**Online Appendix, Chapter 1**

(This Appendix is adapted with permission from Tåhlin 2011.)

*Job complexity indicators in survey research*

The first Swedish Level of Living Survey (LNU) was conducted in 1968, and has since been replicated six times, in 1974, 1981, 1991, 2000, 2010 and 2020 (data collection for the most recent wave began in December 2020 and will be completed by late 2021). The LNU surveys are based on personal interviews with a random sample of the adult (age 18-75) population. The number of respondents in each wave is between 5,000 and 6,000, of whom around 3,000 are gainfully employed. The non-response rate in 2010, when the last survey was completed, was around 40%. The survey questionnaire contains large batteries of descriptive indicators on working conditions and several other life domains (for detailed information, see SOFI 2020).

Job complexity is measured by three indicators in the LNU surveys. Close to identical items are included in two waves (2004 and 2010) of the European Social Survey; see ESS (2010). The first measure concerns the educational requirements of the job, measured by the following survey questions: “Is any schooling or vocational training above elementary schooling needed in your job?” (YES, NO); IF YES: “About how many years of education above elementary school are needed?” (NUMBER OF YEARS). The second complexity indicator measures the time of training after job entry that is required before the job tasks can be carried out reasonably well: “Apart from the competence required to get a job such as yours, how long does it take to learn to do the job reasonably well?” (RESPONSE SCALE: ‘1 day or less’, ‘2–5 days’, ’1–4 weeks’, ’1–3 months’, ’3 months – 1 year’, ‘1–2 years’, ’More than 2 years’).

Both the educational requirements indicator and the initial job learning indicator use time scales. Time measures have several attractive features. First, they are interval-level scales, which are desirable but rare in survey research. Second, they permit meaningful quantitative cross-category comparisons, between persons, between jobs, and between persons and jobs. The person-job comparability allows straight-forward analyses of mismatch, for example (see further below). Third, time measures are concrete enough for survey respondents to provide reliable answers, because time is a unit that is relatively easy to think about, yet abstract enough to allow comparisons across qualitatively distinct categories (such as jobs and persons). Fourth, an important advantage of time measures of complexity is that informal skill formation, such as learning by doing, can be quantified in a manner which avoids heavily skewed response distributions (a major problem with most alternative indicators of informal learning and training).

The third indicator of job complexity concerns continuing learning: skills learned on the job after the initial phase of job training and learning. In this case, it is difficult to design a measure directly based on amounts of time, since the meaning of the concept ‘continuing’ implies that there is no end of the process. Therefore, a survey question of a less precise type is used: ”To what extent does your work involve learning new things?” (RESPONSE SCALE: ’To a very large extent’, ’To a large extent’, ’To some extent’, ’To a small extent’, ’Not at all’).

In the fourth wave of the LNU survey (1991), re-interviews with a random sub-sample of respondents were made around two weeks after the original interview. These data were used to estimate reliabilities. Test-retest correlations for the three job complexity indicators were generally high, with some variation between them: 0.88 for educational requirements, 0.76 for initial job learning requirements, and 0.71 for continuing learning. These high reliabilities together with the strong validity indicated above (the tight conceptual link between job complexity and learning) thus provide evidence of very good measurement properties of the complexity indicators.

Descriptive statistics for the job complexity indicators and correlations between complexity, education and wages are shown in table A1. The data are from the fifth wave of the LNU survey (2000).

*Table A1: Job complexity indicators, education and wages. Descriptive statistics and correlations;   
Swedish Level of Living Survey (LNU) 2000.*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | | | *Correlations* | | |  |  |
|  |  |  | | |  | |  | educ | initial job |
|  | mean | | | sd | wage | | educ | req's | learning |
| Education | 3.78 | | 2.86 | | | .34 |  |  |  |
| Educational requirements | 3.05 | | 2.63 | | | .48 | .58 |  |  |
| Initial job learning | 1.12 | | 1.10 | | | .42 | .20 | .40 |  |
| Continuing job learning | 2.42 | | 1.08 | | | .22 | .22 | .32 | .33 |

The descriptive statistics show that the mean educational requirements among employees are just over three years beyond compulsory school, which is about three quarters of a year shorter than the average amount of post-compulsory schooling completed. This aggregate difference indicates that a substantial fraction of all employees are over-educated, in the sense that their education is longer than what is required in their jobs. At the individual level, around one third of all employees in Sweden had an amount of schooling at least two years in excess of their job requirements at the time of the survey (2000). We return briefly below to the mismatch issue (see Korpi and Tåhlin 2009 for a detailed analysis of educational mismatch, based on the LNU surveys). The average learning time required after job entry until the job tasks can be carried out reasonably well is slightly above one year. Finally, the continuing learning scale has an average of 2.4 on the 0-4 scale, indicating that most jobs contain substantial amounts of learning. Of the three measures of job complexity, the dispersion is clearly smallest in continuing learning, probably in part due to less precise measurement, although the reliabilities of the indicators are generally high as shown above.

The correlations in table A1 clearly show the importance of job requirements relative to individual education for labor market rewards. First, the correlation between education and educational requirements is substantially below unity (.58), indicating far from perfect matching. Thus, job requirements are far from simply a reflection of individual human capital. Rather, the two are distinct although related factors. Second, job complexity seems to be more important than individual education for wages. Both educational requirements and initial job learning requirements are more strongly correlated with wages than individual education is. The difference is fairly large, especially between education and educational requirements. Third, learning on the job, both initial and continuing learning, is more strongly linked to educational requirements than to individual education. This is not surprising: the need for job-related skill development can be expected to be more dependent on the character of the job than on the character of the individual. More complex jobs naturally involve more skill development than less complex jobs do. Still, the correlations in table 2 contradict the widespread notion that the advantage in training opportunities on the job enjoyed by the initially more highly educated, a recurrent pattern shown in many countries and perceived as a major inequality problem in the context of life-long learning, is primarily tied to individual education rather than to skill requirements of jobs (for a detailed analysis of this issue, ‘the training gap’, see Korpi and Tåhlin 2021).

**References**

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