(0.271)	(0.263)
Δh	-0.583***	-0.708***	-0.710***	-0.539***	-0.542***	-0.555***	-0.555***	-0.589***	-0.588***
	(0.170)	(0.121)	(0.121)	(0.175)	(0.171)	(0.158)	(0.158)	(0.148)	(0.148)
ΔCUR	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ITPR	0.930***	0.240***	0.241***	0.921***	0.890***	0.770***	0.773***	0.658***	0.666***
	(0.261)	(0.062)	(0.062)	(0.280)	(0.265)	(0.214)	(0.206)	(0.218)	(0.205)
Constant	-0.038**	0.003	0.003	-0.039**	-0.037**	-0.030**	-0.031**	-0.023*	-0.024*
	(0.016)	(0.004)	(0.004)	(0.017)	(0.016)	(0.013)	(0.013)	(0.014)	(0.013)
Country fixed effects	No	No	No	No	No	No	No	No	No
Number of observations	163	163	163	163	163	163	163	163	163
P-value of test [ΔER_1] = [ΔER_2]		82%		66%		96%		91%	
P-value of test [$\Delta ER_{1,2}$] = [ΔER_3]			9.9%		9.5%		7.5%		8.3%
Sargan stat.	3.565			12.841	13.555	6.396	6.377	15.381	15.264
P-value	0.6136			0.3038	0.3300	0.3803	0.4965	0.1657	0.2273
Durbin-Wu-Hausman stat.	14.64888			12.08244	11.76666	13.23244	12.05782	2.13860	7.11830
P-value	0.00066			0.01675	0.00823	0.01019	0.00719	0.07871	0.06822

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

List of instruments:

Column 1: Δlp_{-1} ; Δh ; ΔCUR ; ΔER_{-1} ; ΔER_{-2} ; ΔER_{-3} ; Δgdp_{-1} ; Δgdp_{-2} ; Δgdp_{-3} ; Δgdp_{-4}

Column 4 : Δlp_{-2} ; Δh ; ΔCUR ; $\Delta ER_{1,-1}$; $\Delta ER_{2,-1}$; $\Delta ER_{3,-1}$; $\Delta ER_{1,-2}$; $\Delta ER_{2,-2}$; $\Delta ER_{3,-2}$; $\Delta_2 ER_1$; $\Delta_2 ER_2$; $\Delta_2 ER_3$; Δgdp_{-2} ; ΔSER ; $\Delta_2 SER$; $\Delta_2 h_{-1}$; $\Delta_2 CUR$

Column 5: Δlp_{-2} ; Δh ; ΔCUR ; $\Delta ER_{1,-1}$; $\Delta ER_{2,-1}$; $\Delta ER_{3,-1}$; $\Delta ER_{1,-2}$; $\Delta ER_{2,-2}$; $\Delta ER_{3,-2}$; $\Delta_2 ER_1$; $\Delta_2 ER_2$; $\Delta_2 ER_3$; Δgdp_{-2} ; ΔSER ; $\Delta_2 SER$; $\Delta_2 h_{-1}$; $\Delta_2 CUR$

Column 6: Δlp_{-1} ; Δh ; ΔCUR ; $\Delta ER_{1,-1}$; $\Delta ER_{2,-1}$; $\Delta ER_{3,-1}$; ΔER_{-2} ; $\Delta_2 ER_1$; $\Delta_2 ER_2$; $\Delta_2 ER_3$; Δgdp_{-2} ; Δh_{-2}

Column 7: Δlp_{-1} ; Δh ; ΔCUR ; $\Delta ER_{1,-1}$; $\Delta ER_{2,-1}$; $\Delta ER_{3,-1}$; ΔER_{-2} ; $\Delta_2 ER_1$; $\Delta_2 ER_2$; $\Delta_2 ER_3$; Δgdp_{-2} ; Δh_{-2}

Column 8: Δh ; ΔCUR ; $\Delta ER_{1,-1}$; $\Delta ER_{2,-1}$; $\Delta ER_{3,-1}$; ΔER_{-2} ; $\Delta_2 ER_1$; $\Delta_2 ER_2$; $\Delta_2 ER_3$; Δgdp_{-2} ; Δgdp_{-3} ; Δgdp_{-4} ; SER ; $\Delta_2 SER$; ΔRD ; $\Delta_2 RD$; $\Delta_3 RD$

Column 9: Δh ; ΔCUR ; $\Delta ER_{1,-1}$; $\Delta ER_{2,-1}$; $\Delta ER_{3,-1}$; ΔER_{-2} ; $\Delta_2 ER_1$; $\Delta_2 ER_2$; $\Delta_2 ER_3$; Δgdp_{-2} ; Δgdp_{-3} ; Δgdp_{-4} ; SER ; $\Delta_2 SER$; ΔRD ; $\Delta_2 RD$; $\Delta_3 RD$

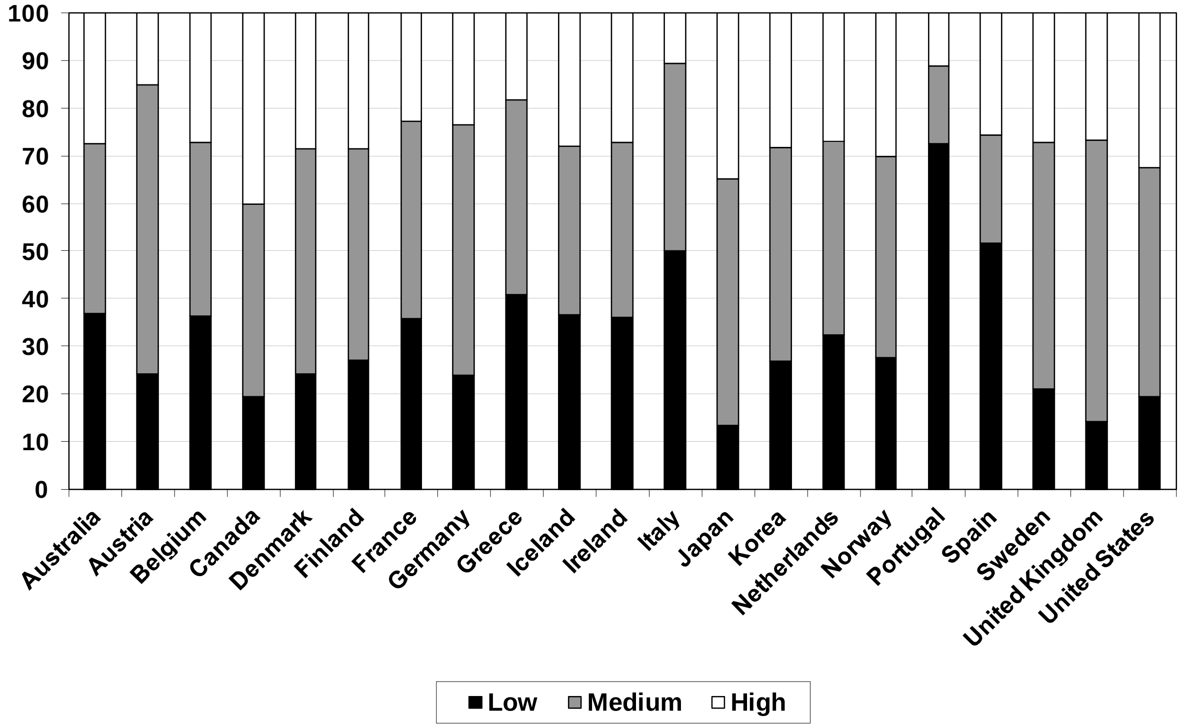
Table 4

Mechanical effect on the GDP level by adopting the best practices for qualification structure or employment structure - 2005

The best practices are found in Canada for education and Denmark for the employment rate

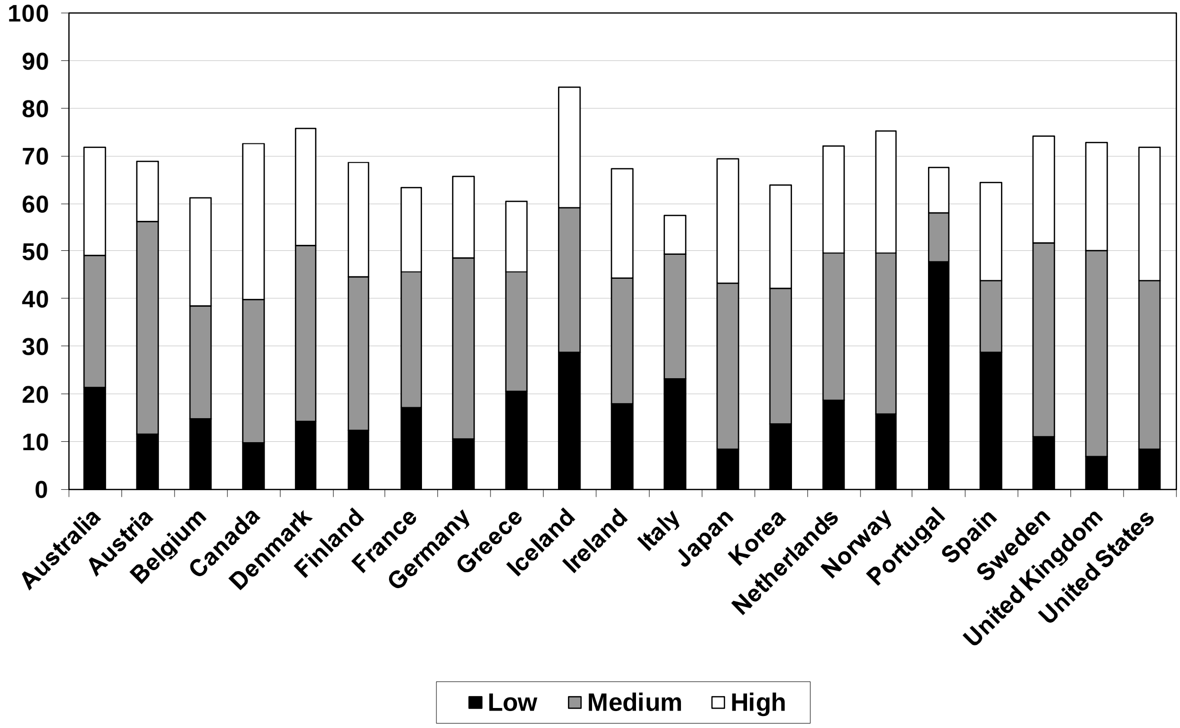
		Education level		
		Impact < 2.5%	2.5% ≤ Impact < 5%	5% ≤ Impact
Employment rate structure	Impact < 2.5%	USA	AUS DNK ISL NLD NOR SWE GRB	AUT PRT
	2.5% ≤ Impact < 5%	CAN JPN	FIN IRL	
	5% ≤ Impact		BEL FRA DEU KOR ESP	GRC ITA

Chart 1
Qualification structure of the working-age population, in 2005
Share, as a %, of each of the three education groups



Source: OECD

Chart 2
Employment rate (in %) and contribution of each education group (in percentage points), in 2005

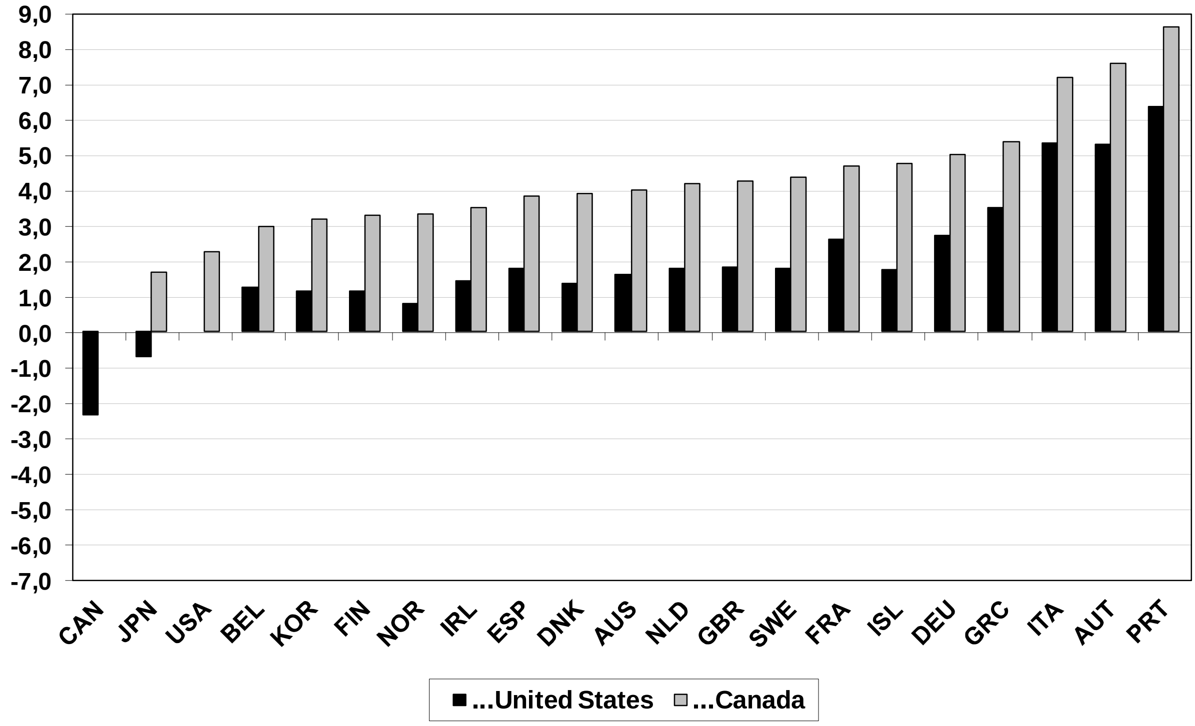


Source : OECD

Chart 3

Mechanical effect on the GDP level by adopting the qualification structure of the working-age population of…

In % - 2005



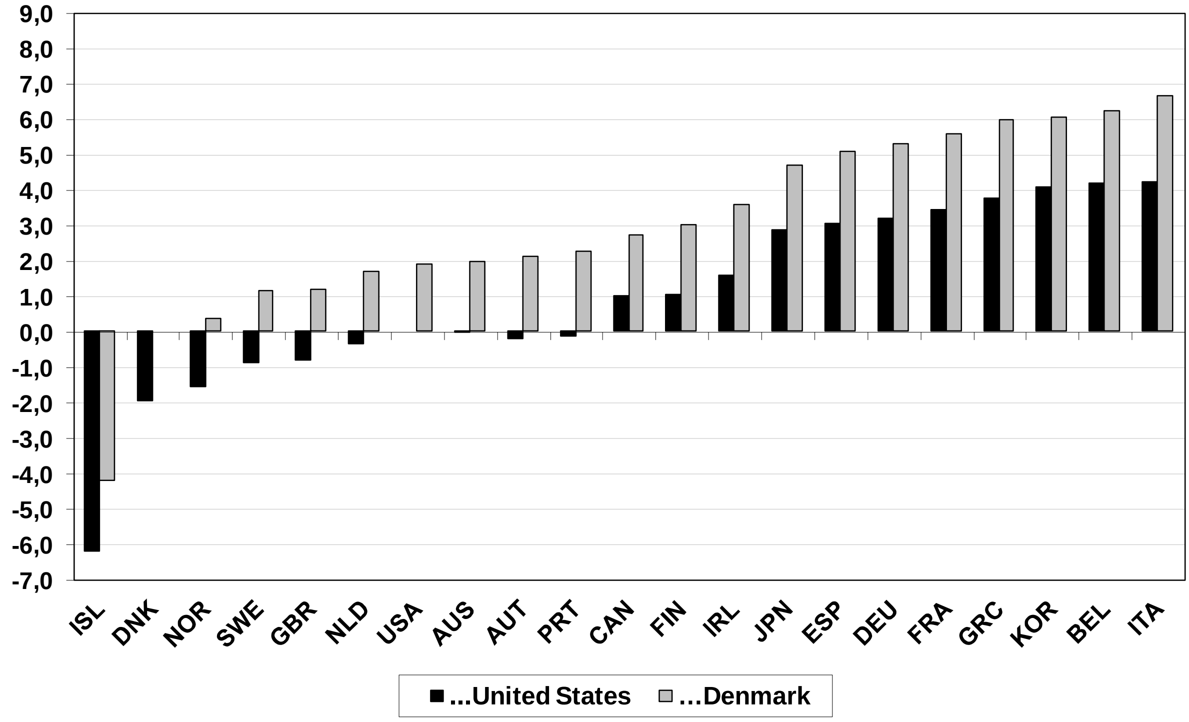
Source: Authors' calculations

In France, for example, the estimation results indicate that adopting the same qualification structure as the United States or Canada would mechanically increase GDP by 0.6% or 1.3% respectively.

Chart 4

Mechanical effect on the GDP level by adopting the employment rate structure of the working-age population of…

In % - 2005



Source: Authors’ calculations

In France, for example, the estimation results indicate that adopting the same employment rate structure as the United States or Denmark would mechanically increase GDP by 2.5% or 3.1% respectively.