Not Only Transition. The Reasons For Declining Returns To Vocational Education

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Abstract [1]

This paper looks at the value of specific skills provided by vocational education in Hungary. I find that post-communist transition increased the returns to general skills and decreased the returns to specific skills. The results support that general skills prepare one to adapt to new circumstances and are therefore more suited for turbulent times. It is, however, not restricted to the post-communist transition or turbulent times. Returns to specific skills have declined with age even in the communist economy. Occupational mismatch is often cited as the major reason for the declining returns to vocational education. But, while a severe problem in itself, it is responsible for neither the declining returns by age nor the significant devaluation brought about by transition.

Key words: vocational training, returns to skills, occupational mismatch

JEL codes: I20, J24, P23

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1. Introduction

Whether secondary schools should provide occupation-specific skills or not has been a debated question in the education economics literature. Many argue that the formal education system should focus on providing general skills and people should acquire specific skills along their career. For example, Psacharopoulos (1997) argues that governments viewed vocational education (secondary level education with a major emphasis on specific skills) as a solution to many social and economic problems, but it has failed to achieve any of those goals. Looking at the French example, Bonnal, Mendes, and Sofer (2002) show that apprenticeship, a more flexible form of vocational training outperforms formal vocational education in terms of providing employment for relatively uneducated youth. Those flexible forms may also save costs for the taxpayers. In addition, Tsang (1997) shows that vocational secondary education is more costly than both general secondary education and also in-service training. On the other hand, Bishop (1998) argues that job-specific training is very important for productive long-term employment. Neuman and Ziederman (2003) argue that in some cases, centrally planned vocational education can achieve this goal.

There are reasons to believe that occupation-specific skills of the kind acquired in vocational schools have the tendency to become obsolete with time. Technological change favors those who can upgrade their skills. By focusing on state-of-the art techniques of the occupations, vocational training schools may not provide enough general skills. Their graduates may therefore be in a disadvantage when new technologies require them to upgrade their skills. Autor, Katz and Kearney (2006) find that current technological progress directly substitutes for the routine tasks found in many traditional middle-wage jobs. People who possess skills that prepared them to perform only such tasks have seen their relative earnings declining because the skill requirement of their occupation changed. These changes did not affect the least qualified manual (mostly service) jobs but changed the content of previously skilled manual occupations. Soviet-type vocational schools have typically prepared for such occupations.

Ljungqvist and Sargent (1998) define turbulent times as characterized by restructuring from manufacturing to services, rapid adoption of new technologies, and rapidly changing international economy. Ljungqvist and Sargent argue that European welfare regimes may have been optimal a few decades ago but they are inferior in turbulent times. Krueger and

Kumar (2004) argue, however, that instead of the welfare system, a focus on specialized skills may be in fact responsible for the phenomenon described by Ljungqvist and Sargent. Post-communist transition can be viewed as a dramatic transition from a state characterized by slow technological progress to one characterized by rapid change. The first phase of the labor market transition was characterized by rapid changes in the international environment, and a major inter-sectoral restructuring; the second phase could be well described by skill-biased technological change (see, for example, Kézdi, 2002). We can therefore expect the returns to specific skills provided by vocational schools to decline sharply with post-communist transition.

This paper documents the decline of specific skills provided by vocational training schools during the transition and investigates its causes. It looks at the case of Hungary. In a simple exercise I separate returns to specific skills from returns to general skills at the vocational/secondary school level. I find that post-communist transition brought about a significant increase in the returns to general skills and a significant decrease in the returns to specific skills. In fact, specific skills acquired in Hungarian vocational schools seem to receive no positive returns anymore. These results clearly support Krueger and Kumar's (2004) argument: general skills are a lot more suited for more turbulent times than specific skills. At the same time, however, I also find that returns to vocational education relative to more general secondary education consistently declined with age even under communist times, a relationship further strengthened by the transition. This implies that pushing for vocational education was not optimal even in more quiet times. Governments and young people might have been deceived by the high returns in early ages; but those returns quickly faded away as vocational graduates were not able to upgrade their skills later on.

Occupational mismatch is often cited as the major reason for the declining returns to vocational education. Presumably, soviet-type vocational training prepared for the wrong occupations that are not needed anymore. The occupational structure of vocational education is usually determined by some planning bureau and bargaining with firms. The outcome does not necessarily reflect the actual occupational structure of labor demand and is probably even further from its future structure. I also explored the role of occupational mismatch in detail and finds that it is indeed a severe problem. Only around 45 per cent of vocational school graduates work in their original occupation. The rest are evenly split for those who do not work or work in an occupation that does not require a vocational school degree. At the same

time, however, I find that occupational mismatch is responsible for neither the declining returns by age nor the significant devaluation brought about by transition. Specific skills acquired in vocational schools did not lose their value because the occupational structure of labor demand changed. They lost their value because the skill content of jobs changed, and vocational school graduates did not possess enough general skills to upgrade their skill level. It is not the occupational structure of vocational education. It is its content.

The remainder of the paper is organized the following way. The next section provides some background of the role of vocational schools in Hungary and other post-communist countries. The third section shortly describes the data. The fourth section presents employment and earnings returns to vocational education in Hungary, it separates the returns to general versus specific skills, and it looks at how they changed with the transition. The fifth section looks at the possible role of occupational mismatch. The last part concludes.

2. Background

The school system in communist Hungary was very similar to other communist countries in the region. Elementary schools covered 8 grades and were compulsory. After 8th grade, students could apply to three kinds of school. General secondary schools, under the gymnasium name in former German systems, provided 4 years of general education led to a comprehensive final examination, called maturity. Some more specialized secondary schools also offered a maturity at the end but incorporated specific training towards some occupation. Most were 4-year schools but some were 5. About one fourth of teaching time was directed towards occupation-specific subjects, and the remaining three quarters covered general subjects. The third kind of schools was the 3-year vocational training schools. About two thirds of time was oriented towards specific training, and general subjects occupied only one third. Vocational schools did not offer a maturity examination at the end. A successful maturity was prerequisite not only for most white-collar jobs but also for college admission. Vocational school graduates, along with those with a completed elementary school only, could enroll in evening secondary schools and get to the maturity examination. In reality, very few of the vocational school graduates ended up doing so. While secondary level vocational training schools are non-existent in the U.S., they are not unheard of in other countries of continental Europe.

Vocational schools started up in the late 1950's in order to feed the labor-hungry mining and manufacturing sectors. In principle, the occupational structure and the training content of vocational schools were determined by current labor demand. Of course, nothing guaranteed that the result would be adequate in the long run. But given the realities of communist bargaining, the outcome was far from ideal even for current demand conditions. A Hungarian case study by Fazekas and Köllő (1990) showed that there had been a substantial mismatch between students' and firms' stated preferences, available vocational school capacity, enrolment, and the occupational structure of subsequent employment. Five years after graduation the occupational structure of employment was closer to initial student preferences than firms' requests, and many vocational school graduates ended up working in a profession different from their certificate. State-provided vocational education could not match labor demand, either measured by firms' initial requests or the occupational structure of employment after graduation.

The collapse of the communist economy brought more decentralization into labor demand and more sophisticated planning and bargaining for the content and structure of vocational education. At the same time, however, labor demand changed dramatically. Demand for skilled blue-collar workers did not decrease dramatically, but the tasks were likely to become very different. Kézdi (2004) argues that after major net job destruction and intersectoral reallocation, transition bought about skill upgrading that is very similar to the skill-biased technological change experienced around the world. Perhaps as a result of changing labor demand, Liskó (2001) finds that ten years into the post-communist economy, a mere 50% of vocational school graduates find a job within a year. In her data, employment rate rises to only 75% within five years, and more than third of the employed end up working in an occupation different from their original vocational training.

Figure 1 shows the size of vocational education in Hungary. Panel A shows the fraction of the population with vocational training school and secondary school as highest degree. Panel B shows the ratio of the two.[2] The pictures confirm that vocational education started to build up in the late 1950's. It peaked in the 1970's and 1980's at around 33 per cent. In other words, one out of three Hungarians of the affected cohorts received a vocational training

[2] Numbers in Panel A are estimated a cross-sectional survey (Hungarian Labor Force Survey, 2003:4) and show educational attainment by birth cohort. Panel B is based on aggregate administrative vocational school completion data and uses the number of 17 years old in the given year as a denominator. See the next section for more details about the data.

degree. Recall that vocational training schools were meant to give a final degree as they did not offer maturity examination themselves, a higher qualification itself and a gateway to higher education. Although in principle vocational training school graduates could take the maturity examination if completed necessary evening courses, comparing the two panels of Figure 1 indicates that the overwhelming majority did not do so. This number started to decrease in the 1990's but remained significant even after 2002.

Hungarian vocational education went through a thorough reform in 2002. The most important element of the reform was the extension of vocational schools by one more year of general training. As a result, vocational schools offered a 4-year program, similarly to secondary schools. But the share of general subject still does not exceed fifty per cent. And vocational schools still do not offer maturity examinations. Vocational education in the other post-communist countries went through various reforms as well. As a result, vocational schools are diverse across countries. But no post-communist country abolished vocational schools altogether.

3. Data

A large number of different datasets is used for this study. Employment figures are estimated from the following: the 3 and 2 percent household sample of the 1980 and 1990 Hungarian Census, respectively; the 1988 Hungarian Household Income Survey; and compiled yearly files of the Hungarian Labor Force Survey, from 1992 to 2003. For some of the descriptive tables, population of the 17 year old cohorts were used, which were estimated by the age-specific population estimates of the 2000 Hungarian Census, published by the National Statistical Office of Hungary. Wage data come from the following sources. The first set consists of the income Surveys of the Central Statistical Office of Hungary from 1973, 1983, and 1988 ask a representative sample of Hungarian households about wages from the preceding year. Only full-time employees are used for wage estimations. The second set consists of the Wage Surveys of the Hungarian National Labor Center for 1986, 1996, and 2002. They collected earnings data from a large representative set of Hungarian employers. All wage variables include monthly earnings plus yearly bonuses and cash benefits normalized to a monthly basis. Personal income tax was introduced in Hungary in 1988 in a way that the 1988 earnings were "grossed up" such that they matched disposable earnings of the previous year. All subsequent earnings refer to after tax earnings. For more detailed

description of all the above data see Abraham and Kezdi (2000). The number of vocational school graduates is also used in the following section. Section 5 makes heavy use of vocational school outflow data, and their source is described there in detail.

4. Employment and earnings

Figure 2 shows the dramatic drop of employment with the post-communist transition. Employment rate of people with 8 primary school degree dropped by more than a third. At the same time, however, vocational school graduates experienced a 15 per cent drop, barely larger than those with a secondary school for the highest degree. In fact, while in certain age groups vocational graduates experienced a slightly larger drop; in other groups they experienced a smaller drop than secondary school graduates. Vocational school graduates did not experience more severe job losses than secondary school graduates.

At the same time, the two groups fared very differently in terms of earnings. Table 1 shows Mincerian wage regressions of two kinds. In the first one, education is entered as years completed. In the second one, it is entered by five categories (less than 8 grades, 8 grades, vocational, secondary, and college). Both kinds are estimated in three different years, using the same source of data, the Wage Survey (see above). 1986 is the last year of communist Hungary with available Wage Survey data. 1996 is the middle of the transition. Alternatively, according to Kertesi and Köllő (2002) and Kézdi (2002), it marks the end of the first phase of the labor market transition (characterized by major job destruction and intersectoral reallocation of labor) and the beginning of the second phase (that is very similar to skill-biased technological change over the world). Finally, 2002 is the year for the latest available Wage Survey data. The Mincerian wage regressions have log earnings on their left-hand side, defined as after-tax all-inclusive earnings of full-time employees, received from their principal employer.

Comparing columns 2, 4, and 6 shows the dramatic increase of the returns to schooling in Hungary. By 2002, an additional year in school is estimated to increase earnings by more than 11 per cent. Columns 2, 5, and 7 show the estimates by school type. The two kinds of estimates are shown in Figure 3 as well, for the two polar years. The figures reveal that most of the apparent increase of the returns to years is due to soaring returns to college. In fact, returns to 8 grades and, yes, vocational schools remained at their 1986 level. Returns to

secondary school as a highest degree increased from about 30 log points to 50 log points by 1996 and decreased slightly to 45 log points to 2002. (The corresponding correct percentage terms, using the $(e^{\beta}-1)\times 100\%$ transformation, are 35 per cent, 65 per cent, and 55 per cent, respectively). College returns saw a spectacular rise from 60 log points to 90 log points to 110 log points (in correct percentage terms, these are significantly larger numbers: 80 per cent, 145 per cent, and 200 per cent, respectively).

Such extraordinary returns are unlikely to be permanent. Panel A of Figure 3 shows that in 1986, the different school types aligned pretty well with the (log-) linear returns function implied by years of schooling. Simple human capital investment theory suggests that a competitive equilibrium is characterized by the same phenomenon. In fact, Card (1999) shows that returns in the U.S. follow a similar (log-) linear pattern. Panel B of Figure 3, on the other hand, implies major imbalances. But it also shows that even if college returns dropped to a more "normal" level (e.g. in line with 8 grades and maturity), vocational degree would be still significantly below.

Table 2 summarizes employment rates and log wage returns of completed 8 grades, vocational school, and secondary school degrees in Hungary, in 1986 and 2002. Based on these estimates, one can calculate the extra expected returns to vocational training degree over completed 8 grades, and the extra expected returns to secondary schools (maturity) over vocational training degree. Expected returns are simply meant to incorporate the probability of employment. We use these estimates to back out implied returns to general and specific skills. Recall that on average, one third of the subjects taught in vocational training schools cover general material, while the remaining two thirds are specific to the occupation. With simplification, one can view vocational training schools as one year of education in general skills, and two years in specific skills. About half of secondary schools are gymnasiums that concentrate on general skills only, and another half are "vocational-secondary" schools where half of the time is spent on general material. For simplicity, I ignore all 5-year secondary schools, and assume that on average, secondary schools spend 3 years on general skills and 1 year on specific skills. Then, the extra returns to vocational schools correspond to 1 year of general training and 2 years of specific training, while extra returns to maturity correspond to 2 more years of general training and 1 year less of specific training. We can use these figures to back out implied returns to general and specific skills:

$$(1) \qquad \begin{aligned} r_{vocational} - r_{8\,grades} &= r_{general} + 2r_{specific} \\ r_{maturity} - r_{vocational} &= 2r_{general} - r_{specific} \end{aligned}$$

The results of this simple exercise are shown in the bottom two rows of Table 2. The 1986 column shows that even in communist Hungary, returns to specific skills were about half as large as returns to general skills. The latter are about the same as average returns to one year, or even a bit less, which is because college added slightly more to the average returns than secondary schools even in 1986 (also see Panel A of Figure 3). The latter phenomenon is also present in 2002, with a 9.8 per cent return to general skills and an 11.4 per cent average return. But more importantly, transition brought about a complete devaluation of specific skills. The simple exercise in implies that returns to specific skills are practically zero. All the advantage of vocational training school graduates over elementary school graduates can be attributed to the one year general skill component of vocational training. The rest do not seem to add anything.[3]

Of course, the above exercise assumes that OLS returns have a causal interpretation. In other words, it assumes that there is no selection into schools on unobservables – clearly a strong assumption. The exercise also assumes that the general training component of vocational schools is comparable to secondary schools, and the specific training components are also comparable. If, for example, general training is lower quality in vocational schools, then the implied returns to the general part of vocational training are smaller, and returns to specific education are larger. The estimates themselves are, therefore, likely to be biased. But the trend estimates are probably on target: returns to general skills increased, while returns to specific skills dropped significantly after the transition.

The depreciation of specific skills, however, is not restricted to the post-communist transition in particular, or turbulent times in general. Instead, it is an even more general phenomenon. As I argued in the introduction, specific skills of the sort advanced in vocational training schools are likely become obsolete with time. In order to see this, one can consider wage regressions with age interactions. Consider the following Cross-sectional Mincerian wage-regression:

[3] This conclusion is consistent with and adds some new twist to the one drawn by Kertesi and Varga (2006). They argue that while Hungarian vocational schools are classified as part of "upper secondary education" in the international classification system, their graduates perform closer to 8-graed elementary school graduates than those with maturity.

(2) $$\ln w_i = \sum_{s=20}^{54} \alpha_s A_{si} + \sum_{s=20}^{54} \beta_s A_{si} \times vocational_i + \gamma' x_i + u_i$$

where i denotes the individual, s the age; A_{si} are age dummies that are 1 if individual i is age s, and zero otherwise; and x is a vector of other individual characteristics (gender and region). If regression (2) is ran on individuals whose highest educational attainment is either vocational school or elementary school (8 grades), then the β_s series shows how the wage premium of vocational degree relative to elementary degree changes with age. If regression (2) is ran on those who are either vocational or secondary educated, then the β_s show the wage premium of vocational degree relative to maturity as a function of age.

The results are shown in Figures 4 and 5 (detailed results are available from the author upon request), for the years of 1972, 1982, 1986, and 2002. Note that the 1972 and 1982 figures are truncated at older ages because vocational education started only in the late 1950's. Figure 4 describes the wage premium of vocational degree over 8 grades. The premium used to be somewhat larger in the 1970's and early 1980's but dropped to be slightly below 10 per cent by 1986. The transition did not bring about major changes. Vocational school graduates have earned 5 to 10 per cent more than 8 graders throughout. Except for the relatively low initial values before age 25, there is no strong relationship between age and the wage premium.

Just the opposite is true, however, for returns relative to secondary school. Figure 5 shows a steep and steady decline of the wage premium relative to secondary school for all years. Estimates for 1972 and 1982 line up surprisingly closely with estimates of 1986. They show that even in communist times, vocational education kept loosing its value over one's life, in a steep and linear way. In their early twenties, vocational school graduates actually earned more than secondary school graduates. But their lost their advantage by age 30, and by age 40, they could expect to earn 10 per cent less. In their late forties, their earnings disadvantage grew to 20 per cent. After the transition, the whole profile shifted down by more than 10 percentage points on average. By 2002, vocational school graduates earned less than secondary school graduates even in their early twenties. The shift was not completely parallel, though: the decline became steeper in earlier years so by age 30, vocational school graduates earned over 20 per cent less. Their disadvantage stabilized between age 35 and 45 and declined again after that.

Recall that vocational schools offer about one year's worth of general training and two years of specific training over elementary schools. Figure 4 implies that vocational training school graduates have some extra skills that provide returns for them through their life over elementary school graduates. It is more likely that those are the general skills, for two reasons. First, the size of the returns is comparable to returns to one average year of education, not two or three. Second, Figure 5 strongly suggests that returns to specific skills decline steadily and significantly over one's life. Recall that vocational schools produce more specific skills, while secondary schools produce more general skills. Their relative returns are therefore informative about the relative returns to general versus specific skills. A steady decline of the vocational wage premium suggests a steady decline of the returns to specific skills. Past age 40, they earned less by about the average returns to two years of education, exactly the amount of specific training embedded in vocational training.

The surprising fact shown by Figure 5 is that the decline of vocational returns was present even in pre-transition Hungary.[4] It is possible that prospective students, firms, and social planners were misled by the high returns to vocational education at early ages, and they all might have thought of vocational schools as a highly productive form of education. But the specific skills produced by vocational schools completely lost their value within 25 years. In other words, vocational training might have looked like a good solution to match the demand for specific skills, but that solution turned out to be inferior in the long run. Apparently, the skills provided by soviet-type vocational schools did not allow one to adapt to new situations neither in socialist times, nor afterwards.

The figures also reinforce the story of transition bringing about differential changes in general and specific skills. If returns over elementary school are mostly due to the general skills provided by vocational schools, the figures imply no decline. On the other hand, if returns (losses) relative to secondary school reflect specific skills, the figures imply a significant drop. They also hint at an acceleration of the devaluation of specific skills after the transition. The remainder of the paper looks at whether occupational mismatch has been an important source of the inferior long-run returns to vocational schools, and whether mismatch worsened after transition. The idea is that the occupational structure of vocational education

[4] Note that the labor market was relatively free in Hungary after 1970, which implies that returns to skills reflected market-driven labor demand (albeit not derived from competitive product demand and profit maximization of firms).

may be very different from the occupational structure of demand because central planners are not able to foresee the latter one in the longer run. An additional question is whether a declining match quality is responsible for the drop of the returns to vocational education after the transition.

5. Is occupational mismatch an important factor?

In order to analyze occupational mismatch, one should look at whether graduates of specific vocational schools end up working in the occupation of their school. This section uses data compiled from education statistics for graduates in different occupations ("outflow") and standard employment data by occupation (employment "stock"). The outflow numbers are approximated by the number of 3rd-year students in the given year summed over all Hungarian vocational schools, by occupation specialization. The sources are volumes of vocational training yearbooks, published by the Hungarian Ministry of Education, and electronic versions after 1993. The first available volume corresponds to the school year 1965/66, with some years (1967/68, 1968/69, and 1973/74) missing. The stock data come from the same large cross-sectional surveys that were used before (for example, for Figure 2). Occupations are defined as wide categories in order to allow for switches between very close occupations without calling them a mismatch. 17 categories are defined. For the categories themselves, see Table A1 in the Appendix.[5]

The dataset for the analysis is a three-dimensional panel. For a given year of employment data, the two-dimensional panel consists of outflow in occupation *j* in graduation year *g*, matched with the number of employed with vocational school degree whose occupation is *j* and graduated in year *g*. These two-dimensional panels for each year of employment data (1980, 1988, 1990, and yearly from 1992 to 2003) are then pooled to form one single dataset. A problem of this dataset is that occupation codes in the outflow and stock data are different and changed several times during the sample period. Matching the different codes were most of the time relatively straightforward because data collecting agencies had given some conversion algorithm. In addition, all cells were checked on a case-by-case basis to make sure the matching was appropriate. In order to minimize classification error, the occupation categories considered for models were relatively broadly defined and were also restricted to

[5] All results are robust to the classification because, as we shall see, mismatch across categories is significantly less frequent than mismatch into occupations that do not need vocational training.

clear cases. At the end, 27 different occupational categories were analyzed plus one category for not elsewhere classified (i.e.) outflow or employment. Table A1 in the Appendix shows descriptive statistics about the stock and flow variables, from the dataset used for the analysis. There are 10976 occupation × graduation year × survey year cells, 392 for each occupation category. Mean employment stock is about 30 per cent smaller than matched mean outflow. Outflow significantly exceeds employment stock in all occupation except for n.e.c. (not elsewhere classified), where it is a mere 3 per cent of that. Recall that the n.e.c. category contains outflow in unidentified or very small occupations, matched with employment in unidentified or very small occupations or in occupations for which there is no vocational school education in principle. Small n.e.c. outflow implies good quality of matching of the flow and stock occupation codes. Large n.e.c. stock is indicative about the low quality of substantive matching: quite a large number of people with vocational school training end up working in occupations that do not require formal vocation schooling, labeled as "outside occupations" from now.

Figure 6 shows crude measures of mismatch, for three age groups (21-30, 31-40, and 41-50 years old). Note that the older the cohort, the less observation is available as our outflow data start in 1966. We consider two kinds of mismatch: those who end up without a job, and those who end up in a job different from their original qualifications. The first measure is inherently noisy because it contains labor supply elements as well. Here the second kind of mismatch is also measured in a simplistic way, by counting those vocational school graduates who work in occupations that do not need a vocational degree ("outside occupations"). Panel A shows the non-employment rate for the vocational educated, and is a mirror image of Figure 2 and thus shows an increased "mismatch" into non-employment. The extra information here is contained in age group disaggregation. But age patterns do not suggest any evidence on increased mismatch with age.

Panel B shows the fraction employed in outside occupations. The most important fact is the large fraction throughout the whole period. More than 25 per cent of vocational school graduates end up in occupations that do not require a vocational school qualification.[6] Somewhat surprisingly, here the effect of transition is not clear. Mismatch actually decreased in the early years of transition but bounced back after 2000. At the same time, there is some

[6] The estimated magnitude of the mismatch is consistent with the data of Liskó (2001). Recall that she finds 30% of vocational school graduates working in an occupation different from the original qualification.

weak evidence of increasing mismatch with age. Employment in outside occupations is slightly more frequent among the 31 to 40 years old than among the younger ones, but there is no comparable difference between the 41-50 and 31-40 years old. Based on these findings, it seems that occupational mismatch does not have a major role in explaining either the decline of vocational wage returns with age or their drop after the transition.

The two panels of Figure 6 imply that over 50 per cent of vocational school graduates are mismatched later in their employment, either because they don't work at all or they work in "outside" occupations. The implied mismatch is substantial, does not seem to increase with age, and increased a bit with the transition. But these measures do not capture all elements of occupational mismatch. Another potentially important part is that people who obtained a vocational degree in some occupation end up working in some other occupation that is offered by vocational schools. In order to assess all possible elements, a three-way panel regression will be used. Let j denote the occupation groups, g the year of graduation from vocational school, and t the year of employment status measurement. Let S_{jgt} denote the number employed people with a vocational school degree in occupation j in year t, for those who graduated in year g; and let F_{jg} denote the vocational school outflow in occupation j in year g. F will be referred as the "outflow", and S as the "stock" of occupation group that graduated in year g. The data for this analysis cover all the occupations with corresponding vocational school outflow data but not the "outside" occupations as the latter would have no corresponding outflow measures. The baseline measurement model is the following:

$$\log\left(S_{jgt}\right) = \beta \log\left(F_{jg}\right) + \alpha_j + \gamma_g + \theta_t + u_{jgt} \tag{3}$$

The parameter of interest is β. Provided the cross-graduation year variation in flows is exogenous, it can be interpreted as an elasticity. It shows the percentage increase in employment in the group defined by occupation and graduation year (jg) in year t if outflow of the group had been increased by one per cent. Of course, nothing makes sure the exogeneity of flows, although occupation fixed-effects may take out much of the endogenous variation. If flows are still endogenous, the interpretation of β is more descriptive. It shows that, on average, how many percentage points more people ended up working in a given occupation, if outflow for those people happened to be larger by one per cent.

The α_j , γ_g and θ_t are occupation, graduation year and employment year fixed-effects, respectively. The parameter of interest is therefore identified out of within-occupation, within-graduation year and within-employment year variation. The occupation fixed-effects take care of size differences in occupational outflows. Without them, the results would show a spurious relationship that has nothing to do with match quality: a substantially larger occupational outflow will probably result in a substantially larger employment in the occupation than in a smaller one. The year fixed-effects take out correlation due to year-specific changes in employment over all occupation groups. The graduation year fixed-effects take out correlation due to matching differences for different cohorts. Since survey year, graduation year and employment are collinear (age = year – graduation year + 17), there is no need for controlling for age effects.

If everyone with a certain vocational school qualification ends up working in the given occupation, the value of β is 1 (perfect matching). If additional graduating people can find no employment at all in the relevant occupation in any of the years and any of the occupation categories, β is 0 (no matching at all). We expect β to fall within the two extremes. A smaller β indicates a lower matching quality. We expect β to be less than 1 for three reasons. First, the additional vocational school graduates may end up non-employed for supply or demand reasons. Second, they may end up in outside occupations. And third, they may end up in occupations that are covered by vocational schools but are different from their own. Note that β is unaffected if the fraction of movers from one occupation category to another one is exactly matched by an opposite movement. This latter is due to the aggregate nature of our data, which allows us to look at net movements only. As a result, we may somewhat overestimate β. Some additional technicalities: as a few cells were zero, log(S+1) and log(F+1) were used in the regressions (and F+1 for the weights). Standard error estimates are robust to heteroskedasticity and clustering at year×occupation cells.

Table 3 shows that results of unweighted and weighted regressions, for three different specifications in each case. The first specification controls for occupation fixed-effects only, the second one controls for year fixed effects in addition, and the third one has the full set of fixed-effects, including graduation year. The results show a rather low matching quality. Unweighted estimates are smaller indicating that mismatch rate is more severe in smaller occupations, a very sensible result. Weighted figures are more informative about the fraction of mismatched people. Somewhat surprisingly, controlling for employment year fixed effects

do not change the results a bit. On the other hand, controlling for graduation year fixed-effects leads to significantly smaller estimates because, as we shall see, matching quality is worse for the smaller outflow cohorts (i.e. the ones graduating after the mid-1990's). The preferred estimate is therefore 0.45, which implies that a one per cent increase in outflow in a given occupation is associated with a 0.45 per cent increase in employment in the same occupation on the long run. Taken together with the 50 to 60 per cent mismatch due solely to non-employment and employment in "outside" occupations (Figure 6), this estimate implies that the third kind of mismatch (i.e. mismatch across occupations that are all covered by vocational education) is not very important.

In light of these results, one expects that including the third mismatch component does not change the overall picture outlined after Figure 5. To recall, we concluded there that occupational mismatch does not have a major role in explaining either the decline of vocational wage returns with age or their drop after the transition. In order to check that robustness of the statement, however, one can estimate matching quality by year, age, and also by graduation year:

$$(4) \qquad \log\left(S_{jgt}\right) = \sum_t \beta_t \log\left(F_{jg}\right) + \alpha_j + \gamma_g + \theta_t + u_{jgt}$$

$$(5) \qquad \log\left(S_{jgt}\right) = \sum_a \beta_a \log\left(F_{jg}\right) + \alpha_j + \gamma_g + \theta_t + u_{jgt} \quad where\ a = t - g + 17$$

$$(6) \qquad \log\left(S_{jgt}\right) = \sum_g \beta_g \log\left(F_{jg}\right) + \alpha_j + \gamma_g + \theta_t + u_{jgt}$$

Panel A shows the results by year of measurement. A significant drop is seen between 1988 and 1992, which may be the result of the transition recession but may also be due to changes in the occupational classification system. The first interpretation is reinforced by the fact that the drop lasted for more than just one year and also by a declining non-employment rate for the younger cohorts implied by Figure 6. Naturally, one cannot rule out influence of the second factor. If the drop was real, recovery of the Hungarian economy brought about a recovery of the matching quality as well. Either way, transition itself did not seem to lead to a decreasing matching quality. Panel B shows how matching quality changes with age. In accordance with Panel B of Figure 5, we see that there is a slight initial decrease in matching quality but that does not continue past age 35. Lastly, Panel C shows that matching quality remained relatively stable for the different cohorts until the late 1990's when in started to decline and get more volatile. In short, as expected, the more sophisticated estimates do not

alter the picture we got earlier. Occupational mismatch does not seem to add much to the devaluation of specific skills acquired in vocational schools.

6. Conclusions

Vocational education steadily loses its value relative to the secondary school degree as people age. This was true in communist times and even more true after the transition. The reason is a steady decline in the value of specific skills relative to general skills. Some simple back-of-the envelope calculations indicate that, except for young ages, the value of specific skills has always been lower than the value of general skills. Transition alone brought about an additional drop in the value of specific skills. The simple calculations indicate that its value dropped close to zero after the transition. Occupational mismatch, while a severe problem in itself, is probably not responsible for the declining returns by age or the significant devaluation brought about by transition.

These results imply that while general skills acquired in secondary schools allow one to develop new skills later on, the same is not true for specific skills, at least not the kind emphasized in Soviet-type vocational training schools. The content of those specific skills further lost its value with the transition to an extent that their value may be close to zero on average.

The results of Krueger and Kumar (2004) imply that, conditional on their belief that times were to stay less turbulent, Western European governments might have made the right thing in investing into vocational education in the 1950's. Their mistake was in their assumption of how long quiet times last. To rephrase this argument in the context of communist economies, it is possible that large-scale Soviet-type vocational training produced the adequate skills for a Soviet-type economy. It is the fall of communism that made those specific skills lose their value. However, the results of this study suggest that specific skills tend to lose their value even in those more quiet times. Transition brought about simply an additional decrease in the value of those specific skills.

It is probably not the specific content of those specific skills that causes the problem. It is the specificity of those skills. Only skills that enhance one to acquire new skills are valuable on the long run. The specific skills taught in Soviet-type vocational schools are clearly

inadequate for that purpose. Increasing the general content in vocational schools, a reform followed by most post-communist countries, is a move into the right direction. But instead of augmenting the curriculum with more general subjects, it may make more sense to replace the specific part. Perhaps all of it.

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TABLES

Table 1: Mincerian wage regressions. Education as years of schooling versus school types. Hungary, 1986, 1996 and 2002.

Dep. variable:	1986		1996		2002	
log earnings	years	Categories	years	Categories	years	Categories
Years of schooling	0.057		0.094		0.114	
	(0.001)**		(0.002)**		(0.003)**	
Less than 8 grades		ref.		ref.		ref.
Completed 8 grades		0.089		0.079		0.097
		(0.006)**		(0.032)*		(0.054)
Vocational training degree		0.196		0.225		0.180
		(0.006)**		(0.033)**		(0.054)**
Secondary school (maturity)		0.281		0.490		0.438
		(0.007)**		(0.034)**		(0.055)**
College or more		0.578		0.896		1.108
		(0.009)**		(0.035)**		(0.058)**
Observations	121,333	121,333	150,966	150,966	123,206	123,206
R-squared	0.36	0.37	0.31	0.32	0.29	0.32

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%
All regressions include gender, potential labor market experience (and its square), region and settlement size fixed effects.
Dependent variable: log earnings earned in promary employment, after personal income tax in 2002 (no personal income tax was payed in and before 1986). Earnings include monthly wages and yearly cash bonuses.
Data source: Wage Surveys of the National Labor Center. (For more information, see Kertesi and Köllő, 1999).

Table 2: Returns to general and specific skills implied by returns to 8 grades, vocational training degree, and secondary schools. Hungary, 1986 and 2002.

	1986			2002		
	Employment rate[a]	Wage returns[b]	Expected wage returns[c]	Employment rate[a]	Wage returns[b]	Expected wage returns[c]
Completed 8 grades	0.84	0.089	0.075	0.55	0.097	0.053
Vocational training degree	0.92	0.196	0.180	0.77	0.180	0.139
Secondary school (maturity)	0.92	0.281	0.259	0.78	0.438	0.342
Extra exp. return to vocational over 8 grades[d]			0.106			0.085
Extra exp. return to secondary over vocatoional [e]			0.078			0.203
Implied returns to general skills[f]			0.052			0.098
Implied returns to specific skills[f]			0.027			-0.006

[a] Estimates shown in Figure 2.
[b] Point estimates from Table 1.
[c] Product of the two previous columns: Employment rate × Wage returns
[d] Difference of second row and first row: Vocational training degree – Completed 8 grades
[e] Difference of third row and second row: Secondary school (maturity) – Vocational training degree
[f] Results of the back-of-the envelope calculations laid out by formula (1)

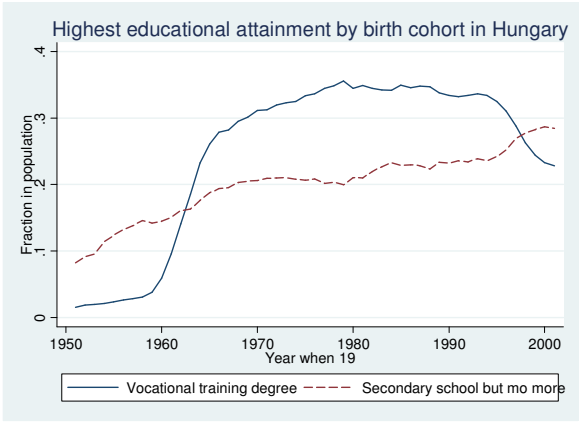
Table 3. Estimated Flow-Stock elasticities for measuring the quality of occupational match in Hungary.

Dependent variable: log(S)	Unweighted estimates			Weighted estimates[a]		
	(1)	(2)	(3)	(1')	(2')	(3')
log(F)	0.331	0.334	0.267	0.590	0.585	0.450
	(0.048)**	(0.048)**	(0.051)**	(0.040)**	(0.040)**	(0.041)**
Occupation FE	Y	Y	Y	Y	Y	Y
Year at employment FE	N	Y	Y	N	Y	Y
Year of graduation FE	N	N	Y	N	N	Y
Observations	9416	9416	9416	9416	9416	9416
Within R-squared	0.01	0.01	0.01	0.01	0.01	0.01
Overall R-squared	0.71	0.71	0.72	0.69	0.69	0.70

Robust standard errors in parentheses, clustered at occupation×year cells.
* significant at 5%; ** significant at 1%
[a] Weighted by outflows (number of students graduated).

FIGURES

Panel A:



Panel B:

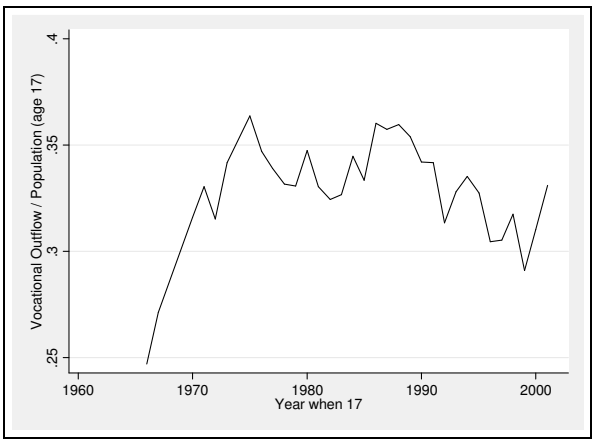


Figure 1: Total vocational training in Hungary.
Panel A: Fraction of population with completed vocational training degree, estimated from a cross-section of 2003.
Panel B: outflow from vocational schools as fraction of population (age 17), estimated from administrative records.

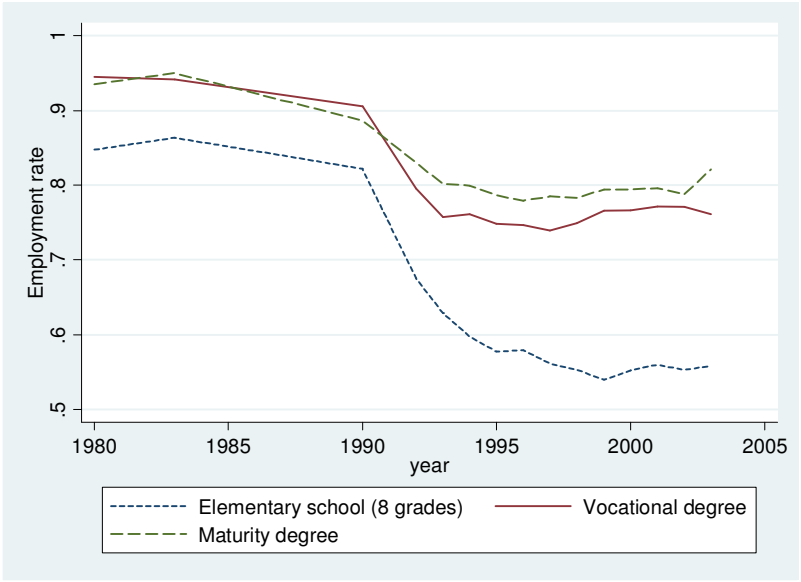
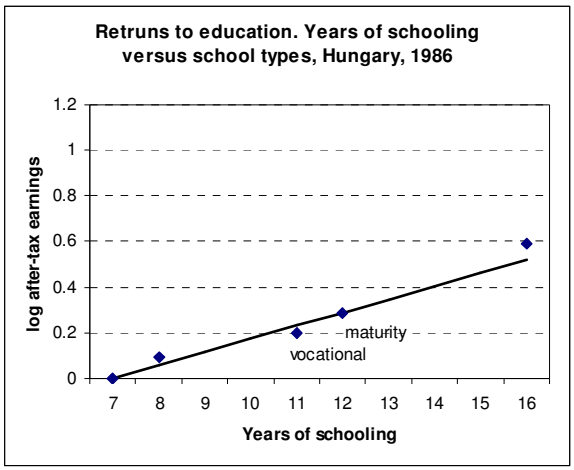


Figure 2: Employment rates in Hungary, 1980 to 2003 (age 20 to 50).

Panel A:



Panel B:

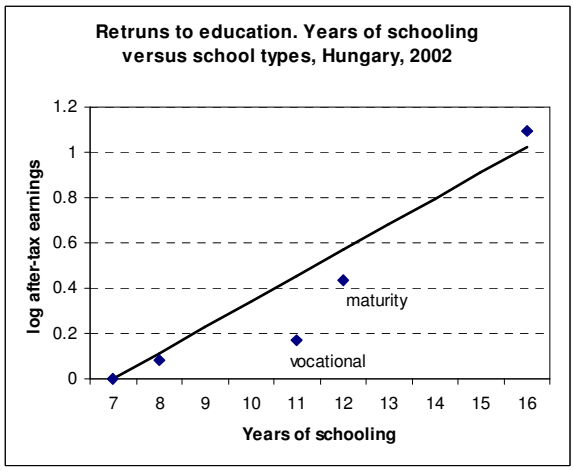


Figure 3: Wage returns to education in communist and post-communist Hungary. Returns to years of education versus returns to degrees. Estimates shown in Table 2.

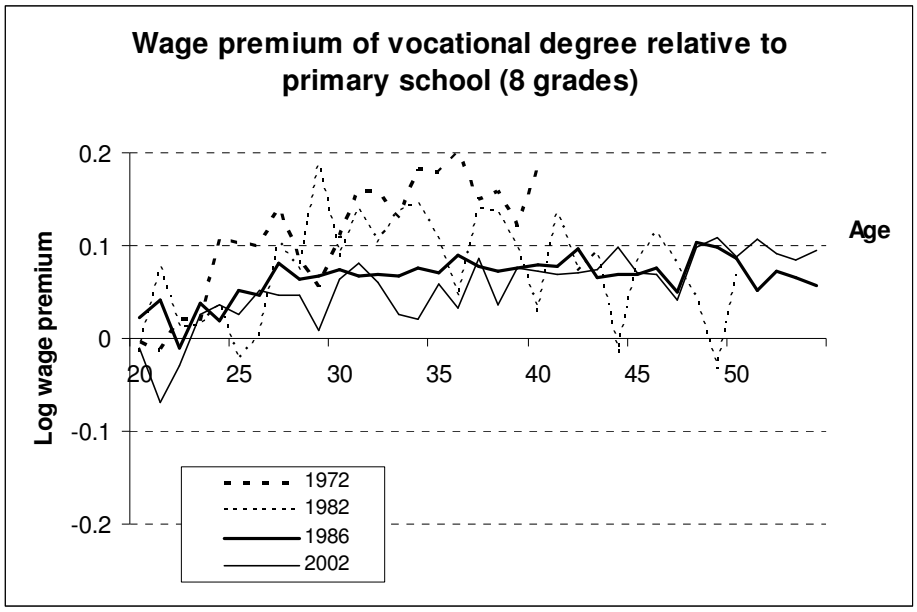


Figure 4: Wage premium of vocational degree relative to elementary school degree (8 grades), by age. 1972, 1982, 1986, and 2002. Point estimates of Mincerian wage regressions on elementary and vocational school graduates.

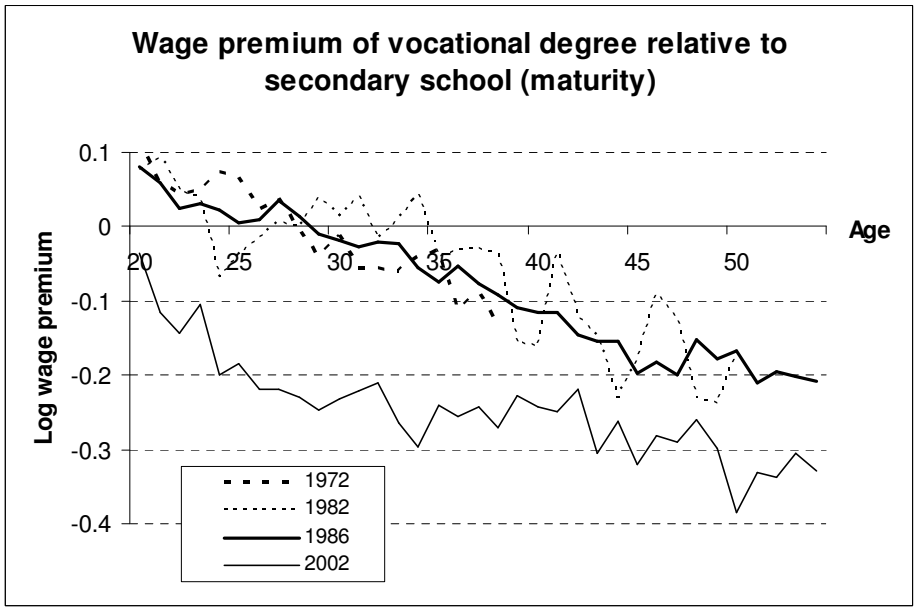
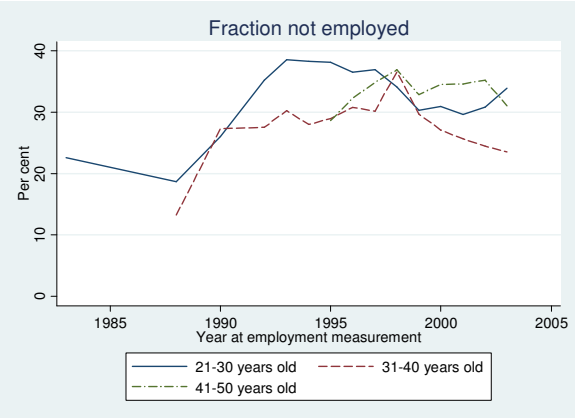


Figure 5: Wage premium of vocational degree relative to secondary degree, by age. 1972, 1982, 1986, and 2002. Point estimates of Mincerian wage regressions on secondary school (maturity) and vocational school graduates.

Panel A:



Panel B:

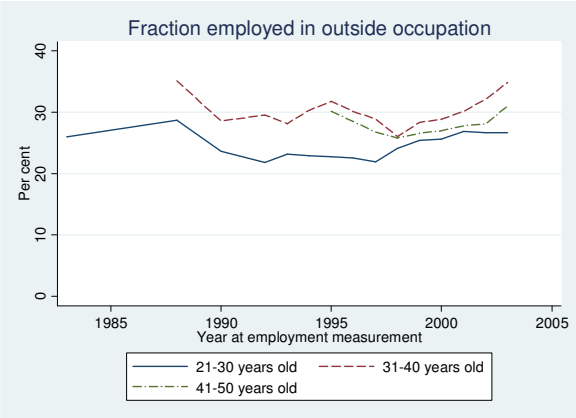
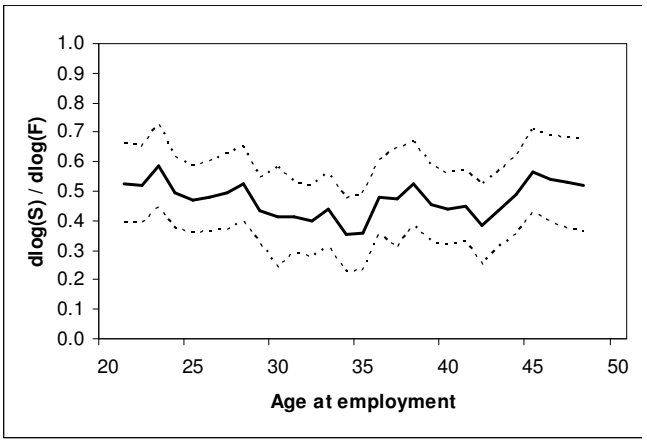


Figure 6: Estimated fraction of vocational educated people who A: are not employed; B: are employed in an occupation that does not require the occupational qualifications offered by vocational schools.

Panel A:

Panel B:



Panel C:

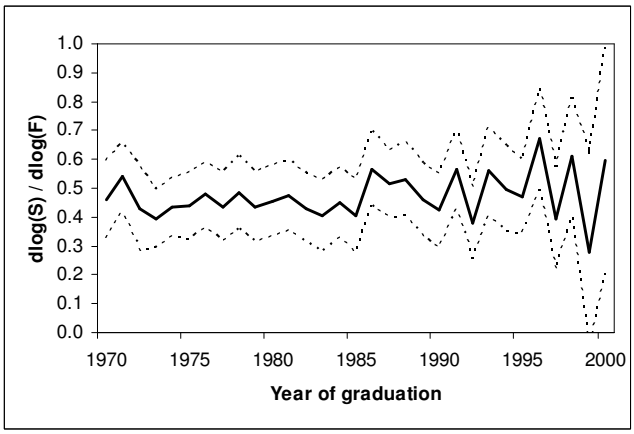


Figure 6: Changes in matching quality. Estimated Flow-Stock elasticities and their change with A: year of employment; B: age; C: year of graduation.

APPENDIX

Table A1: Descriptive statistics for the occupational mismatch analysis. Mean, standard deviation, minimum and maximum of outflow and employment stock data within employment year × graduation year cells. By occupation.

Occupation	School outflow					Employment stock				
	mean	sd	min	max	N	mean	sd	min	max	N
commercial	5,650	1,241	2,960	8,095	392	3,244	1,161	43	8,281	392
hotelling	2,492	608	1,455	4,966	392	1,520	679	56	3,687	392
personnel	941	379	0	1,990	392	466	247	0	1,189	392
culture	228	189	9	578	392	51	107	0	1,174	392
agric1	990	331	643	1,654	392	287	194	0	935	392
agric2	572	152	376	889	392	442	254	0	1,240	392
forestry1	102	39	0	157	392	70	91	0	551	392
forestry2	30	23	0	63	392	19	41	0	345	392
fishing	23	6	13	38	392	12	35	0	227	392
mining	328	317	12	1,334	392	140	172	0	1,012	392
food	1,550	450	524	2,580	392	784	383	0	2,047	392
drink	60	33	0	124	392	44	70	0	391	392
tobacco	15	11	0	31	392	3	16	0	166	392
textile	440	406	45	1,599	392	157	166	0	1,016	392
clothing	3,514	1,311	1,053	5,950	392	906	497	0	2,998	392
shoes	1,146	391	558	2,349	392	218	187	0	924	392
wood	2,300	571	1,692	3,622	392	1,007	438	41	2,534	392
printing	398	89	140	572	392	185	183	0	946	392
metallurgy	278	317	35	1,066	392	100	136	0	1,222	392
metals_other	5,750	1,142	2,575	8,242	392	3,689	1,773	0	10,980	392
mechanic1	9,536	2,237	5,221	15,032	392	1,608	692	0	4,157	392
mechanic2	1,911	531	484	3,150	392	824	452	0	2,769	392
manuf_other	335	83	197	559	392	170	154	0	1,207	392
construction1	2,972	965	611	4,827	392	1,431	590	46	3,654	392
construction2	3,861	1,749	1,343	10,235	392	1,722	760	37	4,756	392
construction3	2,888	357	2,253	3,683	392	1,334	571	0	3,306	392
Agric_operator	1,083	316	198	1,626	392	327	217	0	1,281	392
n.e.c.	353	674	16	4,297	392	13,619	3,903	204	24,151	392
Total	1,777	2,324	0	15,032	10,976	1,228	2,713	0	24,151	10,976

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