

Sullivan, Dennis Hal; Smeeding, Timothy Michael

Working Paper

Educational Attainment and Earnings Inequality in Eight Nations

LIS Working Paper Series, No. 164

Provided in Cooperation with:

Luxembourg Income Study (LIS)

Suggested Citation: Sullivan, Dennis Hal; Smeeding, Timothy Michael (1997) : Educational Attainment and Earnings Inequality in Eight Nations, LIS Working Paper Series, No. 164, Luxembourg Income Study (LIS), Luxembourg

This Version is available at:

<https://hdl.handle.net/10419/160836>

Standard-Nutzungsbedingungen:

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

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

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

Terms of use:

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

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

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

Luxembourg Income Study Working Paper Series

Working Paper No. 164

**Educational Attainment and Earnings Inequality
in Eight Nations**

Dennis Sullivan and Timothy Smeeding

July 1997



Luxembourg Income Study (LIS), asbl

Educational Attainment and Earnings Inequality in Eight Nations

Dennis H. Sullivan
Miami University (Ohio)

Timothy M. Smeeding
Syracuse University

July 1997

We gratefully acknowledge the continuing support of the Luxembourg Income Study (LIS) member countries. We acknowledge also the technical advice provided in conversations or correspondence with Inge O'Connor, Robert Weathers, Cheri Minton, and Koen Vleminckx. The authors assume full responsibility for remaining errors. The manuscript and tables were prepared with the assistance of Esther Gray, Mohua Das, and Chungling Lu.

Educational Attainment and Earnings Inequality in Eight Nations

I. Introduction

This paper investigates the relationship between educational attainment and earnings inequality in eight nations using the Luxembourg Income Study (LIS) database. Although the results should be considered exploratory rather than definitive until verified and qualified by more detailed comparative studies, two basic conclusions can be simply stated.

First, among advanced economies there is no obvious relationship between the degree of earnings inequality and the percentage of labor force attaining higher levels of education. Countries differ substantially both in the way in which they organize their educational systems and the way in which they integrate the educational system with the labor market. Moreover, factors such as age and experience, unions and other wage-setting institutions, and the role and regulatory character of the public sector will also affect earnings inequality. It is, therefore, perhaps unsurprising that there is no obvious correlation between simple measures of the educational attainments typical of a nation's labor force and the inequality of earnings in that nation.

The second conclusion is less agnostic: there is a clear positive correlation between the earnings differentials associated with greater educational attainment and the extent of earnings inequality. If education can be considered a rough metric of "skill," then it is indeed true that the relative size of a nation's "returns to skill" is associated with inequality in its earnings distribution.

One unique feature of our paper made possible by recent additions to the LIS database is the inclusion of two non-OECD countries, Hungary and the Republic of China (Taiwan). These countries differ substantially from the OECD countries included (the United States, Canada, Australia, Germany, The Netherlands, and Sweden) in both income level and political history, thus broadening the range of the

comparative study and providing greater variation in the institutional features that one can use to advance and test hypotheses.

The paper proceeds as follows. Section II briefly describes the Luxembourg Income Study database and its contents. Section III briefly describes some of the technical decisions taken in defining the population of interest, the measure of earnings, and the taxonomy of educational attainment, though we have remanded much of the technical detail to an Appendix. Section III concludes with a summary of the extent of earnings inequality in the sample countries, showing results so familiar to income distribution researchers that they may be regarded as stylized facts (Gottschalk and Smeeding 1997). Section IV contains the basic statistical results for both educational attainment and the earnings differentials associated with educational attainment. Section V discusses the interpretation one might place on these results and the implications for future research. An Appendix shows the sensitivity of several results to changes in data definitions and also documents the taxonomy of the various nations' educational systems.

II. The Luxembourg Income Study

For over a decade the Luxembourg Income Study (LIS) has been involved in harmonizing national survey data on household incomes and income components (e.g., earnings) with a common conceptual framework. By improving data comparability, LIS has achieved one of its major objectives: to facilitate cross-country comparisons of inequality, poverty and other distributional issues. Over 160 LIS Working Papers have been generated so far, many of which are also published elsewhere. While comparative analysis of income distributions was possible prior to the construction of LIS, the results were susceptible to the criticism that the data were insufficiently comparable, and the results from different studies could rarely be compared with any confidence.

The LIS project has reduced these uncertainties by establishing a “lowest common denominator” framework of data consistency which permits ready comparability of results from analyses which employ the LIS data. By reducing data inconsistencies as an explanation for observed international differences in income distributions, LIS has improved both the confidence one can place in the results and the clarity of discourse about those results. Even when dealing with data series like educational attainment that cannot be readily harmonized, it is possible to isolate the definitional difficulty and clarify its importance.

The LIS database contains over 70 datasets from 26 nations; new datasets are added regularly. From these we have selected eight different nations with a wide range of institutional features. Three are geographically large OECD countries with diverse populations and an Anglo-Saxon political heritage: the United States, Canada and Australia. Three are European members of the OECD: Germany, the Netherlands and Sweden. Recent additions to the LIS database have extended it beyond the OECD. We have included a Central European “transition economy,” Hungary, and a rapidly growing “Asian tiger,” the Republic of China (Taiwan). We chose these eight countries from among the longer list of possibilities because they all provide recent (1989 through 1994) data including good measures of earnings, full-time work status and educational attainment (see Appendix Table 4A). After imposing the screens described below to isolate the full-year, full-time, prime-age labor force, the samples sizes range from 1163 (Hungary) to 33,917 (United States). Statistical results weight each sample observation with weights determined by the sampling frames of the original surveys.

III. From Data to Measurement

The description and analysis of the inequality of earnings within each nation require a set of technical decisions about how to define the population, how to measure earnings, and how to characterize inequality. Population and earnings data have been harmonized by LIS to ensure the highest feasible level

of comparability. Likewise, a comparative analysis based on educational attainment requires that common definitions be imposed on disparate educational systems. This Section summarizes some of our technical decisions and their rationales. Sensitivity results for several of these decisions can be found in the Appendix.

The LIS Surveys are typically household surveys which report household income from a variety of sources, including earnings from wages and salaries, self-employment income, property income, private and public pensions, and means-tested transfers. Looking at persons rather than households, the surveys typically report for each earner a measure of annual earnings gross of taxes, including any employee's share of social insurance contributions. The only exception among our eight countries is Hungary, which uses a net earnings concept. There are various ways to address the problem that annual earnings differentials involve differences in both wages and hours. The common and straightforward approach that we employ here is to limit the population of interest to workers who worked full time (generally 35 hours or more) during the survey period and reported full-time employment during 50 or more weeks, thus eliminating those who had substantial spells of unemployment or part-time employment. Because young workers are often still in training, while older workers are a self-selected group from among those who may be eligible for retirement, we have followed the common procedure (for example, Gottschalk and Smeeding 1997) of restricting our sample to persons aged 25 to 54.

Another key decision is whether to report men and women separately. Nations differ in the extent to which it makes sense to treat their labor markets as segmented by gender; in many nations, men and women are undoubtedly close substitutes in production. We follow the usual procedure of reporting results separately by gender, though we do not propose to analyze gender gaps in either educational attainments or earnings differentials (see Callan et al. 1995, and Gornick and Jacobs 1996 for LIS-based studies of gender differentials; also Blau and Kahn 1995).

Another important technical decision concerns the treatment of self-employment income. In principle, self-employment generates income which is a mix of labor earnings, returns to capital, and returns to entrepreneurship. Moreover, self-employment income is notoriously misreported (see Atkinson, Rainwater and Smeeding 1995, Table 3.1). The definition of a “self-employed worker” varies across nations, however, so there is no completely consistent way to expunge the earnings of self-employed workers, short of deleting from the sample all households with any self-employment income at all. We have taken the tack of treating the reported earnings of the self-employed as labor earnings. In another study (Sullivan and Smeeding 1997) we have shown that households with earnings exclusively from self-employment tend to clump in the tails of the household income distribution in most LIS countries. One would therefore postulate that including the earnings of full-time self-employed workers would tend to increase measured earnings inequality. We have conducted a sensitivity analysis on this point in Appendix Table 1A, and the postulate is correct for our eight countries with trivial exceptions.

Summing up, the earnings measure is the reported annual earnings of full-year, full-time workers aged 25 to 54, whether employees or self-employed, which we report separately by gender. Table 1 reports inequality results for this measure and sample. There is not, of course, a single measure of income inequality which describes such a complex phenomenon comprehensively. A common measure is P90/10, the ratio of earnings at the 90th percentile to that at the 10th, reported in the third data column of Table 1, and illustrated by the breadth of the bar on the chart. This measure tends to emphasize the tails of the distribution, as do most policy discussions, without giving undue weight to extreme values, which are often unreliable due to a mix of misreporting and different survey conventions about topcoding and bottomcoding (see Atkinson, Rainwater and Smeeding 1995). It is often helpful to break the P90/10 ratio into a bottom and a top portion, P10/50 and P90/50, as shown in the first two data columns of Table 1. Note that greater levels of inequality are associated with higher values of P90/10 and P90/50, but with

lower values of P10/50. In order to use inequality measures based on moments rather than percentiles, it is common to trim observations with extreme values of the variable of interest, and thus we have trimmed the top and bottom 5 percent from the earnings distribution before computing moments or regression results. The squared Coefficient of Variation for the trimmed sample is reported in the final column of Table 1. There are only minor differences in the ranking of nations by inequality using CV-squared rather than P90/10.

The results in Table 1 are generally consistent with the stylized facts as reported, for example, in Gottschalk and Smeeding (1997). However one measures inequality, it is almost always greater in the United States than in any other OECD country, and (growing) inequality at the lower end of the distribution for men is often singled out for special comment (see, for example, Freeman and Katz 1993; Blau and Kahn 1996; and Smeeding 1997). Canada often places high in the inequality league table also, though it seems to have been one of the few nations able to buck the trend toward *higher* inequality (Gottschalk and Smeeding 1997a). Australia and the European economies are often noted to have far less inequality than North America, though inequality seems to have been growing in both Sweden and Australia (Gottschalk and Smeeding 1997a). It is interesting that Hungary, a transition economy, has a level of inequality similar to the United States at the bottom end and greater than the United States at the upper end; greatly increased inequality has been one of the most controversial aspects of transition in the formerly Communist economies (Torrey, Smeeding and Bailey 1996). Wherever one might suppose it would be on Kuznets' famous curve in which economic development first increases inequality the reduces it again, Taiwan does not seem to have a unique degree of earnings inequality of full-time, prime-age workers, with male inequality similar to Canada and female inequality similar to the United States.

The last measurement issue we need to confront is the measurement of educational attainment, which we describe in greater detail in Appendix Table 4A. We deliberately avoided nations like the United

Kingdom which report years of attendance rather than attainment. From the attainment data we distinguish three levels, which we code as Low, Medium and High attainment. For the United States, the break between Low and Medium is the completion of high school, and that for the break between Medium and High is the completion of college. This conceptual definition of the breaks transfers to Canada, Australia, and Taiwan fairly readily. The application to the European systems of a taxonomy based on a North American system is more problematic, particularly at the top end of the attainment scale.

Our taxonomy of the systems for Canada, Australia, Germany and The Netherlands draws heavily on the work of Inge O'Connor (1994), who employed a five-level taxonomy based on the evidence from previous studies and consultations with experts on each nation. A problem with analyzing both the Swedish and the Dutch data is that a strict definition of the High level of attainment leads to a group similar to Americans with Masters degrees, while a more liberal definition includes some persons with something akin to American two year Associate degrees; we have opted for the more liberal definition. The German and Hungarian systems, on the other hand, make especially great use of vocational education. There are undoubtedly many German workers without a University degree who have job skills comparable to American college graduates of the same age. We have opted for the more liberal definition of University qualification for Sweden and The Netherlands, but a strict one for Germany, so the results for Sweden and The Netherlands may compare more directly to the North American results than to the German results. The next section provides results based on this tripartite taxonomy. Results for a taxonomy into four rather than three categories are shown in Appendix Tables 2A and 3A.

IV. Educational Attainment and Earnings Differentials

The proportions of the relevant population at the various attainment levels is shown in Table 2. There is a bar chart showing the percentage in each category; the succeeding columns give the ratio of the

proportion in the High category to that in the Middle; and the ratio of the proportion in the Low category to that in the Middle. The United States sticks out as a nation with high educational attainment of men and women alike, though there are doubtless some American high school graduates whose skill levels would not qualify them for the Middle category in some of the other countries. Canada looks a lot like the United States, but with fewer in the High category and more in the Low. By our trichotomy, Australia does not seem to have a high level of overall educational attainment; the fact that fully a third of the working prime-age women are in the Low category is particularly notable. The effect of the vocational training systems is that both Germany and Hungary have an extraordinarily large proportion in the Middle category. Only about one-sixth of the German men and one-tenth of the German women meet the rather strict definition of the High education attainment category. The relatively liberal definition of High attainment in Sweden and The Netherlands generates a large proportion in that category, especially among women. Note, however, that except for Swedish women, these countries have large proportions in the Low category also. Despite great efforts to increase educational qualifications, Taiwan still has a high percentage of its prime-age work force in the Low educational attainment category.

The main focus of our study, however, is not so much the extent of attainment as the rewards associated with it. These results are displayed in Table 3. The percentage differentials between Low and Medium attainment and between Medium and High attainment are measured in three different ways. The first, which we call the Median Ratio, is measured as the percentage differential between the median earnings in the higher category and the median earnings in the lower. The second, which we call the Trimmed Mean Ratio, is the percentage differential between the mean earnings in the higher category and the mean earnings in the lower category for the middle 90 percent of the overall earnings distribution. The third measure, which we call the Regression estimate, is the log points differential from an earnings regression (see O'Connor 1994 for a discussion in a LIS context) for the middle 90 percent of the overall

earnings distribution, using dummy variables for attainments and ten year age groups as regressors. Since the trim of the top and bottom earners tends differentially to remove earners from the High and Low attainment categories, it is not surprising that the Trimmed Mean differentials and Regression differentials are usually smaller, sometimes much smaller, but the rankings of nations do not differ much.

The results in Table 3 should *not* be interpreted as “rates of return,” for at least two different reasons. First, there is no attempt made to compare the time, the foregone earnings, or the out-of-pocket expense it takes to achieve a given level of educational attainment in different countries. And second, only our regression estimates control for the person’s age, and none of our estimates control for other possible productivity factors that may be correlated with educational attainment more closely in some countries than others. The results in Table 3 are what they claim to be, earnings differentials, and the interesting question for us is how they relate to earnings inequality.

Tables 4 (for men) and 5 (for women) summarize some of the results from previous tables in the form of rankings. The upper panel in each table refers to the differential between Low and Medium attainment, the lower panel between Medium and High. The first two columns give rankings and values of the size of the percentage differential by two different measures from Table 3, from one as the largest differential to eight as the smallest. The next two columns give the relevant attainments from Table 2 measured as percent or as ratio, from one as highest value to eight as lowest. The last column gives the P50/10 (reciprocal of P10/50) and P90/50 values from Table 1, from one as largest (least equality) to eight as smallest (most equality).

Among the OECD countries there seems to be some negative association between the differential from achieving a Medium (rather than a Low) attainment and the proportion who have failed to achieve even a Medium attainment. The interpretation might be that a greater differential encourages students to stay in school, but the result scarcely seems robust. An association between the earnings differential for

achieving a High educational attainment and the proportion achieving it is even harder to discern, though a stricter definition of higher education in Sweden and The Netherlands might indicate a slight positive correlation. There may be several reasons for the lack of an obvious association. First, the measurements of educational attainment are imperfect regarding amount and take no account at all of differences in the quality of education. Second, recall the point above that these are just differentials, not rates of return. Third, a market interpretation raises the issue of the direction of causation; higher earnings differentials ought to encourage greater educational attainment; but greater educational attainment ought in turn to depress the earnings differentials (as happened in the United States in the 1970s, for example). Recent studies (see, for example, the Summary paper by Freeman and Katz 1995) have generally tended to the view that in most countries “skill” supplies have been increasing more slowly than “skill” demands, thus increasing differentials associated with higher educational attainment, with the Netherlands as an interesting example of the opposite phenomenon in which a large increase in the supply of highly educated workers was associated with a decline in the premium paid to college-educated men (Gottschalk and Joyce 1997). Fourth, in many countries, educational attainment is by no means a market phenomenon: access to education is closely managed (especially at the lower end) and sometimes strictly rationed (especially at the upper end). And last, countries differ substantially in how closely educational qualifications are tied to labor market needs: it is often alleged that the tie is particularly close in Germany, while North Americans may stay in school to acquire skills they do not ultimately need because their educational systems are not so directly responsive to changing skill requirements.

The real payoff, however, comes when we look at the final columns of Tables 4 and 5. While there is no obvious association between the *extent of attainment* and the amount of earnings inequality, there is an obvious association between *earnings differentials* and the amount of earnings inequality. In particular, the earnings differential for being a high school graduate (Medium rather than Low educational attainment)

is associated with greater inequality in the lower half of the earnings distribution (P50/10), and the differential for being a college graduate (High rather than Medium educational attainment) is associated with greater inequality in the upper half of the earnings distribution (P90/50). The correlation is not perfect. For example, at the lower levels of attainment, Canada and Sweden have more inequality than the earnings differentials would imply, and Germany less. Nevertheless, it seems clear that the earnings differential associated with educational attainment varies substantially among nations and plays a role in generating earnings inequality.

V. Conclusion

The results we have shown are consistent with the view that differences in labor market institutions are important determinants of earnings inequality (see Freeman 1994; Freeman and Katz 1995; Blau and Kahn 1996). Inequality seems to be less associated with the extent of educational attainment in a society than with the differential rewards that wage-setting systems provide for greater attainments. While there is evidence that sufficiently *increased* supplies of highly educated workers can reduce or reverse *growing* education premia (Freeman and Katz 1995; Gottschalk and Joyce 1997), the cross-section evidence is not consistent with the claim that among advanced (OECD) nations higher *levels* of educational attainment are associated with lower *levels* of inequality.

The institutional differences most often cited by labor economists are the degree of “centralization” of wage-setting (see especially Blau and Kahn 1996) and the legal and historical role of unions (see Freeman 1994). Australia and Sweden, for example, have historically had highly centralized wage-setting systems, though the degree of centralization is now declining (see Gregory and Vella 1995; Edin and Holmlund 1995). As Abraham and Houseman (1995) emphasize, however, Germany has taken a somewhat different route involving heavy investment in training those without a University degree. The

role of unions is often cited as a major difference between Canada and the United States (see Lemieux 1993; Card and Freeman 1994).

The inclusion of Hungary and Taiwan in our study offers some interesting contrasts. The attainment structure in Hungary is fairly similar to that in Germany, but inequality is much higher in Hungary, in part because the earnings differentials are larger, especially for the lower levels of educational attainment. One supposes that the matching of skills provided to skills needed, which is a hallmark of the German training system, would be much less in a transition economy like Hungary, generating relatively large skill rents both across and within education groups. The results for Taiwan are also interesting. We find, as Kim and Topel (1995) did for Korea, that earnings inequality in an “Asian tiger” need not be particularly high by OECD standards. Both overall earnings inequality in Taiwan and the differentials associated with education are similar to those in the North American economies.

There has been a rapid increase in both the amount of research on comparative income inequality and the level of interest in the results, as described in the Gottschalk and Smeeding (1997) review. At the technical level this research effort has been facilitated by the development of readily accessible comparative datasets like LIS. At the conceptual level the impetus for this research is undoubtedly the desire to consider the effects of institutional arrangements that vary much more widely across nations than within nations or over time.

Educational systems are crucial elements of the institutional structure that generates cross-national differences in inequality. One important avenue for further research is the identification of the key parameters that characterize an educational system, particularly its role in imparting marketable skills. Because of widely differing systems of subsidy and philosophies about access, systems with similar superficial traits may generate very different patterns of educational attainment. Moreover, as Freeman (1994) emphasizes, educational systems typically fit into a broader system of labor market “rules,” which

include a nation's wage-setting institutions, approach to worker representation, and social safety net; each element of a nation's "rules" has adapted itself to the others. The research we have presented suggests that differences in the extent of earnings inequality among high-income countries are heavily influenced by the rewards for educational attainment.

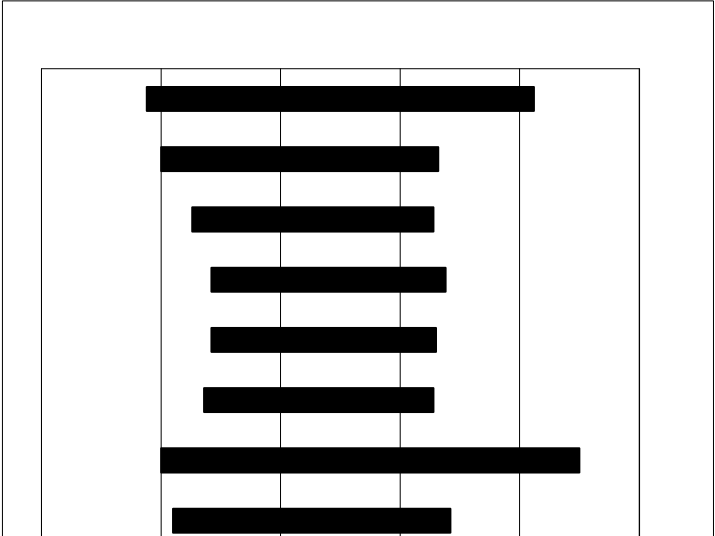
References

- Abraham, K. and S. Houseman. 1995. "Earnings Inequality in Germany." In R. Freeman and L. Katz (eds.), *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press, pp. 371-404.
- Atkinson, A., L. Rainwater, and T. Smeeding. 1995. *Income Distribution in OECD Countries: Evidence from the Luxembourg Income Study (LIS)*. Paris: OECD.
- Blau, F. and L. Kahn. 1996. "International Differences in Male Wage Inequality: Institutions versus Market Forces," *Journal of Political Economy*, 104: 791-837.
- Blau, F. and L. Kahn. 1995. "The Gender Earnings Gap: Some International Evidence." In R. Freeman and L. Katz (eds.), *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press.
- Callan, T., S. Adams, S. Dex, S. Gustafsson, J. Schupp, and N. Smith. 1996. "Gender Wage Differentials: New Cross-Country Evidence," LIS Working Paper #134. Luxembourg: Luxembourg Income Study.
- Card, D. and R. Freeman. 1994. "Small Differences that Matter: Canada vs. the United States." In R. Freeman (ed.), *Working Under Different Rules*. New York: Russell Sage Foundation, pp. 189-222.
- Edin, P. and B. Holmlund. 1995. "The Swedish Wage Structure: The Rise and Fall of Solidarity Wage Policy?" In R. Freeman and L. Katz (eds.), *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press, pp. 307-344.
- Freeman, R. 1997. *When Earnings Diverge*. Washington, DC: National Policy Association.
- Freeman, R. 1994. "How Labor Fares in Advanced Economies." In R. Freeman (ed.), *Working Under Different Rules*. New York: Russell Sage Foundation, pp. 1-28.
- Freeman, R. and L. Katz. 1994. "Rising Wage Inequality: The United States Vs. Other Advanced Countries." In R. Freeman (ed.), *Working Under Different Rules*. New York: Russell Sage Foundation, pp. 29-62.
- Freeman, R. and L. Katz (eds.). 1995. *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press.
- Gornick, J. and J. Jacobs. 1996. "A Cross-National Analysis of the Wages of Part-Time Workers," *Work, Employment, and Society*, 10(1) (March): 1-27.
- Gregory, R. and F. Vella. 1995. "Real Wages, Employment, and Wage Dispersion in U.S. and Australian Labor Markets." In R. Freeman and L. Katz (eds.), *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press, pp. 205-226.

- Gottschalk, P. and M. Joyce. 1997. "Crossnational Differences in the Rise in Earnings Inequality—Market and Institutional Factors," LIS Working Paper #160. Luxembourg: Luxembourg Income Study.
- Gottschalk, P. and T. Smeeding. 1997. "Cross-National Comparisons of Earnings and Income Inequality," *Journal of Economic Literature*, XXXV (June): 633-686.
- Gottschalk, P. and T. Smeeding. 1997a. "Empirical Evidence on Income Inequality in Industrialized Countries." In A.B. Atkinson and F. Bourgignon (eds.), *The Handbook of Income Distribution*. London: North Holland Press, in press.
- Kim, D. and R. Topel. 1995. "Labor Markets and Economic Growth: Lessons from Korea's Industrialization, 1970-1990." In R. Freeman and L. Katz (eds.), *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press, pp. 227-264.
- Lemieux, T. 1993. "Unions and Wage Inequality in Canada and the United States." In D. Card and R. Freeman (eds.), *Small Differences That Matter: Labor Market and Income Maintenance in Canada and the United States*. Chicago: University of Chicago Press.
- O'Connor, I. 1994. "Cross-National Comparisons of Education and Earnings," LIS Working Paper #116. Luxembourg: Luxembourg Income Study.
- Smeeding, T. 1997. "American Income Inequality in a Cross-National Perspective: Why Are We So Different?" LIS Working Paper #157. Luxembourg: Luxembourg Income Study.
- Sullivan, D. and T. Smeeding. 1997. "The Sensitivity of Earnings Differentials for Educational Attainment to Alternate Measures of Earnings, Attainment and Inequality: Results for Eight Countries," LIS Working Paper #164. Luxembourg: Luxembourg Income Study.
- Sullivan, D. and T. Smeeding. 1997. "All the World's Entrepreneurs: The Role of Self-Employment in Nineteen Nations," LIS Working Paper #163. Luxembourg: Luxembourg Income Study.
- Torrey, B., T. Smeeding, and D. Bailey. 1996. "Income Transitions in Central European Households," *Economic Development and Cultural Change*, in press.

Table 1-Overall Earnings Inequality

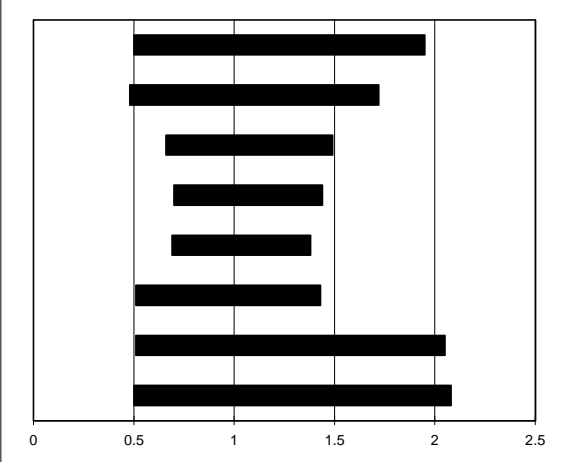
Full - Year, Full - Time^a Men

Country and Year^b	P10/50^c		P90/50	P90/10	CV Squared^d
United States 1994	0.44		2.06	4.67	0.19
Canada 1994	0.50		1.66	3.31	0.12
Australia 1989	0.63		1.64	2.59	0.08
Germany 1989	0.71		1.69	2.37	0.08
The Netherlands 1991	0.71		1.65	2.31	0.07
Sweden 1992	0.68		1.64	2.41	0.07
Hungary 1994	0.50		2.25	4.55	0.21
ROC(Taiwan) 1991	0.55		1.71	3.11	0.12

0.0 0.5 1.0 1.5 2.0 2.5

Table 1- Continued

Full-Year, Full-Time Women

Country and Year	P10/50		P90/50	P90/10	CV Squared
United States 1994	0.50		1.95	3.90	0.21
Canada 1994	0.48		1.72	3.57	0.15
Australia 1989	0.66		1.49	2.27	0.08
Germany 1989	0.70		1.44	2.06	0.06
The Netherlands 1991	0.69		1.38	1.93	0.06
Sweden 1992	0.51		1.43	2.82	0.07
Hungary 1994	0.51		2.05	4.06	0.23
ROC(Taiwan) 1991	0.50		2.08	4.16	0.21

a. Full-year is 50+ weeks of full time employment; full-time is 35+ hours/week during sample period.

b. "Year" is the reference year, not necessarily the sample year.

c. Earnings at the 10th percentile as a ratio to earnings at the 50th percentile(median). P90/50 and P90/10 are defined analogously. Thus, $P90/10 = (P90/50)/(P10/50)$.

d. Squared coefficient of variation. Sample omits earners (of either gender) in the top or bottom 5% of the earnings distribution.

Source: Authors' tabulations from Luxembourg Income Study.

**Table 2-Percentage Educational Attainments
(in percents)**

Percent in Each Attainment Category

Full - Year, Full - Time Men

Country and Year	Low	Medium	High		Ratio of High to Medium	Ratio of Low to Medium
United States 1994	8.70	58.4	32.9		0.563	0.150
Canada 1994	16.2	61.3	22.4		0.366	0.265
Australia 1989	27.5	55.3	17.1		0.310	0.497
Germany 1989	14.6	68.4	16.9		0.247	0.214
The Netherlands 1991	27.9	48.2	23.9		0.496	0.580
Sweden 1992	25.6	46.5	27.8		0.598	0.551
Hungary 1994	13.0	68.0	19.1		0.281	0.191
ROC(Taiwan) 1991	44.4	42.0	13.6		0.324	1.056

Table 2- Continued

Percentage in Each Attainment Category

Full-Year, Full-Time Women

Country and Year	Low	Medium	High		Ratio of High to Medium	Ratio of Low to Medium
United States 1994	6.50	63.7	29.7		0.466	0.102
Canada 1994	12.3	65.4	22.2		0.340	0.188
Australia 1989	33.9	49.5	16.6		0.335	0.683
Germany 1989	22.9	67.2	9.90		0.148	0.340
The Netherlands 1991	24.8	42.2	32.9		0.780	0.588
Sweden 1992	17.4	48.5	34.1		0.703	0.358
Hungary 1994	22.6	57.6	19.8		0.344	0.392
ROC(Taiwan) 1991	48.4	41.3	10.3		0.248	1.171

Source: Authors' tabulations from Luxembourg Income Study

Table 3. Percentage Earnings Differentials Based on Educational Attainments
(in percents)

Country and Year	Percent Differential Between Low and Medium Attainment			Percent Differnential Between Medium and High Attainment		
	Median Ratio ^a	Trimmed Mean Ratio ^b	Regression ^c	Median Ratio ^a	Trimmed Mean Ratio ^b	Regression ^c
	Full-Year, Full-Time Men					
United States, 1994	50.0	37.8	32.8	56.7	31.2	27.2
Canada, 1994	17.1	11.6	14.0	29.3	15.5	14.9
Australia, 1989	17.2	11.9	11.9	30.3	20.2	19.0
Germany, 1989	14.4	14.8	14.4	61.3	34.8	29.3
The Netherlands, 1991	12.8	14.2	10.9	32.8	21.8	20.9
Sweden, 1992	4.6	5.4	7.5	28.1	16.5	15.1
Hungary, 1994	30.3	21.0	19.0	105.8	49.1	41.6
Republic of China (Taiwan), 1991	29.7	22.7	23.8	41.2	24.3	23.6
	Full-Year, Full-Time Women					
United States, 1994	52.9	35.4	29.6	58.9	43.4	37.0
Canada, 1994	27.3	17.2	18.4	48.0	37.7	32.5
Australia, 1989	19.6	16.7	15.7	31.5	25.1	22.7
Germany, 1989	21.2	9.4	11.0	39.0	34.7	29.4
The Netherlands, 1991	6.0	-3.4	0.8	14.2	14.6	11.9
Sweden, 1992	4.0	1.7	5.1	22.1	20.8	16.8
Hungary, 1994	49.1	38.5	32.1	71.7	54.9	44.2
Republic of China (Taiwan), 1991	58.7	49.2	42.1	55.6	41.1	37.0

^aPercentage differential between median earnings in attainment categories.

^bPercentage differential between mean earnings in attainment categories. Sample omits earners (of either gender) in the top or bottom 5 percent of the earnings distribution.

^cLog points differential based on regression coefficient in regression of log earnings on educational attainment and ten year age group.

Source: Author's tabulations from Luxembourg Income Study.

Table 4. Rankings by Various Measures (Values in Parentheses) Full-Year Full-Time Men

Country and Year	Median Wage Differential: Medium/Low Attainment	Regression Differential: Medium/Low Attainment	Percentage with Low Attainment	Ratio of Low/Medium Attainment	P50/10
United States, 1994	1 (50)	1 (33)	8 (9)	8 (0.15)	1 (2.27)
Canada, 1994	5 (17)	5 (14)	4 (16)	5 (0.27)	2/3 (2.00)
Australia, 1989	4 (17)	6 (12)	3 (28)	4 (0.50)	5 (1.59)
Germany, 1989	6 (14)	4 (14)	6 (15)	6 (0.21)	7/8 (1.41)
The Netherlands, 1991	7 (13)	7 (11)	2 (28)	2 (0.58)	7/8 (1.41)
Sweden, 1992	8 (5)	8 (8)	4 (26)	3 (0.55)	6 (1.47)
Hungary, 1994	2 (30)	3 (19)	7 (13)	7 (0.19)	2/3 (2.00)
Republic of China (Taiwan), 1991	3 (30)	2 (24)	1 (44)	1 (1.06)	4 (1.82)
	Median Wage Differential: High/Medium Attainment	Regression Differential: High/Medium	Percentage with High Attainment	Ratio of High/Medium Attainment	P90/50
United States, 1994	3 (57)	3 (27)	1 (33)	2 (0.56)	2 (2.06)
Canada, 1994	7 (29)	8 (15)	4 (22)	4 (0.37)	5 (1.66)
Australia, 1989	6 (30)	6 (19)	6 (17)	6 (0.31)	7/8 (1.64)
Germany, 1989	2 (61)	2 (29)	7 (17)	8 (0.25)	4 (1.69)
The Netherlands, 1991	5 (33)	5 (21)	3 (24)	3 (0.50)	6 (1.65)
Sweden, 1992	8 (28)	7 (15)	2 (28)	1 (0.60)	7/8 (1.64)
Hungary, 1994	1 (106)	1 (42)	5 (19)	7 (0.28)	1 (2.25)
Republic of China (Taiwan), 1991	4 (41)	4 (24)	8 (14)	5 (0.32)	3 (1.71)

Source: Tables 1, 2, and 3 above

Table 5. Rankings by Various Measures (Values in Parentheses) Full-Year, Full-Time Women

Country and Year	Median Wage Differential: Medium/Low Attainment	Regression Differential: Medium/Low Attainment	Percentage with Low Attainment	Ratio of Low/Medium Attainment	P50/10
United States, 1994	2 (53)	3 (30)	8 (7)	8 (0.10)	2/3 (2.00)
Canada, 1994	4 (27)	4 (18)	7 (12)	7 (0.19)	1 (2.08)
Australia, 1989	6 (20)	5 (16)	2 (34)	2 (0.68)	6 (1.50)
Germany, 1989	5 (21)	6 (11)	4 (23)	6 (0.34)	8 (1.43)
The Netherlands, 1991	7 (6)	8 (1)	3 (25)	3 (0.59)	7 (1.45)
Sweden, 1992	8 (4)	7 (5)	6 (17)	5 (0.36)	4/5 (1.96)
Hungary, 1994	3 (49)	2 (32)	5 (23)	4 (0.39)	4/5 (1/96)
Republic of China (Taiwan), 1991	1 (59)	1 (42)	1 (48)	1 (1.17)	2/3 (2.00)
	Median Wage Differential: High/Medium Attainment	Regression Differential: High/Medium	Percentage with High Attainment	Ratio of High/Medium Attainment	P90/50
United States, 1994	2 (59)	2/3 (37)	3 (30)	3 (0.47)	3 (1.95)
Canada, 1994	4 (48)	4 (32)	4 (22)	5 (0.34)	4 (1.72)
Australia, 1989	6 (32)	6 (23)	6 (17)	6 (0.34)	5 (1.49)
Germany, 1989	5 (39)	5 (29)	8 (10)	8 (0.15)	6 (1.44)
The Netherlands, 1991	8 (14)	8 (12)	2 (33)	1 (0.78)	8 (1.38)
Sweden, 1992	7 (22)	7 (17)	1 (34)	2 (0.70)	7 (1.43)
Hungary, 1994	1 (72)	1 (44)	5 (20)	4 (0.34)	2 (2.05)
Republic of China (Taiwan), 1991	3 (56)	2/3 (37)	7 (10)	7 (0.25)	1 (2.08)

Source: Tables 1, 2, and 3 above

Appendix Tables.

Appendix Table 1A, which is comparable to Table 1 in the text, shows the sensitivity of measured earnings inequality to the decision of whether to include self-employment earnings in the definition of “earnings” or whether to restrict the definition of “earnings” to wages and salaries.

Appendix Table 2A, which is comparable to Table 2 in the text, shows the results of an alternative taxonomy of educational attainment into four categories rather than three (see also Table 4A)

Appendix Table 3A, which is comparable to Table 3 in the text, shows the earnings differentials associated with the alternative taxonomy of educational attainment show in Table 2A.

Appendix Table 4A shows the relationship between the educational attainment descriptions given in the LIS data dictionaries for the respective countries and the taxonomies employed in Tables 2, 3, 2A and 3A.

Appendix Table 1A. Overall Earnings Inequality

Country and Year	P_{10}/P_{50}^a		P_{90}/P_{50}		P_{90}/P_{10}	
	Wage and Salary Earnings	Including Self-Employment	Wage and Salary Earnings	Including Self-Employment	Wage and Salary Earnings	Including Self-Employment
Full-Year, Full-Time Men						
United States, 1994	0.46	0.44	1.98	2.06	4.28	4.67
Canada, 1994	0.50	0.50	1.65	1.66	3.29	3.31
Australia, 1989	0.65	0.63	1.61	1.64	2.49	2.59
Germany, 1989	0.72	0.71	1.68	1.69	2.33	2.31
The Netherlands, 1991	0.72	0.71	1.65	1.65	2.30	2.31
Sweden, 1992	0.71	0.68	1.64	1.64	2.32	2.41
Hungary, 1994	0.53	0.50	2.22	2.25	4.20	4.55
Republic of China (Taiwan), 1991	0.58	0.55	1.69	1.71	2.94	3.11
Full-Year, Full-Time Women						
United States, 1994	0.50	0.50	1.92	1.95	3.83	3.90
Canada, 1994	0.50	0.48	1.72	1.72	3.47	3.57
Australia, 1989	0.68	0.66	1.48	1.49	2.18	2.27
Germany, 1989	0.69	0.70	1.43	1.44	2.06	2.06
The Netherlands, 1991	0.69	0.69	1.38	1.38	1.98	1.98
Sweden, 1992	0.55	0.51	1.43	1.43	2.58	2.82
Hungary, 1994	0.51	0.51	2.03	2.05	4.00	4.06
Republic of China (Taiwan), 1991	0.52	0.50	2.06	2.08	3.94	4.16

^aEarnings at the 10th percentile as a ratio to earnings at the 50th percentile (median). P_{90}/P_{50} and P_{90}/P_{10} are defined analogously.

Source: Authors' tabulations from Luxembourg Income Study.

**Table 2A - Percentage Educational Attainments
(in percents)**

Percent in Each Attainment Category

Full-Year, Full-Time Men

Country and Year	Primary	Secondary	Post-Secondary	University
United States 1994	8.74	31.27	27.13	32.86
Canada 1994	16.25	21.10	40.20	22.44
Australia 1989	27.52	11.30	44.04	17.14
Germany 1989	12.62	67.07	3.39	16.92
The Netherlands 1991	8.91	67.22	17.36	6.52
Sweden 1992	25.63	46.48	12.71	15.17
Hungary 1994	12.95	67.97	9.69	93.91
ROC (Taiwan) 1991	44.37	28.19	13.84	13.59

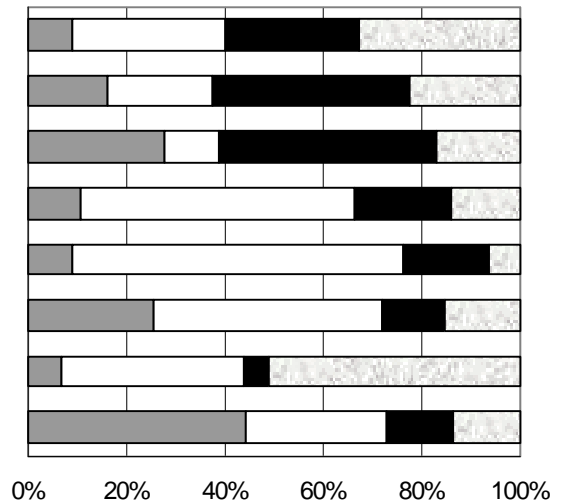
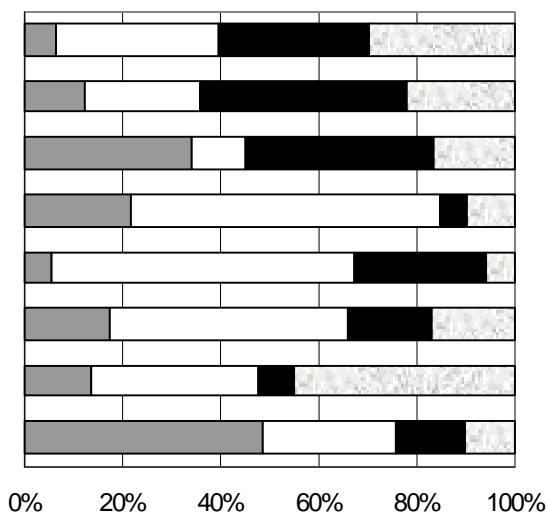


Table 2A - Continued

Percent in Each Attainment Category

Full-Year, Full-Time Women

Country and Year	Primary	Secondary	Post-Secondary	University
United States 1994	6.51	32.98	30.77	29.74
Canada 1994	12.32	23.26	42.18	22.25
Australia 1989	33.86	11.39	38.15	16.60
Germany 1989	21.62	62.96	5.50	9.92
The Netherlands 1991	5.41	61.66	27.14	5.79
Sweden 1992	17.40	48.53	17.10	16.97
Hungary 1994	22.58	57.61	12.24	75.74
ROC (Taiwan) 1991	48.42	27.42	13.91	10.25



Source: Authors' tabulations from Luxembourg Income Study

Appendix Table 3A. Percentage Differentials Based on Educational Attainments
(in percents)

Country and Year	Percent Differential between Primary and Secondary Attainment		Percent Differential between Secondary and Post-Secondary Attainment		Percent Differential between Post-Secondary and University Attainment	
	Median Ratio ^a	Regression ^b	Median Ratio ^a	Regression ^b	Median Ratio ^a	Regression ^b
Full-Year, Full-Time Men						
United States, 1994	40.0	26.9	21.4	12.6	38.2	20.4
Canada, 1994	7.6	7.4	12.6	8.7	25.0	19.1
Australia, 1989	14.1	9.9	3.7	2.5	29.1	18.5
Germany, 1989	15.7	14.3	-0.8	7.5	62.7	22.6
The Netherlands, 1991	17.5	15.6	26.6	20.9	26.2	10.1
Sweden, 1992	4.6	7.4	14.0	10.6	23.9	9.4
Hungary, 1994	30.3	19.1	54.3	31.5	44.7	23.2
Republic of China (Taiwan), 1991	22.1	19.1	20.0	14.9	25.1	12.2
Full-Year, Full-Time Women						
United States, 1994	42.9	22.4	20.0	14.6	41.7	29.6
Canada, 1994	23.9	12.8	3.9	8.7	46.4	29.5
Australia, 1989	11.4	10.5	11.1	6.6	27.0	21.2
Germany, 1989	19.8	9.7	2.3	10.8	37.5	19.6
The Netherlands, 1991	3.0	-5.8	13.1	9.1	21.7	23.4
Sweden, 1992	4.0	5.0	14.8	10.3	16.0	12.8
Hungary, 1994	49.1	32.1	54.9	36.2	37.3	22.9
Republic of China (Taiwan), 1991	42.5	32.1	39.4	29.0	24.3	18.0

^aPercentage differential between median earnings in attainment categories.

^bLog points differential based on regression coefficient in regression of log earnings on educational attainment and ten year age groups.

Source: Authors' tabulations from Luxembourg Income Study.

Appendix Table 4A. Narrative Descriptions and Codings of Educational Attainment

Country	Narrative Description	Coding Tables 2 and 3	Coding Appendix Tables 2A and 3A
Australia	Never went to school	low	primary
	Less than secondary	low	primary
	Completed secondary	medium	secondary
	Trade certificate	medium	post-secondary
	Other certificate	medium	post-secondary
	Bachelor or Higher	high	university
	Other	medium	secondary
Canada	Less than grade 8	low	primary
	Grades 9 and 10	low	primary
	Grades 11 through 13	low	primary
	Graduated high school	medium	secondary
	Some post-secondary	medium	post-secondary
	Post-secondary certificate	medium	post-secondary
	University diploma	high	university
Germany	No degree	low	primary
	Other degree	low	primary
	Other degree with tech	low	secondary
	Secondary	low	primary
	Secondary with technical	medium	secondary
	Nonclass secondary	low	primary
	Nonclass secondary with technical	medium	secondary
	Technical school degree	medium	secondary
	Technical school with technical	medium	secondary
	High school degree	medium	post-secondary
	High school with technical	medium	post-secondary
	Technical college	high	university
	University	high	university

Appendix Table 4A. Continued

Country	Narrative Description	Coding	Coding
		Tables 2 and 3	Appendix Tables 2A and 3A
Hungary	No formal school	low	primary
	1 to 3 classes	low	primary
	4 to 5 classes	low	primary
	6 to 7 classes	low	primary
	Elementary (3 classes)	low	primary
	Vocational	medium	secondary
	Secondary	medium	secondary
	College	high	post-secondary
	University	high	university
The Netherlands	Pre-primary	low	primary
	Primary	low	primary
	Secondary lower	low	secondary
	Secondary higher	medium	secondary
	Tertiary lower	high	post-secondary
	Post-graduate or old masters	high	university
Republic of China (Taiwan)	Illiterate	low	primary
	Supplementary schooling	low	primary
	Primary school	low	primary
	Junior vocational	low	primary
	Junior high	low	primary
	Senior vocational (part)	low	primary
	Senior vocational (grad)	medium	secondary
	Senior high (part)	low	primary
	Senior high (grad)	medium	secondary
	Junior college (part)	medium	post-secondary
	Junior college (grad)	medium	post-secondary
	College/university (part)	medium	post-secondary
	College/university (grad)	high	university
	Grad school (part)	high	university
	Grad school (grad)	high	university

Appendix Table 4A. Continued

Country	Narrative Description	Coding	Coding
		Tables 2 and 3	Appendix Tables 2A and 3A
Sweden	No education	low	primary
	Primary 1	low	primary
	Primary 2	low	primary
	Secondary 1	medium	secondary
	Secondary 2	medium	secondary
	University 1	high	post-secondary
	University 2	high	university
	Research	high	university
United States	No schooling	low	primary
	Elementary school	low	primary
	Some high school	low	primary
	High school diploma	medium	secondary
	Some college	medium	post-secondary
	Associate degree	medium	post-secondary
	Bachelor degree	high	university
	Masters degree	high	university
	Doctorate	high	university