So Many Rocket Scientists, So Few Marketing Clerks: Occupational Mobility in Times of Rapid Technological Change

Nauro F. Campos
Department of Economics, University of Newcastle,
CEPR, London, and Davidson Institute at the University of Michigan.
E-mail: n.f.campos@ncl.ac.uk

Aurelijus Dabušinskas
CERGE-EI, Charles University, Prague.
E-mail: aurelijus.dabusinskas@cerge-ei.cz

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Abstract: The transition from centrally planned to market economy involves a process of occupational change that has been largely neglected in the literature. This paper investigates the magnitude and determinants of this process using data from the Estonian Labour Force Survey. We find that almost 50 percent of wage earners changed occupations between 1989 and 1995 and that job tenure is the main determinant of occupational mobility. Our results also show the remarkable speed with which the market mechanism takes root: the returns to current and alternative occupations play, over these few years, increasingly meaningful roles in explaining occupational change.

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1. Introduction

One of the few positive legacies from socialism is the high level of educational attainment of the labour force. In spite of it, the composition of the stock of human capital (in terms of occupations) has proven inadequate to the needs of a modern market economy. The transition from plan to market entails a process of massive occupational change that has been largely neglected in the literature. This paper attempts to fill this gap.

We offer three motivations. The process of economic development in general, and that of transition in particular, necessarily involves occupational change. One of the least appreciated features of Lewis' seminal surplus labour model is that it is not sufficient for workers to move from the rural to the urban sector, they must change occupations. Campos and Coricelli (forthcoming) summarize the first ten years of the transition in a set of seven stylized facts. One of these facts is that labour moved. Although it did not seem to have moved geographically, workers changed sectors and occupations in an unprecedented scale. In order to grasp the transition from plan to market, we need to understand the process of occupational change.

A second motivation for studying occupational mobility is that it can throw light on the recent debate on the skill premium.[1] One argument is that rising wage inequality in last two decades in the U.S., U.K. and Canada is due to skill-biased technological change. Studying occupational mobility may be useful because one of its determinants is the transferability of skills across occupations. In this light, the premium may have risen for skills that are more easily transferable. A third and final motivation is that occupational change is at the heart of the allocation of talent problem. Murphy, Schleifer and Vishny (1991) and Acemoglu and Verdier (1998) emphasise that one of the most important aspects of the process of accumulation of human capital regards occupational choice. In particular, how society's

[1] See Acemoglu (forthcoming), Katz and Autor (1999) and Violante (forthcoming).

pool of talent is allocated to entrepreneurial or rent-seeking activities is of fundamental importance vis-à-vis long-term growth. Murphy et al. (1991) put forward empirical evidence that shows that countries with a larger proportion of engineers grow faster than those with a larger proportion of lawyers.

The objective of this paper is twofold. The first is to provide a detailed description of the changing composition of the stock of human capital (in terms of the occupational mix), and the second is to investigate the determinants of this process of occupational change. We choose Estonia for a number of reasons. Foremost is that the Estonian Labour Force Survey is arguably the best database in the region. It is unique as it contains a retrospective section with detailed information on work histories that go back to communist times (until 1991, Estonia was one of the Soviet Republics). Also, among transition economies, Estonia is considered a radical reformer and as such has pursued aggressive labour market policies that have fostered mobility (Table 1).

There are very few studies of occupational mobility. Shaw (1984, 1987) models the relationship between occupational change, sunk costs of occupational investment and transferability of skills and test them using data for young men (aged 14-24) during the period 1966 to 1975 in the United States. McCall (1990) and Sicherman and Galor (1990) study occupational change in a matching framework. Dolton and Kidd (1998) provide an empirical analysis of occupational mobility of recent graduates in Great Britain from 1980 to 1987. Overall, these studies tend to focus on "careers" (that is, upward occupational mobility) and the attendant empirical evidence favours young men. In contrast, our paper covers the entire age distribution and deals with downward as well as upward occupational mobility. In terms of the literature on transition economies, our paper is closer to Sabirianova's study of occupational mobility in Russia (2000). There are at least two important differences. Sabirianova provides a detailed analysis of the consequences of occupational mobility in late

transition Russia (1994-1998). In contrast, this paper emphasizes the determinants of occupational mobility and it does that before and in the very early years of the transition.[2]

Our results use data from the Estonian Labour Force Survey 1995 (hereafter, ELFS95), a representative survey of Estonian workers covering the period from 1989 to 1995. The data covers the end of the socialist period as well as the early years of the transition to a market economy. Depending on the level of aggregation we use to classify occupations, we find that between 35 and 50 percent of all Estonian wage earners changed occupations in this short period of time.[3] Moreover, the bulk of these occupational switches happened in the early years, that is, at the very beginning of the transition. We find that job tenure is the main determinant of occupational mobility: it has a negative, significant and robust impact from 1989 to 1994. Our results also show the remarkable speed with which the market mechanism takes root: the returns to current and alternative occupations play, over these few years, increasingly meaningful roles in explaining occupational change. For instance, the effect of the returns to the currently held occupation only gradually becomes statistically significant and of the expected sign (higher returns to the current occupation lower the probability of changing occupations). This same gradual emergence happens to returns to alternative occupations. Moreover, we find that our results are not sensitive to the effects of gender, nationality, labour market conditions, heterogeneity of workers and complexity of the occupational switch.

The paper is organized as follows. The next section documents the process of occupational change. Section 3 presents the econometric model we use to investigate the

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[2] With the data we have for Estonia, we are unable to provide a detailed discussion of the impacts or to cover the late transition period (the latter is not a shortcoming as the vast majority of occupational switches take place in the first two years of transition). Another paper that studies occupational change in a transition economy (Hungary) is Campos and Zlabkova (2001).

[3] Sabirianova (2000) reports that about 30 percent of Russian workers changed occupations from 1991 to 1995, and Campos and Zlabkova (2001) find that approximately 30 percent of Hungarian workers changed occupations from 1989 to 1995.

determinants of this process and discusses the steps taken to test it empirically, with emphasis on the construction of key variables. Section 4 examines the determinants of occupational mobility during the transition from centrally planned to market economy. Section 5 concludes.

2. Data and measurement

The objective of this section is to describe the changing composition of the stock of Estonian human capital with emphasis on occupational shares. The main data source is the Estonian 1995 Labour Force Survey (ELFS95), which contains data on education, occupation, changes of residence and family background. The ELFS95 is often described as wider than a normal labour force survey because it also includes a retrospective section, covering the period 1989-1995, that has wage data and attendant information on work histories.

The sampling procedure uses the 1989 Census to randomly draw one of every 100 persons in the 16-75 age group in 1995. Of 10,955 people selected, 9,608 were interviewed.[4] Respondents reported earnings and employment status in October of 1989, and in 1992, 1993, and 1994. The high inflation years of 1990 and 1991 were excluded from the outset. All the variables are coded following the latest standard international classifications: occupations were coded according to ISCO, education to ISCED and economic activity according to ISIC. Because economic reforms started in 1991 (which is the year of independence from the USSR), the data cover two years before the start of transition and three to four years into it.

The ELFS95 was prepared and carried out paying particular attention to the well-know difficulties with retrospective data.[5] The retrospective responses regarding employment status

[4] The difference is given by the following motives: failure to locate (557 people), emigration (404), death or illness (130), or refusal to participate (213) (Eamets et al., 1997).
[5] See Beckett et al. (2001).

were compared to the 1989 Census data. Most of the small discrepancies found could be explained by differences in the definition of the labour force. Although wage data could not be directly compared, the sample means of wages in ELFS 1995 match wage data from the Estonian Statistical Office for all years (Noorkôiv et al., 1998). Last, but not least, data on economic activity and occupation were re-coded to Soviet classification as well and was found to compare satisfactorily to the 1989 Census (Eamets et al., 1997).

Let us now turn to measuring the extent of occupational mobility in Estonia. Tracking changes in reported occupation codes captures individuals changing occupations. The ELFS95 provides up to four-digit ISCO-88 occupation codes. The incidences of occupational mobility can be observed and analyzed at any of these four possible levels of aggregation, but the decision about the level of aggregation at which occupational mobility is to be studied involves a trade-off. On the one hand, we might want to capture as many incidences of occupational changes as possible and perform the investigation in terms of four-digit groupings. On the other hand, we might try to avoid the measurement error problem by focusing on occupational shifts using broader definitions of occupations.

Table 2 shows our results for the four different levels of aggregation available. The incidence of occupational mobility decreases with the level of aggregation. For example, gross occupational flows based on four-digit coding indicate that 47.1 percent of individuals who were employed in both 1988 and 1995 had changed occupations. This share declines to 35.2 percent if we use one-digit occupational grouping. Similar differences can be found in the yearly rates of change. Notice that the differences across levels of aggregation seem smaller than they appear at first sight as they might be reflecting the differences between the flows occurring “within groups” and “between groups.” For example, consider the difference between the rates of gross occupational flows of 9 percent and 8.4 percent in 1990-1991 obtained from four- and three-digit coding, respectively. If not caused by measurement error,

0.6 percentage point difference may be due to the occupational mobility within three-digit groups. Net occupational flows in Table 2 take into account only those changes of occupations that simultaneously alter the structural composition of occupations. In other words, the net measures neglect those parts of between-group flows that cancel out. It can be seen that depending on the level of aggregation and year, the net flows account from 37 to 12 percent of gross flows. The results in Table 2 also suggest that the importance of net flows in gross flows follows an inverse-U shape dynamics. The peak years of 1991-93 were associated with the most extensive changes in the occupational structure. Note, however, that these net flows do not characterize structural changes fully. For example, inflows into and outflows from employment that caused structural shifts in occupations are not taken into account (Haltiwanger and Vodopivec, 2000).

While these results demonstrate that occupational change was impressive in the early Estonian transition, it says little about the nature of these changes. How extensive were these changes? It is important to investigate whether or not those workers changing occupations also changed firm and sector. Complex changes are defined as those in which workers change simultaneously occupation, firm and industry (as in Neal, 1999). We find that between 1989 and 1995, 69.1 percent of all occupational switches are complex.[6] It is also worth noting that this share rises rapidly in the first years of transition.

Table 3 describes the occupational dynamics from the ELFS95 sample in terms of one-digit level occupations. It shows that four out of nine occupational groups have contracted during the transition in Estonia. These include plant and machine operators, clerks, professionals, and craft and related trade workers. Interestingly, the share of service workers and salesmen as well as that of senior officials and managers has expanded. This is perhaps what one should expect. Note, however, that elementary occupations have also gained

[6] Yearly estimates are not reported for the sake of space. They are available upon request.

importance. One possible interpretation is that the economic transformation has forced a number of workers to move to lower-skill jobs. The last row ("extensiveness of change") confirms the results from Table 2 that 1992 and 1993 were the years of most intense change in the occupational structure.

After considering the magnitude and complexity of occupational switches, we now turn to their direction. Is the average switch one from high schooling requirement occupations to ones with low schooling requirement? Is the average switch one from high skills requirement occupations to ones with low skills requirement? And finally, is the average switch one from high earnings occupations to ones with low earnings? In order to answer these questions we must rank occupations. To do so, we construct two rankings: one is derived from an index of the amount of human capital needed to work in different occupations and the other based on pure monetary returns.[7] Although the simple correlation between the two rankings in high (0.87 at the two-digit level based on year 1994), there are a number of noteworthy differences. With these rankings in hand, it is straightforward to classify all occupational switches according to their direction up or down these two ladders. As for the schooling ladder, half of the switches were down the ladder and the other half up the ladder so there is little that can be say conclusively. As for the earnings ladder, it is clear that the majority of the switches were down the ladder.

In summary, in this section we have provided documentation of the process of massive occupational change in which between 35 and 50 percent of all employed Estonian workers changed occupations in half a decade. The bulk of these occupational switches happened very

[7] We use the methodology proposed by Sicherman and Galor (1990, pp. 189-192). The "schooling ladder" is based on a Mincerian regression. First, we regress log wage on dummy variables for sector of activity, for level of education, for location, for gender, and experience and experience squared. the schooling coefficients are used as weights to average the occupational means. Similarly, the "earnings ladder" is derived by regressing log wages on dummy variables for sector of activity, for level of education, for location, for gender, experience and experience squared, and dummies for occupation. Second, the occupation coefficients are used as the indexes.

early in the transition. We also found that the average or typical change of occupations entailed stepping down the schooling ladder. In the next sections, we go beyond description and try to explain this process of occupational change by assessing its main determinants.

3. Econometric model

In this paper we use a modified version of a standard model for the study of occupational mobility, that of Shaw (1987). Shaw's model states that the probability of changing between occupations *i* and *j* and/ or employers *d* and *e* at time *t* is:

$$p_t^{ij,de} = \hat{a}_1 \mathrm{COST}_t^{i,j} + \hat{a}_2 \mathrm{RTN}_t^{i} + \hat{a}_3 \mathrm{RTN}_t^{j} + \hat{a}_4 \mathrm{TENURE}_t^{d} + \hat{\mathbf{a}}_5 \mathbf{X_i} + \mathring{a}_t^{i,j} \qquad (1)$$

where COST represents the value of lost returns to past investment, RTN^i is the present value of occupational investment in the current occupation, RTN^j is the present value of occupational investment in an alternative occupation, TENURE proxies for the level of current employer-specific investment, and **X** contains a set of variables to control for sector of activity, firm ownership (state, cooperative, private) and location (town or country) of initial employment.

Shaw's model predicts that an increase in the present value of occupational investment in the current occupation reduces the likelihood of changing occupations, while and increase in the present value of occupational investment in an alternative occupation has the opposite effect. The increase in the value of lost returns to past investment also reduces the likelihood of switching occupations, while the predicted effect of job tenure is the opposite.

Let us start with returns to current and alternative occupations. These returns are estimated from wage regressions for every year for which wage data were available (that is

1989, 1992, 1993, and 1994). Returns to current occupation results from a regression of log wage on gender, level of education (seven categories), sector (three categories - primary, secondary, tertiary), firm ownership (three categories - state, cooperative, private), location (three categories – town, countryside, abroad), occupation dummies, age, and occupation dummies interacted with age. We used two-digit occupational codes. The returns to current occupation are calculated as the sum of the coefficient on the occupational dummy plus the one on the age interacted with the relevant occupation times the worker's age.

The returns to alternative occupations are computed as the weighted average of the returns to all other occupations times the probability of actual occupational switches in the previous period. For example, when calculating current and alternative returns in 1989, we used actual occupational switches between 1988 and 1989 to obtain these probabilities. The same procedure was followed for all other years, with the exception of the returns for 1991 and 1992, the high inflation years, for which we had to use the contemporaneous switches.

Returns to current and alternative occupations were also calculated on current and future basis. The fundamental difference regards the information taken into account for the decision to change occupations. The current returns (to current and alternative occupations) are calculated using current wages, while future returns assume that workers can perfectly forecast wages one year ahead and use this information for deciding whether or not to change occupations. In practical terms, we use wages for Fall (Octobers) of 1989, 1992, 1993, and 1994 for the current returns specification for 1989, 1992, and 1993. Notice that we try to circumvent endogeneity issues by computing occupational switches, for example, from 1989 to 1990 using the 1989 wages as current. The intuition is that workers would know current and alternative returns from 1989 wages and decide whether or not to change occupations actually in 1990. Returns to current and alternative occupations on a future basis are constructed using wages of 1992 wages for the years 1989, 1990 and 1991. For the year 1992 we use wages of 1993, and for the year 1993 we

use wages of 1994. Notice that we can not use 1994 wages because we do not have in the data set mobility information from 1994 to 1995.

One of the most difficult variables we have to measure is the value of lost returns to past investment. The literature recognizes the issue and the standard solution so far seems to be to try to capture the inverse of this factor. We follow Shaw (1987) in arguing that this can be satisfactorily proxied by those skills in the current occupation that can be easily transferred across occupations. Contrast, for example, a good grasp of relativity theory to the ability to use a word processor. In this light, a number of "skills transferability indexes" (STI) have been proposed in the literature.[8] Unfortunately, our data does not allow to replicate any of these indexes and we were forced tom propose an alternative. We tried several possibilities[9] for our skills transferability index (STI), but decided for the following:

$$STI_q = 1 - \frac{\sum_{j=1}^{J}\left(N_{q,j} - \frac{N_q}{J}\right)^2}{N^2{}_q}, \quad where$$

$J - number \quad of \quad occupation \quad categories,$

$N_q - total \quad number \quad of \quad persons \quad with \quad qualification \quad q,$

$N_{q,j} - \quad number \quad of \quad persons \quad with \quad qualification \quad q \quad in \quad occupation \quad j.$

where J is the number of occupation categories, N_q is the number of workers with qualification q, and $N_{q,j}$ is the number of workers with qualification q in occupation j. This index is equal to 1 if the qualifications are uniformly distributed across occupational categories. The index declines if they not uniformly distributed: if some categories are

[8] See, e.g., the Skills Transferability Indexes proposed by Shaw (1987), Sicherman and Galor (1990) and Sabirianova (2000).

[9] One index we tried was to compute, for each qualification, the share of individuals holding the qualification but working outside the "main" occupation. The main occupation here was defined as the occupation employing the greatest number of people with that qualification. An alternative we also experimented with was to use the relative number of occupational categories covered by those holding a particular qualification. Because both of these indexes have normalization problems, we decided that the alternative discussed in the text was preferable.

"discriminated," some get mass and more some less. When ranking two-digit qualifications, our STI does a good job in singling out secondary and basic education as the two most easily transferable qualifications and in identifying home economics and theology as those qualifications that are more difficult to transfer across occupations. The major shortcoming we can identify in our STI is that it depends heavily on how careful was the data collection for the qualifications that describes occupations in different jobs.

In summary, our econometric model posits that the probability of switching occupations is a positive function of the returns to alternative occupations and of the transferability of the skills used in the current occupation. On the other hand, the probability of switching occupations is an inverse function of the returns to the current occupation and of job or firm tenure. Let us turn to the results.

4. The Determinants of Occupational Mobility

The objective of this section is to investigate the determinants of occupational mobility in Estonia over the period 1989-1995. Table 4 shows our probit estimates of equation (1) using returns calculated on the basis of current wages (Panel A) as well as on the basis of future wages (Panel B).

One result stands out as significant for all years in the two panels and that is job or firm tenure. This is measure as the number of years the worker has spent with the current employer and our results show that this lowers the probability of changing occupations. It is important to notice that this result obtains controlling for initial sector of employment, initial firm ownership, initial firm location and education level. Both our STI (skills transferability index) and our measure of potential labour market experience do not play a systematic role in explaining the occupational mobility.

For the first and last years of the two panels, the dummy variable for gender is statistically significant and suggests that, after taking into account a number of important determinants, females are still less likely than males to change occupations. Notice that this gender effect is not statistically significant over all years. Given the importance of gender differences with respect to occupational choice, we deem that the issue deserves a closer analysis (we return to it below).

Notice that the effects of private ownership turns from negative to positive over time, and that might be reflecting transition itself. Initially, if one was in the private sector perhaps it was less likely to move than from the state sector. But later on, it is the private sector that constitutes the larger part of economy, so movers tend to be from the private sector.

We believe that some of the most striking results from Table 4 are those relating to the returns to current and alternative occupation. Panel A shows the stark contrast between the results for 1990 and those for 1994. Recall that, for 1990, the data still refer to the Soviet Republic of Estonia or, in other words, it refers to the probability of switching occupations in the socialist system. Signs of rationality as we know it in a market economy are to be mistrusted. The sign on the coefficient on returns to alternative occupations suggest that, during communism in Estonia, an increase in those returns actually decrease the probability of switching occupations. Maybe workers could observe the eroding the relative returns to their current occupation, but could not react. In stark contrast we show the results for 1994, after some years of deep economic reform. We can see that the coefficient on the returns to current occupation is now statistically significant and carries the sign theory predicts: a decrease in these returns (everything else the same) translates into an increase of the probability of changing occupations. Notice that the coefficient on the returns to alternative occupation is also now statistically significant and carries the sign theory predicts. An improvement in the outside options increases the probability of changing occupations. These results show the

remarkable speed with which the market mechanism takes root: the returns to current and alternative occupations play, over these few years, increasingly meaningful roles in explaining occupational change. One of the most commonly alleged reasons for studying transition economies is that they provide a natural laboratory for observing the gradual emergence of a market mechanism. This difficult and complex issue is what, we believe, Table 4 succinctly shows.

How robust are these results? Of particular interest is whether they hold if we investigate the gender issue further. Another concern regards ethnicity issues. Estonia is, among the Baltic countries, the one with largest Russian minority (as of late 1990s, only about two-thirds of the population were of Estonian origin). Kroncke and Smith (1999) offer econometric evidence that suggests that labour market discrimination in favour of Estonians increased significantly throughout the transition. One would thus expect that Estonian nationality would significantly affect the probability of changing occupation.

Table 5 assesses these gender and ethnicity issues for the case of returns to current and alternative occupations on the basis of current wages, splitting the sample by gender. There is a very interesting result, namely, that the process of occupational mobility seems to be driven by radically different reasons for men and women (with the exception of tenure that remains a crucial determinant irrespective of gender). While, for males, it seems to be that the negative effect of the returns to current occupation pushes them to change occupations, for females, our results suggest that the fundamental issue is that the returns to alternative occupations seem to drive them to change occupations. These results are not inconsistent with the notion that the transition has been good to women by favouring sectors and occupations in which they do well in advanced market economies. Our results suggest that occupational mobility is driven by push factors for males and pull factors for women, once the market mechanism starts to take root (that is for years 1993 and 1994 in Table 5). Notice that these results also

hold taking into account the effect of ethnicity (although the later is not a systematic determinant).[10]

Table 6 shows our gender and ethnicity results for the case of returns on the basis of future wages. Firm tenure is, once again, the main determinant of occupational mobility. The results for our skills transferability index show that its coefficient is seldom statistically significant (mostly for males) and changes sign often. Notice, however, that using future wages as a basis to calculate returns confirms the previous results for the males sub-sample that their process of occupational mobility is driven (after the start of economic reforms) by declining returns to current occupation, the push factor identified before. The "push factor" result for women looses statistical significance when we use future wages to calculate returns and the effect of Estonian ethnicity is still not statistically significant.

Another issue of concern is whether or not our results are robust to the introduction of labour market conditions and of worker heterogeneity issues. In order to incorporate the former, we used a number of variables, such as regional (county) employment rates and number of months of non-employment in the year of reference (up to a maximum of 11 months). These did not change qualitatively the results presented above.

Our results are also robust to the introduction of various controls for worker heterogeneity. For instance, they do not qualitatively change if we include, as an explanatory variable, the number of occupations previously held, number of jobs previously held, the age of the individual, a dummy variable for multiple-job holding, and the yearly number and the cumulative number of jobs lost.[11]

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[10] We tried using a dummy variable for main language spoken at home (Estonian), but the results is not qualitatively different.

[11] Notice that for a job lost we only consider the cases in which the reason for dismissal was one of the following: closing of enterprise, reorganisation of enterprise, bankruptcy of enterprise, privatisation of enterprise, dismissal initiated by the employer, and personnel reduction.

A final form of sensitivity analysis we subjected our results was to study whether they are robust across occupational switches of different levels of complexity. A complex change is defined as a simultaneous change of firm and occupation (Neal, 1999). In Table 7 we estimate a multinomial logit model to identify the main factors that discriminate between intra- and inter-firm occupational mobility (Sicherman and Galor, 1990). Note that by doing this we are assessing whether the explanatory variables discussed above can explain the complexity of occupational switches as well. The three possible states in this exercise are to change occupation and firm, to change occupation but stay in the same firm, and to not change occupation (but the worker may change firm). The latter state is the reference category. As noted above, for the period 1989-90, 9.2 % of those employed in both 1989 and 1990 changed firms in this period, and 58.5% of those who changed firms also changed occupations.

The results of Table 7 are useful in showing that complex switches are the majority in Estonia between 1989 and 1995 and therefore dominate our previous results.[12] Notice that the results for inter-firm mobility are qualitatively the same as the results discussed above. For the former, we obtain that the dummy variable for females carries a negative sign and is statistically significant for all years and the same happens to the coefficient on firm tenure. Once again our skills transferability index does not seem to play any role in explaining the complexity of occupational switches. Finally, the gradual change in the coefficients on the returns to current and alternative occupations takes place once again suggesting that the strength of this picture that our results paint of the remarkable speed with which the market mechanism takes root.

As noted, our data does not allow for a rich study of the effects of occupational mobility as we have few impact variables that we can use. One of the few results we report regards the impact of occupational mobility on terms of wage growth. By and large,

[12] We tested for the irrelevance of independent alternatives (IIA) using the Hausman and Small-Hsiao tests and both indicate that our design is appropriate.

occupational mobility is found to hinder wage growth for the last years of our data (1993 and 1994).

The way we understand it, "rational expectations" work (and empirically that would perhaps imply significant coefficients on returns) if people are able to predict wages. Given that we deal with transition, one hypothesis was that maybe only in 1993 could people reasonably predict wages in 1994, that is why the coefficients for this last year became significant and with the right sign.

5. Conclusions

I this paper, we used data from a representative survey of Estonian workers between 1989 and 1995 (the Estonian Labour Force Survey 1995) to document the process occupational change in detail. We find evidence that this process was massive: according to our estimates, between 35 and 50% of all employed Estonian workers changed occupations in half a decade. Moreover, the bulk of these occupational switches happened in the first years, that is, very early in the transition. We also find that the typical (average) change of occupations involved stepping down both the schooling and earnings ladders. Because these moves down the ladder meant losses, we suggest that the process of occupational change was driven more by the transition itself (a large number of bad matches need not be anymore) than by individual workers' pure choice.

We also inquired into the determinants and the consequences of occupational mobility in Estonia. The main findings in this regard are that the main factors lowering the probability of an employed worker changing occupation are gender (female) and having longer experience and longer job tenure. We find that although returns to current or alternative

occupations do not seem to play a systematic role, they play over these few years increasingly meaningful roles in explaining occupational change. Regarding its impact, we find that the private costs of occupational mobility have outweighed the benefits (e.g. occupational mobility tend to lower wage growth), reinforcing our conclusions that the massive process of occupational mobility contributed, in the early years, to the costs of transition.

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Table 1.
Selected macroeconomic indicators: Estonia, 1990-1999

Year	*Real GDP growth, %*	*Inflation rate, %*	*Share of sectoral value added, %*			*Gov. balance, % of GDP*
			Agriculture	*Industry*	*Services*	
1990	-8.1	23.1	16.6	43.5	39.9	..
1991	-7.9	211.0	17.9	39.0	43.1	5.2
1992	-14.2	1076.0	13.1	34.7	52.2	-0.3
1993	-8.5	89.8	11.0	31.1	57.9	-0.7
1994	-1.8	47.7	10.2	30.4	59.4	1.3
1995	4.3	28.9	8.1	28.7	63.2	-1.2
1996	4.0	23.1	7,5	28.0	65.1	-1.5
1997	10.6	11.2	6.9	27.3	65.8	2.0
1998	4.7	8.1	6.3	27.6	66.1	-0.3
1999	-1.1	3.3	5.7	25.3	69.0	-4.7

Source: Statistical Office of Estonia (http://www.stat.ee/).

Table 2
Occupational mobility, 1989-1995

Period	*Gross Occupational Flows, %*	*Net Occupational Flows, %*	*Share of Net Flows in Gross, %*	*Number of observations*
		Four-Digit ISCO88 Codes		
1988-1989	5.1	-	-	5906
1989-1990	8.2	-	-	6049
1990-1991	9.0	-	-	5911
1991-1992	13.4	-	-	5461
1992-1993	15.3	-	-	5187
1993-1994	13.6	-	-	5140
1988-1995	47.1	-	-	4379
		Three-Digit ISCO88 Codes		
1988-1989	4.7	1.5	31.5	5906
1989-1990	7.6	2.3	30.5	6049
1990-1991	8.4	3.1	37.1	5911
1991-1992	12.5	4.2	33.8	5461
1992-1993	14.3	4.6	32.2	5187
1993-1994	12.7	2.9	23.3	5140
1988-1995	44.0	17.1	38.8	4379
		Two-Digit ISCO88 Codes		
1988-1989	4.4	1.0	23.3	5906
1989-1990	6.9	1.4	20.8	6049
1990-1991	7.5	2.1	27.4	5911
1991-1992	11.5	3.0	26.5	5461
1992-1993	12.9	3.7	29.0	5187
1993-1994	11.6	1.8	15.7	5140
1988-1995	40.3	14.3	35.4	4379
		One-Digit ISCO88 Codes		
1988-1989	3.7	0.8	21.1	5906
1989-1990	5.9	1.1	18.7	6049
1990-1991	6.5	1.2	17.7	5911
1991-1992	9.9	2.2	21.9	5461
1992-1993	11.0	2.8	25.9	5187
1993-1994	10.0	1.2	11.9	5140
1988-1995	35.2	10.0	28.4	4379

Note: Gross occupational mobility is computed as a ratio of the number of employed individuals who had different occupations in December of a current year and in December of a base year to the total number of individuals employed in December of the base year. Net flows are computed by summing the absolute values of changes in occupational share for all occupations and dividing by two. ISCO88 is the 1988 International Standard Classification of Occupations (International Labour Office, 1990).

Table 3
Percentage change of occupational shares
(1989-1995)

	Share 1989, %	1989	1990	1991	1992	1993	1994	1995	1988-95	Share 1995, %
		Change in shares, %								
Armed forces	*0.1*	-26.7	18.2	7.7	0.0	78.6	12.0	14.3	113.3	*0.32*
Legislators, senior officials and managers	*11.5*	-1.4	0.3	0.8	6.1	6.4	1.4	1.3	15.4	*13.4*
Professionals	*13.6*	-1.8	-1.8	-2.5	2.4	-4.0	-4.2	3.0	-8.8	*12.6*
Technicians and associate professionals	*10.9*	-0.1	-1.7	0.8	1.3	5.0	0.6	-1.8	4.0	*11.4*
Clerks	*5.8*	-3.3	-0.9	2.4	-1.5	-4.5	-4.7	2.5	-9.8	*5.4*
Service workers, shop and market sales workers	*7.1*	2.3	3.5	1.5	14.9	18.1	7.0	-1.6	53.8	*10.6*
Skilled agricultural and fishery workers	*4.3*	-0.2	5.9	2.4	5.0	-9.1	4.5	3.0	11.2	*4.8*
Craft and related trade workers	*21.7*	1.7	-0.4	0.1	-2.3	-5.1	-1.5	-0.1	-7.4	*19.7*
Plant and machine operators	*17.4*	-0.6	-1.3	-2.0	-10.0	-10.0	-4.8	-2.1	-27.4	*12.7*
Elementary occupations	*7.7*	3.5	3.2	1.1	-2.5	10.6	6.4	-2.1	21.4	*9.1*
Extensiveness of change		*1.9*	*1.8*	*1.3*	*4.3*	*7.7*	*3.6*	*1.7*	*15.8*	

Note: First and last columns (Shares in 1989 and 1995) show the percentage of wage earners in each occupation in total employment. The middle columns ("Change in shared, %") show December to December annual and all period (1988-95) percentage changes in occupational shares. The category "armed forces" has less than 20 respondents. The last column, "Extensiveness of change" captures the extent of the changes: it is the (weighted) average of the absolute values of changes in shares.

Table 4
Determinants of Occupational Mobility
(Probit estimates)

Panel A: Returns based on current wages

	1990	*1993*	*1994*
Returns to current	-.009	-.025	-.053*
occupation	(.018)	(.034)	(.028)
Returns to alternative	-.087***	-.023	.148***
occupation	(.025)	(.037)	(.051)
Skills transferability	-.013	-.018	-.023
index	(.017)	(.021)	(.019)
Dummy: Female=1	-.017**	-.015	-.035***
	(.006)	(.009)	(.009)
Experience	.162**	.029	-.184***
	(.079)	(.152	(.063)
Firm tenure	-.277***	-.251***	-.229***
	(.045)	(.062)	(.068)
Log likelihood	-1385.37	-1686.69	-1552.11
Pseudo R2	0.04	0.04	0.05
Number of observations	5843	4894	4751

Panel B: Returns based on future wages

	1990	*1991*	*1992*	*1993*	*1994*
Returns to current	.025	-.019	-.036	.021	-.036
occupation	(.021)	(.022)	(.03)	(.03)	(.023)
Returns to alternative	-.05***	.029	.054	.068	.091**
occupation	(.018)	(.024)	(.036)	(.051)	(.044)
Skills transferability	-.014	-.04***	.005	-.02	-.024
index	(.017)	(.015)	(.022)	(.021)	(.019)
Dummy: Female=1	-.012*	-.03***	-.005	-.012	-.03***
	(.006)	(.007)	(.009)	(.009)	(.009)
Experience	.042	-.17**	-.177	-.088	-.29***
	(.087)	(.09)	(.129)	(.071)	(.048)
Firm tenure	-.28***	-.21***	-.17***	-.26***	-.23***
	(.046)	(.049)	(.059)	(.062)	(.069)
Log likelihood	-1388.4	-1421.3	-1719.9	-1686.5	-1553.5
Pseudo R2	0.04	0.05	0.02	0.04	0.05
Number of observations	5843	5685	5259	4894	4751

Note: Not shown: dummies for education (primary, basic, secondary, specialized secondary, higher and academic degree), for sector (primary, secondary and tertiary), for ownership (private, state and co-operative), and for location (town and countryside). Wage data for 1991 and 1992 were not collected because these were years of high inflation. Occupational mobility basis for comparison is "not switching" (assigned value 0).
Standard errors (in parentheses) are heteroscedastic-consistent, *** denotes significant at the 1% level;
** denotes significant at the 5% level; and * denotes significant at the 10% level.

Table 5
Determinants of Occupational Mobility (Probit estimates):
Using Returns based on Current Wages to Assess Gender and Ethnicity Issues

Panel A: Males

	1990	*1993*	*1994*
Returns to current	-.0293	-.11**	-.11***
occupation	(.031)	(.04)	(.041)
Returns to alternative	-.147***	.031	.099
occupation	(.039)	(.05)	(.071)
Skills transferability	-.462**	.014	-.054**
index	(.023)	(.031)	(.027)
Experience	.351***	.043	-.301***
	(.107)	(.223)	(.105)
Firm tenure	-.354***	-.278***	-.273***
	(.069)	(.092)	(.097)
Dummy: Estonian=1	-.008	.028**	.034**
	(.010)	(.014)	(.014)
Log likelihood	-740.15	-948.95	-910.49
Pseudo R2	.07	.05	.06
Number of observations	2979	2603	2534

Panel B: Females

	1990	*1993*	*1994*
Returns to current	.001	.059	.015
occupation	(.022)	(.047)	(.039)
Returns to alternative	-.013	.088*	.156**
occupation	(.032)	(.051)	(.066)
Skills transferability	.022	-.049*	.012
index	(.027)	(.028)	(.026)
Experience	-.064	.074	-.062
	(.108)	(.211)	(.091)
Firm tenure	-.195***	-.228***	-.193**
	(.060)	(.081)	(.089)
Dummy: Estonian=1	-.008	.007	.018
	(.009)	(.013)	(.012)
Log likelihood	-624.58	-718.99	-623.88
Pseudo R2	.03	.04	.05
Number of observations	2849	2285	2197

Note: Not shown: dummies for education (primary, basic, secondary, specialized secondary, higher and academic degree), for sector (primary, secondary and tertiary), for ownership (private, state and co-operative), and for location (town and countryside). Wage data for 1991 and 1992 were not collected because these were years of high inflation. Occupational mobility basis for comparison is "not switching" (assigned value 0).
Standard errors (in parentheses) are heteroscedastic-consistent, *** denotes significant at the 1% level;
** denotes significant at the 5% level; and * denotes significant at the 10% level.

Table 6
Determinants of Occupational Mobility (Probit estimates):
Using Returns based on Future Wages to Assess Gender and Ethnicity Issues

Panel A: Males

	1990	*1991*	*1992*	*1993*	*1994*
Returns to current	.054*	-.037	-.096**	-.084*	-.109***
occupation	(.031)	(.034)	(.040)	(.044)	(.032)
Returns to alternative	-.097***	.047	.064	.075	.061
occupation	(.026)	(.035)	(.047)	(.071)	(.068)
Skills transferability	-.049**	-.038	.022	.007	-.053*
index	(.024)	(.023)	(.030)	(.031)	(.027)
Experience	.126	-.211	-.011	-.307***	-.258***
	(.122)	(.137)	(.181)	(.115)	(.065)
Firm tenure	-.365***	-.314***	-.149**	-.271***	-.259***
	(.070)	(.076)	(.086)	(.092)	(.097)
Dummy: Estonian=1	-.008	.004	.017	.027*	.033**
	(.010)	(.011)	(.012)	(.014)	(.014)
Log likelihood	-743.55	-839.75	-926.35	-950.02	-908.24
Pseudo R2	.07	.05	.03	.04	.06
Number of observations	2979	2947	2784	2603	2534

Panel B: Females

	1990	*1991*	*1992*	*1993*	*1994*
Returns to current	-.010	-.011	.018	.121***	.052
occupation	(.029)	(.029)	(.046)	(.042)	(.033)
Returns to alternative	-.0002	.016	.048	.013	.081
occupation	(.0301)	(.034)	(.048)	(.072)	(.061)
Skills transferability	.022	-.037*	-.013	-.049*	.009
index	(.027)	(.019)	(.031)	(.028)	(.026)
Experience	-.052	-.101	-.322*	.104	-.288***
	(.114)	(.119)	(.173)	(.107)	(.063)
Firm tenure	-.191***	-.109*	-.212***	-.245***	-.203**
	(.061)	(.062)	(.077)	(.081)	(.089)
Dummy: Estonian=1	-.008	-.006	.001	.005	.017
	(.009)	(.009)	(.013)	(.013)	(.012)
Log likelihood	-624.56	-573.82	-783.23	-715.72	-624.29
Pseudo R2	.03	.03	.02	.05	.05
Number of observations	2849	2720	2467	2285	2197

Note: Not shown: dummies for education (primary, basic, secondary, specialized secondary, higher and academic degree), for sector (primary, secondary and tertiary), for ownership (private, state and co-operative), and for location (town and countryside). Occupational mobility basis for comparison is "not switching" (assigned value 0). Standard errors (in parentheses) are heteroscedastic-consistent, *** denotes significant at the 1% level; ** denotes significant at the 5% level; and * denotes significant at the 10% level.

Table 7
Determinants of Occupational Mobility (Multinomial Logit);
Using Returns based on Future Wages to Assess Complexity (Intra- and Inter-firm mobility)

	1990		*1991*		*1992*		*1993*		*1994*	
	Interfirm mobility	*Intrafirm mobility*	*Interfirm mobility*	*Intrafirm mobility*	*Interfirm mobility*	*Intrafirm mobility*	*Interfirm mobility*	*Intrafirm mobility*	*Interfirm mobility*	*Intrafirm mobility*
Returns to current occupation	.379	.143	-.302	-.829	-.296	-1.114	.158	.311	-.505**	-.096
	(.411)	(.691)	(.395)	(.781)	(.363)	(.794)	(.347)	(.714)	(.272)	(.745)
Returns to alternative occupation	-1.14***	.146	.385	1.27	.35	2.03**	.545	1.36	1.19**	-.784
	(.343)	(.553)	(.441)	(.869)	(.387)	(1.02)	(.567)	(1.31)	(.512)	(1.29)
Skills transferability index	-.006	-.250	-.532**	-.106	.077	.561	-.272	.187	-.238	.027
	(.322)	(.701)	(.249)	(.658)	(.275)	(.728)	(.223)	(.662)	(.208)	(.647)
Dummy: Female=1	-.369***	.232	-.518***	-.145	-.186*	.468**	-.294***	.762***	-.391***	-.384
	(.132)	(.221)	(.123)	(.284)	(.107)	(.221)	(.109)	(.251)	(.1146)	(.291)
Experience	2.059	-3.24	-2.66*	-2.44	-1.29	-5.139*	-1.38*	1.59	-3.58***	-.551
	(1.631)	(2.83)	(1.605)	(2.75)	(1.49)	(2.96)	(.827)	(1.551)	(.576)	(1.34)
Firm tenure	-8.62***	1.128	-5.16***	.375	-3.29***	1.79	-4.01***	1.22	-3.86***	-.331
	(1.24)	(1.36)	(1.128)	(1.368)	(.794)	(1.29)	(.804)	(1.27)	(1.04)	(1.61)
Log likelihood	-1576.84		-1572.78		-1961.97		-1889.21		-1730.35	
Pseudo R2	0.05		0.05		0.0299		0.0484		0.0553	
Number of observations	5848		5690		5259		4898		4751	

Note: Not shown: dummies for education (primary, basic, secondary, specialized secondary, higher and academic degree), for sector (primary, secondary and tertiary), for ownership (private, state and co-operative), and for location (town, countryside and abroad). Occupational mobility basis for comparison is not switching occupations or firms. Interfirm mobility stands for change in occupation and change in firm. Intrafirm mobility stands for change in occupation in same firm.
Standard errors (in parentheses) are heteroscedastic-consistent, *** denotes significant at the 1% level; ** denotes significant at the 5% level; and * denotes significant at the 10% level.