

**Time-Based Measurement of Human Capital Accounting in
Canada, US and the EU**

For the Canadian Mission to the European Union

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1 Introduction

In October 2006 Deutschland Denken published the Human Capital Index through the Lisbon Council Policy Brief “Innovation at Work: The European Human Capital Index”. The widespread interest that the Index engendered encouraged us to invest further into the underlying accounting methodology – something we call time-based measurement of human capital – and broaden its usability. The present paper in particular adds Canada and the US to the comparison against the range of EU performances (average, top and bottom) along a variety of human capital criteria.

What is the significance of human capital accounting? China and India engage the Western world not in a race to the bottom, but in a race to the top – a contest where our workers’, managers’ and policy makers’ capacity for developing and delivering ever higher value-added goods and services will determine our ability to generate the wealth needed to preserve our way of life for generations to come. Against this backdrop; future policy making must be focused much more than is currently the case on investing in the individual citizen, on raising and enhancing his or her capabilities and on allowing him or her to realize his or her utmost potential.

There is a growing consensus that more must be done to develop citizens’ knowledge and skills, to create an economy where “innovation” forms a core part of daily economic life: developing and maintaining the human capital that will determine our future economic prosperity. Although Canada fares well against its European peers, its immediate neighbor USA is doing even better.

The term human capital is well understood in economic circles, but is sometimes less well received in policy circles, where analysts believe it looks too rigidly at the inherently dynamic process of innovation in a modern economy. However, the fact that the decisive economic resources of the future will be knowledge and education is widely understood and broadly accepted. In using the term human capital, this paper aims to develop an analytical framework allowing the measurement and comparison of investment in knowledge and education between countries.

As economists have shown, wealth is the result of several things – natural, financial and human capital – and the productivity (or efficiency) with which these inputs are used, including innovation. The role financial capital can play in stimulating growth rates is well documented. In Europe, Ireland is a particularly good example of an economy which has grown rich by attracting high levels of inward investment. Today, not just in Europe but in the developed world more generally, financial capital is more or less freely available on equal terms. Financial capital can and does flow to the places where the prospect of returns is largest.

However, human capital is less mobile and therefore factors like the availability of human capital and the efficiency of its use are more likely to influence the success of individual countries in the long term. This makes policies for successfully developing

human capital the principle arena in which Canada's future competitiveness and growth will be determined.

The methodology employed in this paper is an extension of the work presented in the Lisbon Council Policy Brief. The methodology has since evolved for example from being expressed in Euros to using inflation- and purchasing power-adjusted US-Dollars, and by monetizing the time-based education inputs not at historical cost but at replacement cost in each year of analysis. Although no new index has been calculated we are now able to provide human capital comparisons across most OECD countries, provided the raw data are available. Also see section at the end of this report.

2 Human Capital Endowment

The Human Capital Endowment measures the cost of all types of education and training in a particular country per person active in the labor force (i.e. employed person). Specifically, we look at five different types of learning for each active person: learning on the job, adult education, university, primary and secondary schooling and parental education. The figure is subsequently depreciated to account for obsolescence in the existing knowledge base and some level of forgetting.

<Cf chart 1>

Canada's human capital endowment per employed person is nearly 40% above the average for the European Union¹ and still 18% above the most highly endowed European country, Denmark. This is in part a function of the greater relative wealth in Canada which means that Canadian human capital is created from a higher cost base. (Assuming an efficient market for investment arbitrage between human capital and other investments, the higher investment cost implies that the value of the investment must also be higher.) It is also a function of greater inputs in a number of the types of learning that constitute the Human Capital Endowment:

2.1 Human Capital Creation Through Childcare

Canadian parents spend about 110 minutes a day educating children 6 or under and about 39 minutes educating children 7 to 17. This excludes times spent purely supervising, feeding or clothing children. The Canadian value is 41% above the level in the US and 68% above the average level in the EU.² Parental minutes spent on educating children are monetized at the opportunity cost, i.e. the net earnings of the parents that could have been obtained through work.

<Cf chart 2>

¹ As represented by EU-13, i.e. the pre-accession countries without Greece or Luxemburg both of which have, like the accession countries, insufficiently reliable historical time series.

² The underlying time use data is from different sources, possibly reflecting inconsistent definitions.

2.2 Human Capital Creation Through Primary and Secondary Education

Almost every school leaver in Canada attends school for 12 years (higher secondary attainment). Only 9% leave after 9 years (lower secondary attainment). The corresponding values for the US are 13% and for the EU 20%. As a consequence, the average Canadian generates more human capital in school than either his European or US counterpart. The human capital endowment generated in school corresponds to the cost of the minutes of education received.

<Cf chart 3>

2.3 Human Capital Creation Through Tertiary Education

While the attainment of tertiary education has been increasing gradually in all countries under observation, Canada has by far the highest level of attainment. 54% of Canadians between the ages of 30 and 34 have a university or similar degree compared with only 41% in the US and 43% in Finland, the European country with the highest level of attainment.

<Cf chart 4>

2.4 Human Capital Creation Through Adult Learning

Time use series show that adult Canadians spend slightly more time learning informally as adults, i.e. by reading newspapers, magazines or books with relevance for work or by learning IT skills, than their US or European counterparts, at all age groups <cf chart 5>. Each minute so spent is converted into human capital by the opportunity cost of the individual concerned, which is determined by wage or salary that could have been earned <cf chart 6>. At purchasing power parity, Canadian wages are slightly above the average level in Europe (and considerably behind the US) which impacts not only adult informal learning but more importantly non-formal learning at the job.

3 Human Capital Endowment by Age Cohort

Summing up the five different types of human capital, each with the appropriate rates of depreciation from forgetting, obsolescence and redundancy, for each of the age cohorts represented in the Canadian employed (i.e. working) population, gives the Human Capital Endowment by Age Cohort. This illustrates that the working human capital is boosted considerably at the end of the tertiary education when the majority of Canadians enter the work force. Over the time of the professional lives, they continue to add more human capital than is depreciated until about the age of 50. From this point onwards, the employed human capital is declining, primarily through exits from the work force, first more gradually and then, towards the age of 65 more quickly.

<Cf chart 7>

4 Human Capital Utilisation

Human Capital Utilization looks at how much of a country's human capital stock is actually deployed. It differs from traditional employment ratios in that it measures human capital as a proportion of the overall population. For Canada, this utilization has been higher than the European average and about on par with the European country with the highest Human Capital Utilization, Sweden. Over the past 15 years (i.e. from the time that consistent, relevant work force participation data are available), Canada has also caught up with the even higher utilization achieved by the US.

<Cf chart 8>

5 Human Capital Productivity

Human Capital Productivity measures the productivity of human capital. It is derived by dividing gross domestic product (actually that share of the GDP that is represented by consumption which in turn is taken as a proxy for the share of the GDP that paid as wages rather than returns on capital) by all of the human capital employed in that country. This diverges from traditional productivity measures, in that the figure takes account of how well educated employed labor is, instead of just how many hours are being worked.

On this measure, Canada has performed relatively consistently over a long period, earning a return about 12-13% on its Human Capital Endowment. Low Human Capital Productivity is often a sign of lower marginal returns in countries where the Human Capital Endowment is high and Human Capital Utilisation is high. The similar performance of another high endowment, high utilization country such as Denmark is a case in point whereas other European countries with a lower endowment and lower utilization manage higher productivities. More astonishing is the ability of the US to earn high returns on human capital in spite of high utilization and high endowment.

<Cf chart 9>

6 Methodology

We define human capital as the cost of formal and informal education expressed in US-Dollars and multiplied by the number of people living in each country. We later account for some depreciation, deducting value due to the fact that some knowledge will become obsolete and that people will forget some of what they learn. We also adjust for ongoing demographic developments, provisioning for the loss of human capital due to declining populations and shifting employment patterns across countries.

The model of TBM-HCA is based on five different kinds of human capital creation activities which are monetized with five separate opportunity costs and depreciated with three kinds of depreciations.

The five kinds of human capital are following the life cycle:

- Parental Education received (excluding preschool activities)
- Schooling Education received (including vocational schooling)
- Tertiary Education received
- Adult Learning conducted (typically informal learning at home)
- Learning-by-doing on the job (excluding formal work-place education)

Each of these five kinds of human capital is expressed in net effective time spent on learning skills and acquiring skills. The unit used is “educational minutes”.

Each of these five kinds of human capital is depreciated over time. Three different kinds of depreciation are being used:

- Forgetting of knowledge and skills, driven by biological processes
- Obsolescence of knowledge and skills, driven by technological progress
- Redundancy of knowledge and skills, driven by decline in certain industrial sectors

The depreciation rates are based on available empirical evidence and differ for each kind of human capital.

The educational minutes are monetized with the opportunity cost and/or direct costs of the respective investor. They are respectively:

- For Parental Education: the net income of parents based on employee incomes below 30 years
- For Schooling Education: the gross income of teachers and depreciation cost of school buildings and equipment
- For Tertiary Education: the gross income of professors plus depreciation cost of university buildings and equipment, and the net income foregone by students
- For Adult Learning: the net income of employees above 30 years
- For Learning-by-doing on the job: the gross labor cost of employees, including partial depreciation cost of buildings and equipment

The total monetized human capital stock of a country is thus composed of:

1. Five kinds of human capital added across population and across all years
2. Less all depreciations
3. Multiplied with monetization values

Minutes are monetised for each calendar year and for each age group separately. The monetisation currency is inflation-adjusted US-Dollars normalized for purchasing power in 2000. (cf chart 10, showing the inflation adjustment and the relative purchasing power across time and countries, all relative to a normalised value of 1 for the US in 2005.) The Canadian Dollar’s purchasing power in 2005 was around 10-15% above that of the European currencies.

Following all these steps the resulting monetized figures are interchangeable across:

- Kinds of human capital
- Countries
- Years of observation

7 Outlook

The work presented here is based on national data that are available fairly consistently across a large number of countries. The methodology is however not exhausted at this high level of aggregation and would possibly be a more powerful policy advisory tool at a more granular level. The authors are currently working on expanding the methodology and the data set. Below are three possible directions of expansion which will for the moment focus on core European countries. Given appropriate resources and data, other countries such as Canada could also be included.

7.1 Human Capital By Provinces

Arguably, the variation of Human Capital Endowment between developed economies is less pronounced than between regions within them. Demographics (age structures), income, sector specialization and migration as well as purchasing power all vary widely between regions and each would impact the human capital account significantly.

This perspective would probably magnify the differences between the prosperous regions where high educational attainment, high employment, high skilled immigration and high wages all compound to show a high Human Capital Endowment against the less prosperous regions where the low prevalence of the above factors would show the low Human Capital Endowment from which to generate growth. The more interesting comparisons however, will be between roughly equal regions, to show where the trade-off between human capital utilization on the one hand and human capital productivity on the other has been handled the best.

7.2 Migration Effects on Human Capital

Currently the modeling takes migration into account but does not distinguish between the average human capital endowment of a native and an immigrant or emigrant. As this is unlikely to be true in practice it is an area for further refinement. Unlike most European countries, Canada has a long-standing and active immigration policy that takes educational attainment and skills into account. This should clearly have an enhancing effect on the Human Capital Endowment of Canada while many European countries that have been attracting largely low-skilled immigration from Eastern Europe and Africa would find migration as a whole to be detractive to their average human capital accounts.

Capturing migration in human capital accounting could also put a spotlight on the issues of brain-drain and brain-gain by measuring the migration of the highly-skilled. Although it would not be able put a human capital value on a Nobel Prize winner, it would be able to capture academics, finance and business employees, provided data is available to understand migration at this level of granularity.

7.3 Cohort Averages vs. Educational Biographies

The current version of methodology distributes all human capital acquisition as averages across the entire population of a given country and within a given year. Therefore all analytical results are always true only for the average citizen of a given cohort of a given country.

Empirical evidence suggests that this does not represent reality. Instead there exist educational pathway biographies, where higher educational attainment in school leads to higher educational attainment in universities, leading to more education intensive jobs, more non-formal education and in turn higher cost education to children. This suggests rather large variations in human capital endowment within cohorts, especially adult cohorts. Furthermore, there are clear differences in the working biographies between women and men, and thus also different endowments with human capital among the genders.

A possible further development of TBM-HCA is to model such biographical pathways in order to illustrate how not only the absolute level but also the distribution of human capital within a cohort may be impacting overall human capital productivity in a country.

Chart 1: Human Capital Endowment per employee (2005)

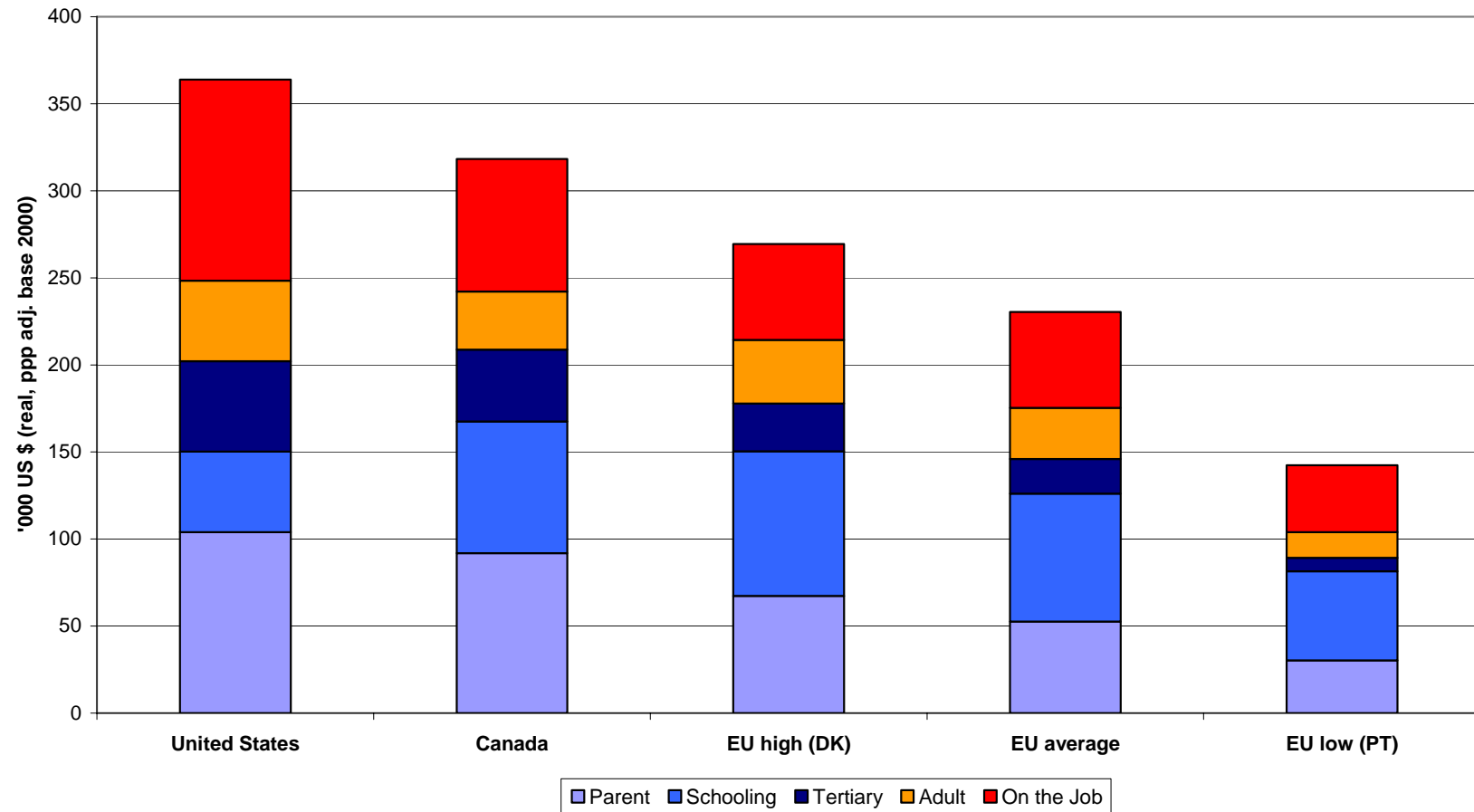


Chart 2: Average time spent on child care

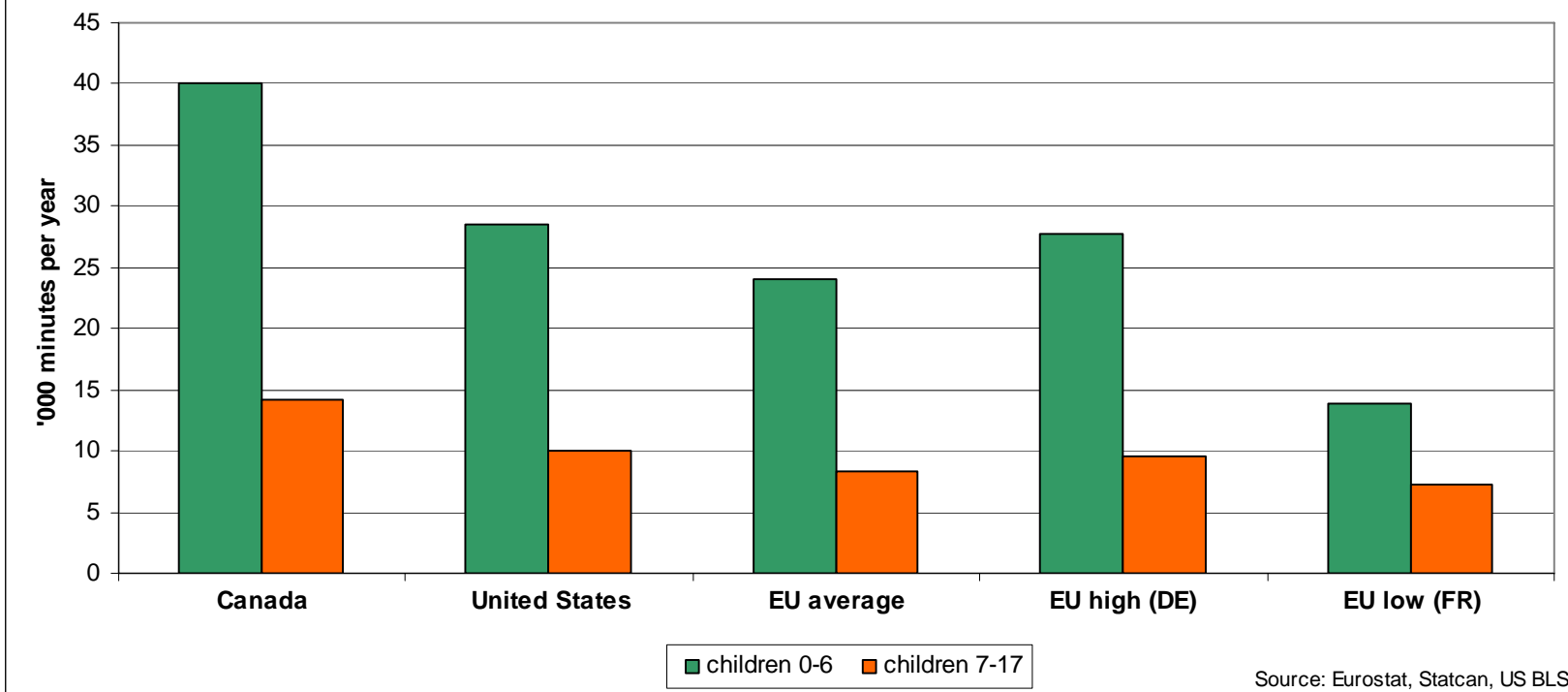
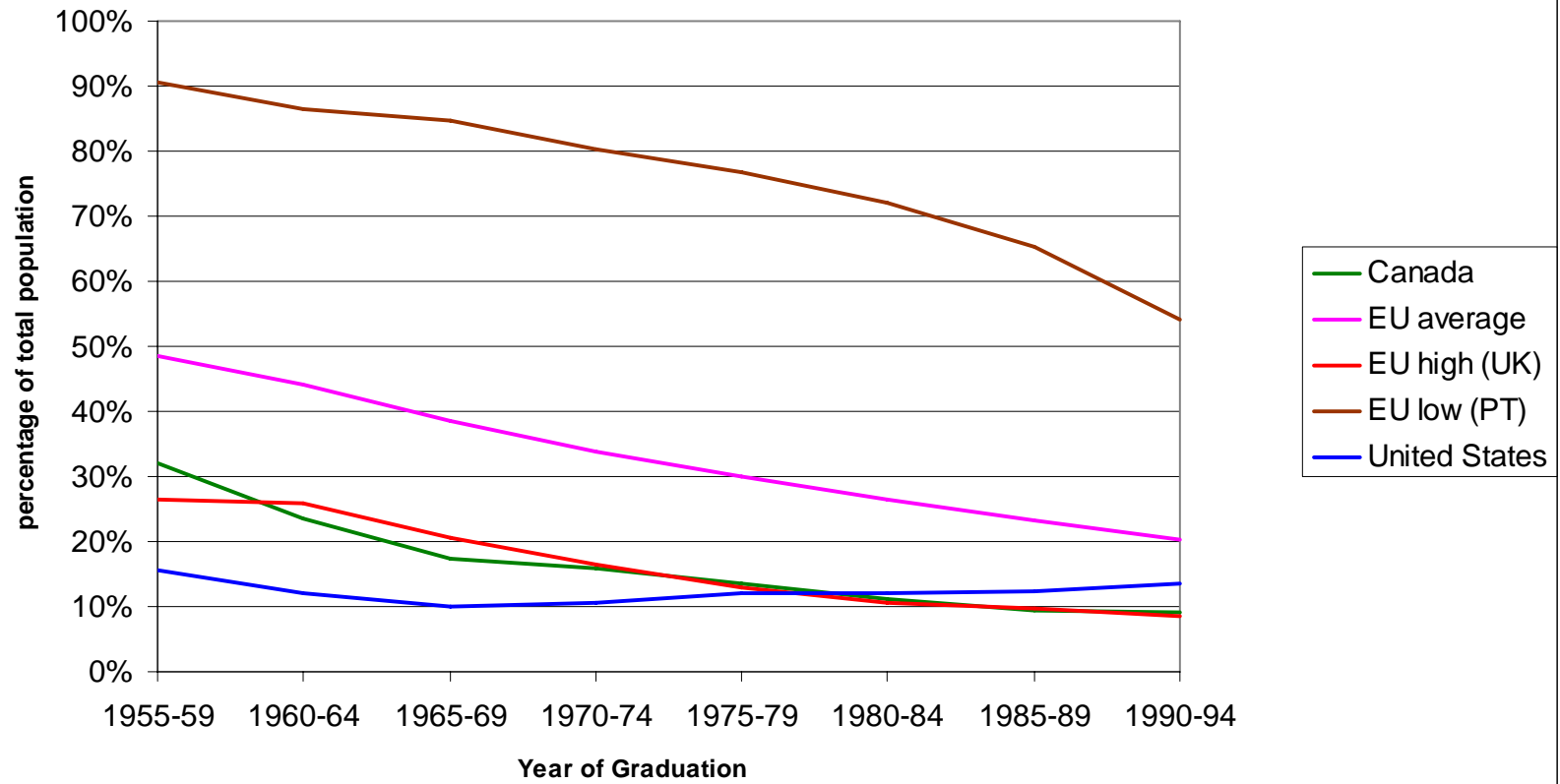


Chart 3: Lower Secondary degree as Highest Attainment level



Source: OECD

Chart 4: Tertiary degree as Highest Attainment level

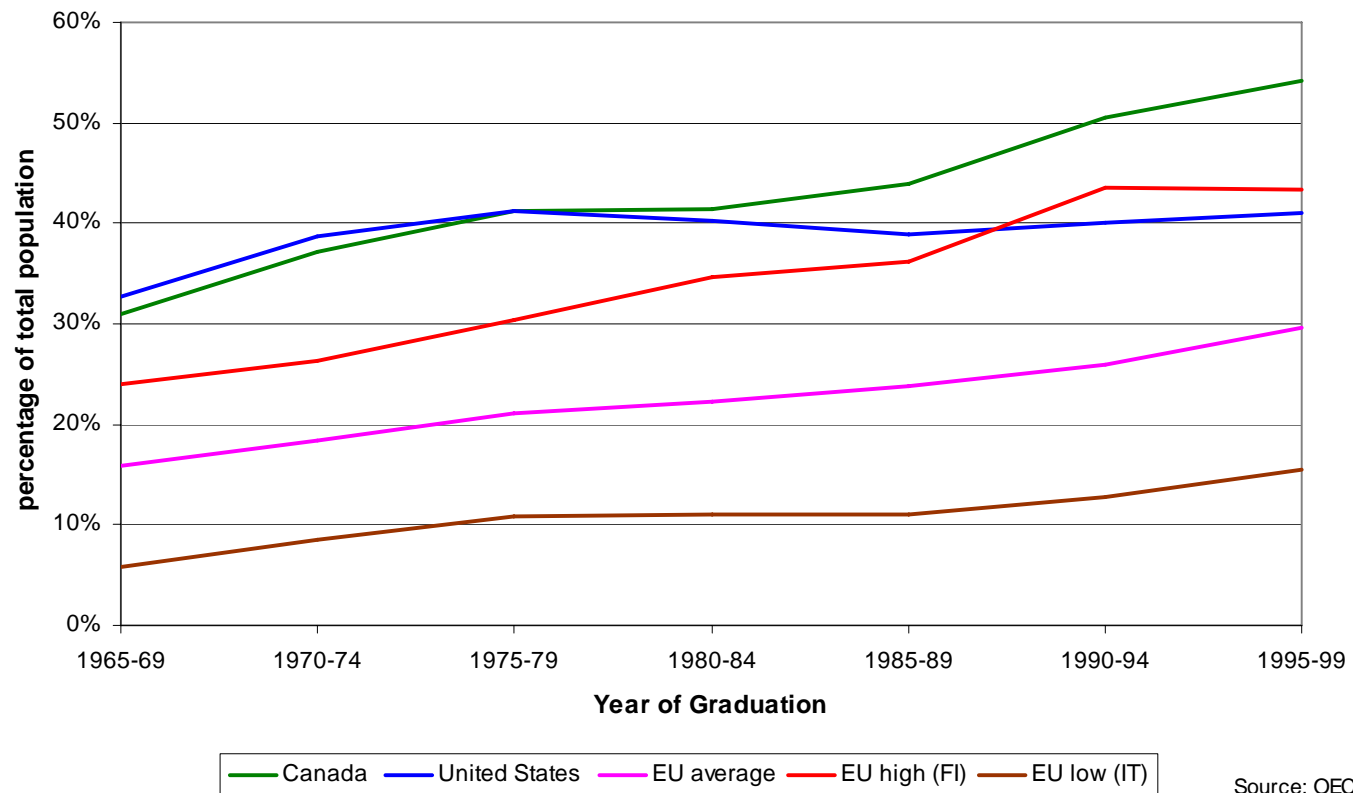


Chart 5: Average Time spent on Informal Adult Education

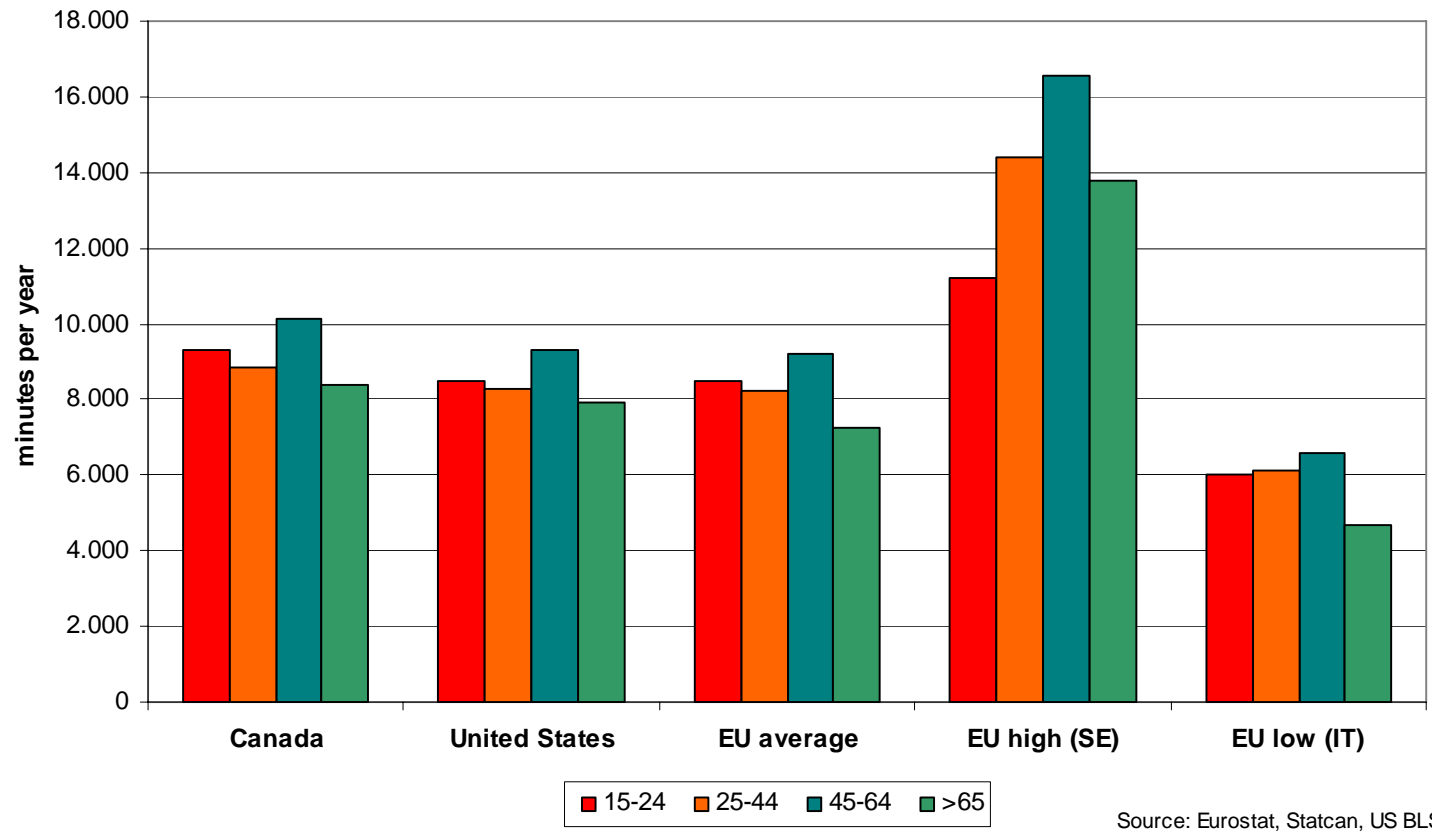
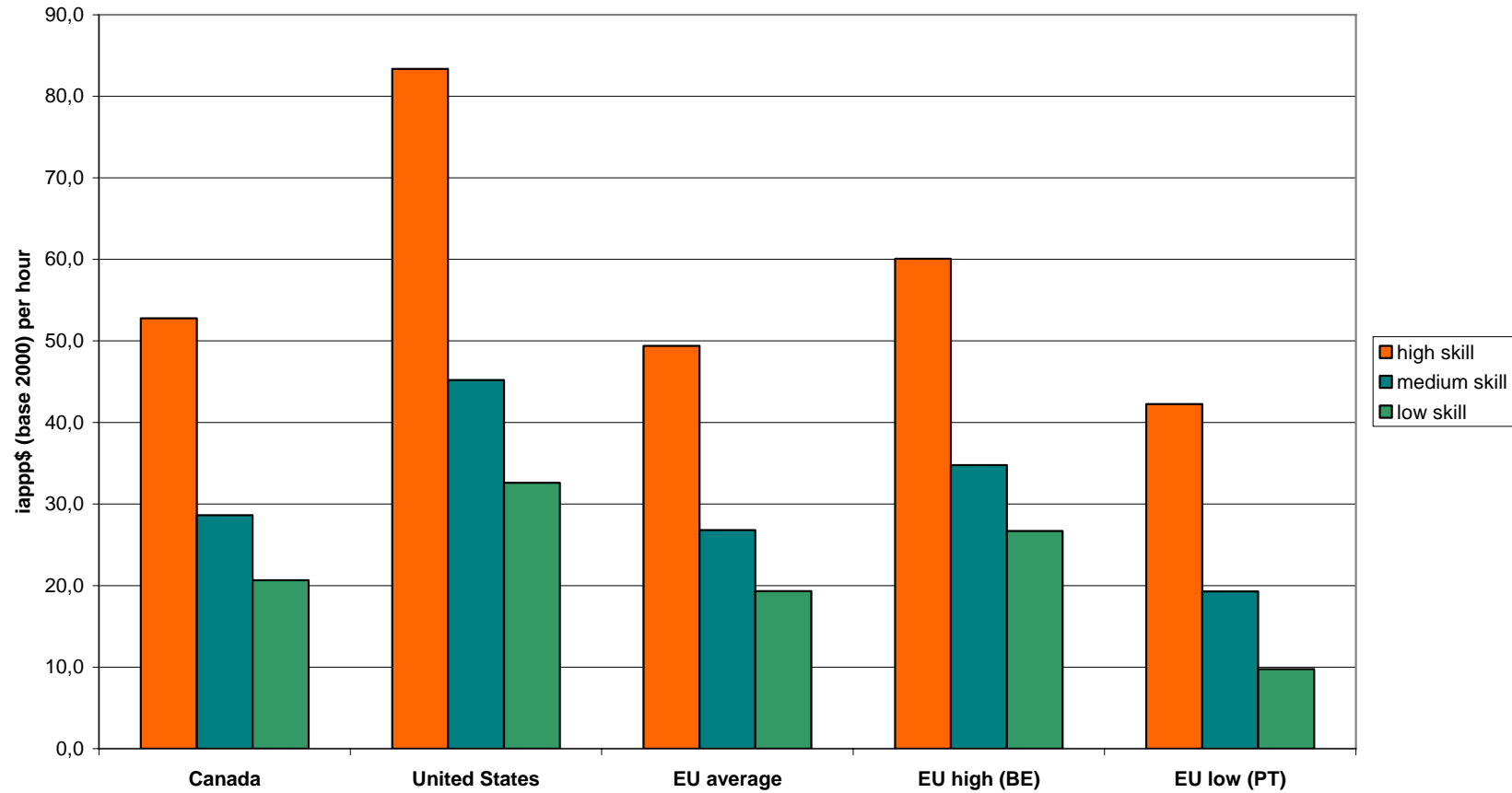


Chart 6: Wages by occupation



Source: Eurostat

Chart 7: Canadian Human Capital, employed total by cohort

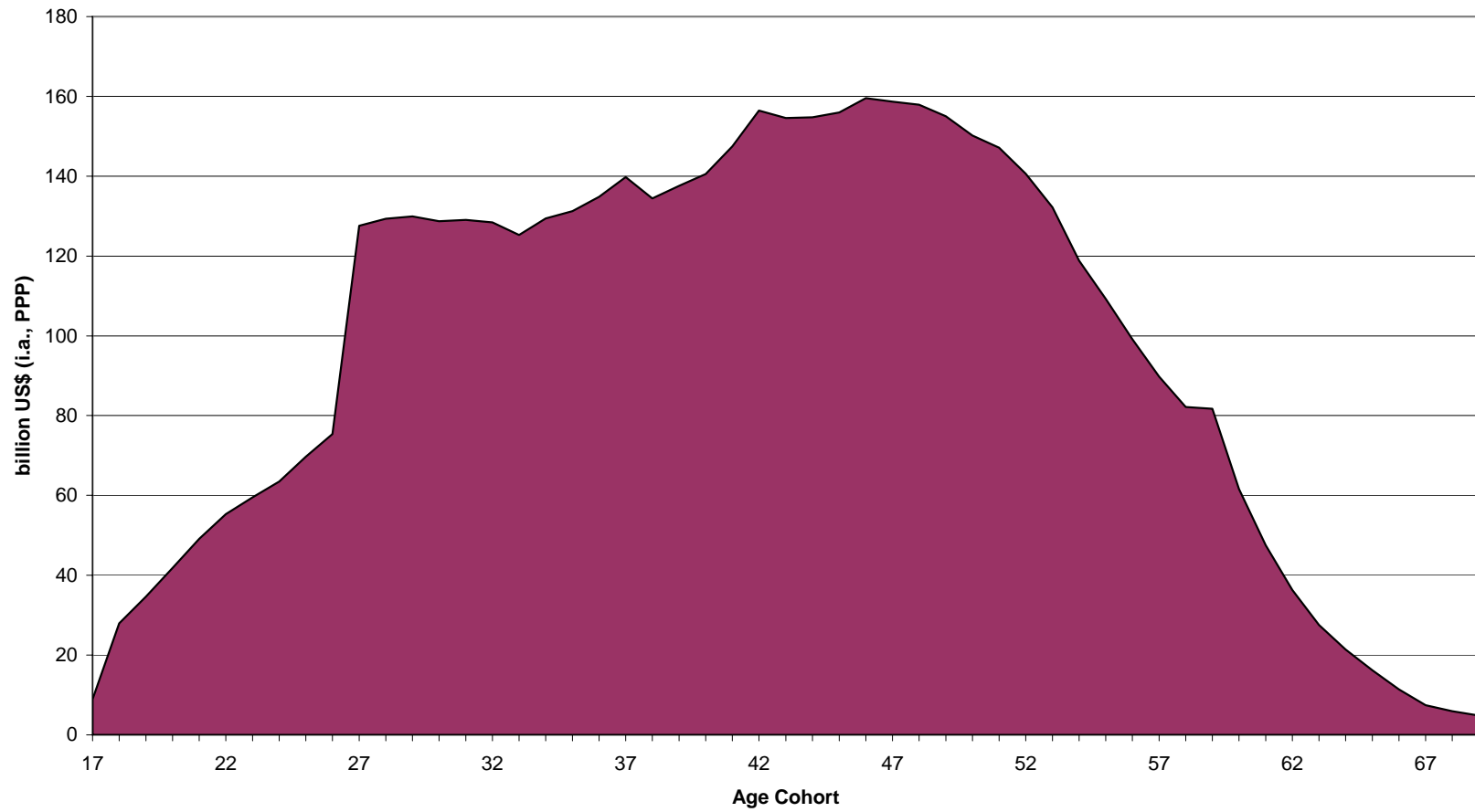


Chart 8: Utilization of Human Capital

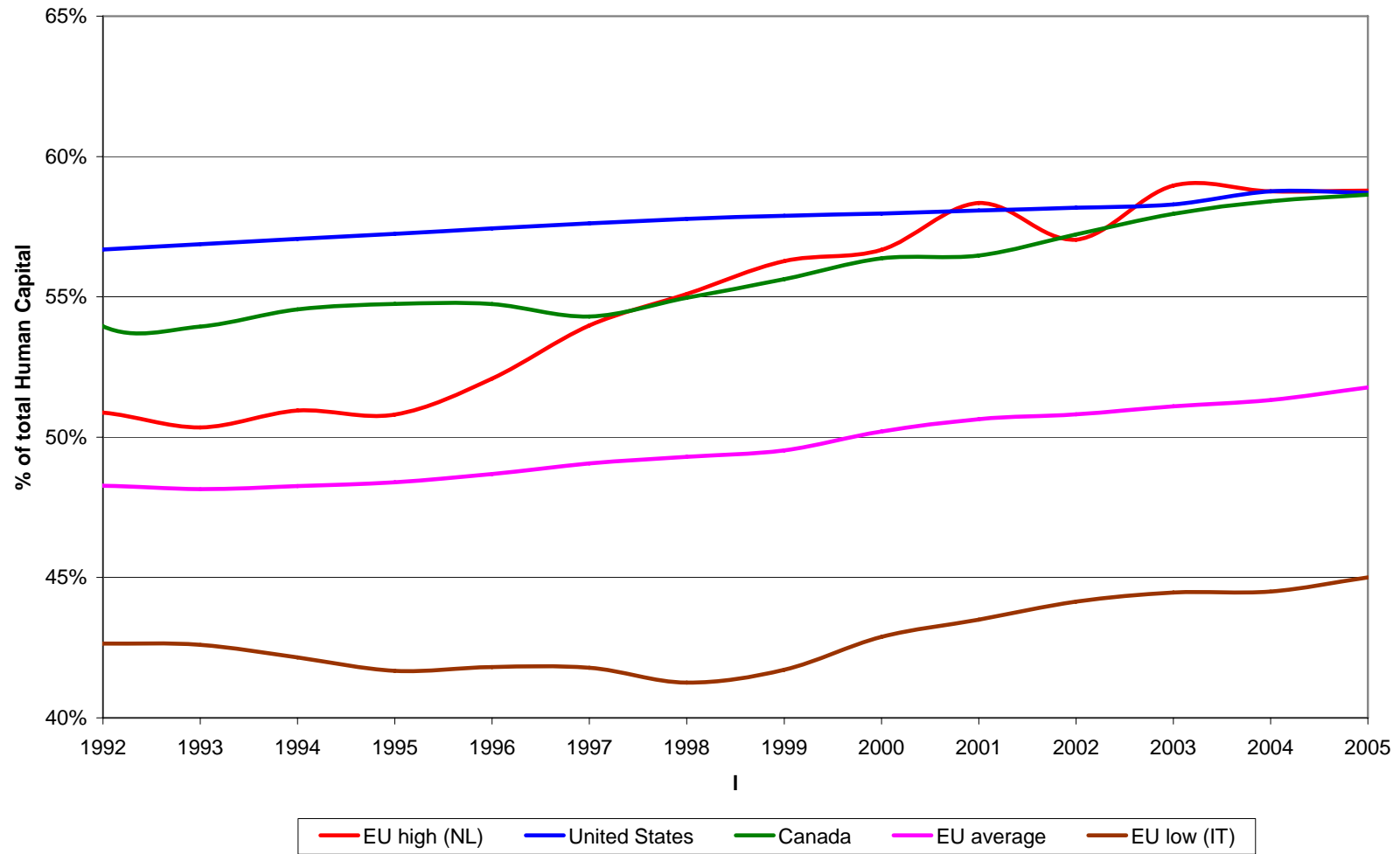


Chart 9: Return on Employed Human Capital (expressed as consumption share of GDP in real PPP adjust. US\$ 2000)

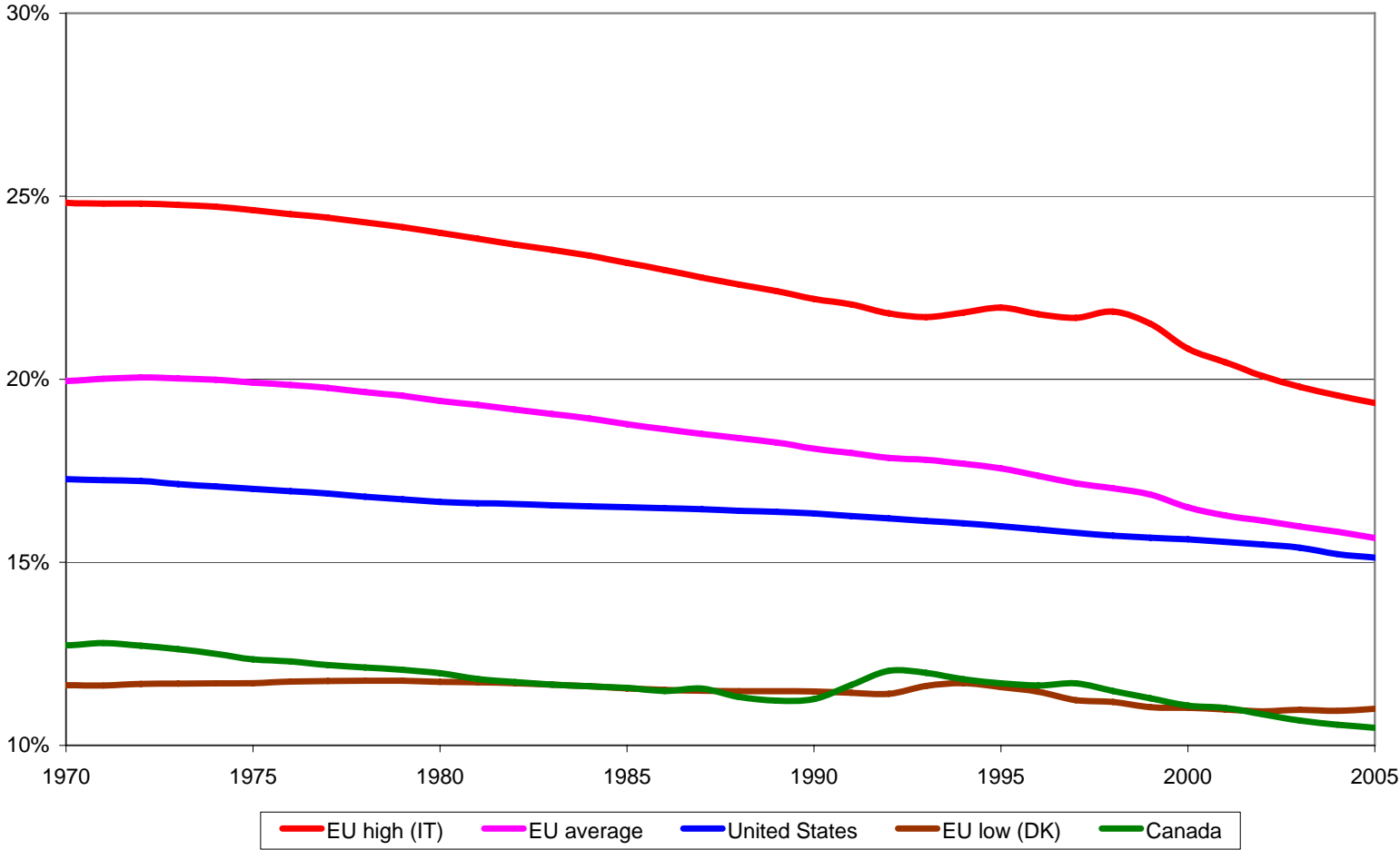


Chart 10

