TRANSITION TO SELF-EMPLOYMENT: HISTORICAL CONTINUITIES AND DISCONTINUITIES*

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SUMMARY

The paper investigates entry into self-employment in a dynamic historical perspective, focusing on the changing influence of social origin, educational credentials and Communist Party membership. Interrupted bourgeoisie theory, concept of investment into human and cultural capital as well as social capital investment theory provide the framework for the empirical analysis. The analysis is carried out on a person period file where social origin is a time-constant measure, education and party membership are time-dependent measures. The model is estimated for different historical periods and findings are interpreted as historical effects on the changing conditions of social determination for becoming entrepreneurs in Hungary. Historical continuities and discontinuities are investigated by the spline regression method.

Results reveal a *U*-curve for the impact of social origin on becoming self-employed, while returns to educational investments seem a reversed *U*-curve which is more marked for human capital investments than for cultural capital investments. Accumulated political capital plays larger role in predicting entry into self-employment than simple party membership. But conversion of political capital into economic one is not a post-communist phenomenon, it started much earlier already under the communist era.

KEYWORDS: Employment; Social mobility; Spline regression.

In the paper, entry into self-employment is investigated in Hungary in the perspective of long-term historical changes. Considering the last four-five decades of Hungarian history, structural mobility and period effects played an important role in the process of stratification first after the communist take-over in 1949, and recently after the collapse of communism (*Andorka*, 1978, 1983; *Róbert*, 1998). Focusing on the latter event – when an economy dominated formerly by state ownership and central planning system moves into an economy dominated by market relations and private initiatives – the increase of self-

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employment and entry into entrepreneurship belong to the most interesting research issues to be investigated.[2] The common feature of most of the previous analyses, however, is that they apply a mobility approach by comparing two distinct time-points: a date from the late 1980s and another date from the 1990s. This perspective is rather narrow and does not provide an appropriate view of the formation of post-communist self-employment with respect to long-term economic, political and historical changes in these societies. Educational expansion, industrialization process, stronger or weaker inclusion of market elements in economy as well as varying value and use of political connections and credentials have to be considered for explaining the historically changing pattern of recruitment into entrepreneurship in these societies. Moreover, all these processes vary according to the different periods one can distinguish within the last four-five decades. This is why this research approaches its topic in a longer historical perspective, going back even to the times before World War II and the communist take-over, rather than the usual 5–10 year period of time between 1989–1990.

The research question, as formulated by *Osborn* and *Slomczynski* (1997 p. 248.), puts the topic into the relevant historical context: 'Are those people who started their business after 1989 a new breed of entrepreneurs? Or, are they similar to those who started their business in the 1950s, 1960s, 1970s, and 1980s?' The authors investigate the topic in the light of evolutionary versus revolutionary theories of *Campbell* and *Pedersen* (1996). The evolutionary theory assumes that the new entrepreneurial class has strong roots in the communist era when they were able to accumulate appropriate social, cultural and material assets. Foundations even from the pre-communist times like habitus, ambition and material capital for self-employment matter in this respect as well. The revolutionary theory, however, expects more radical changes after 1989 and stronger break with the past. Evolutionary and revolutionary elements probably coexist in historical change but one of them may have a stronger dominance. Distinguishing three historical periods (1949–1968, 1969–1988, 1989–1993), Osborn and Slomczynski found more support for the evolutionary theory in Poland.

First the paper, provides a conceptual background for research. Second, the main hypotheses are summarized. Third, data, measures and methods are described. Fourth, the results of the statistical models are presented. Finally, the paper summarizes and discusses the findings.

1. Conceptual background of the research

When investigating entrepreneurship two approaches can be followed. Research can focus on the social composition of those who are entrepreneurs in different periods or can focus on becoming self-employed. Since our main analytical interest lies in the periodical effects, in the changing role of the different determinants of the emergence of self-employment in the different historical periods, we analyze the transition to self-employment in Hungary. The state of being self-employed and the social characteristics of these people can differ from various historical periods; however, becoming an entre

[2] Several contributions can be referred to focusing on this topic either from the perspective of emerging new economic elite (*Szelényi* and *Szelényi*, 1995; *Böröcz* and *Róna–Tas*, 1995; *Szelényi–Wnuk-Lipinski* and *Treiman*, 1995; *Kolosi* and *Sági*, 1998) or from the viewpoint of recruitment of new entrepreneurs (*Róna–Tas*, 1994; *Róbert* and *Sági*, 1997; *Róna–Tas* and *Lengyel*, 1997).

preneur and social factors of this career mobility process provide a better insight into the periodical and historical changes of different eras.

When estimating statistical predictors for this process we intend to consider the role of social origin; that of human, cultural and social resources accumulated by educational investments or during previous work experience before moving into self-employment; and that of political credentials. In the subsequent paragraphs we provide the conceptual basis for each of these determinants.

Inheritance: impact of father's self-employed position

In their large monograph, *Erikson* and *Goldthorpe* distinguish four effects influencing social fluidity. These effects: hierarchy, inheritance, sector, affinity 'can be associated with desirability, advantages, and barriers within a structure of class positions' (*Erikson* and *Goldthorpe*, 1992. p. 123.). The interpretation of inheritance effect is that individuals can be found in a destined position being equal to their origins. The likelihood of this effect is especially high for certain classes like service class, entrepreneurial class, or farmer class. For entrepreneurs, the argument means that fathers are able to provide direct support to their offsprings to a larger extent and endow them with the necessary capital to remain and keep their position in petty bourgeoisie. On the contrary, mobility into the entrepreneurial class can be more restricted from other class positions like from service class or from semi- and unskilled manual worker class in line with hierarchy effects. Inflow mobility into petty bourgeoisie is also restricted from farmer and agricultural manual worker classes due to the sector effect which produces a sectorial cleavage between proprietors and workers in agriculture and members of other classes. Finally, affinity effects play their role in recruitment into self-employment as well. Although sector provides strong division between petty bourgeoisie and farmers, they have something common in affinities namely that both are 'independent' and both can have similar entrepreneurial habits. Likewise, there is a positive affinity effect between service class and petty bourgeoisie on the grounds that both can have similar professional and managerial habits to a certain degree.

Due to the nationalization after 1949, the proportion of entrepreneurs fell to about 3 percent of the labour force in Hungary. Partly in consequence of the shrinking of the high-inheritance categories like farmers or self-employed, marked outflow mobility from petty bourgeoisie could be observed during the period of 1938–1973 (*Simkus*, 1984). Even after 1968, when the Hungarian economy became more liberal, market elements and private initiatives were better tolerated, and a dual system developed in the society (*Kolosi*, 1988; *Szelényi*, 1986–1987), inheritance in self-employment was relatively low.

Human and cultural capital investments

The concept of human and cultural capital investment is based on *Becker's* (1975) as well as on *Bourdieu's* (1984) theories. In general, for successful status attainment on the labor market one needs to accumulate different kinds of skills, knowledge and expertise. Becker states that human capital investments are indicators of higher ambitions and result in better market capabilities. Bourdieu emphasizes the importance of cultural capital for

achieving higher status. The accumulation of both human and cultural capital can be done – at least partly – by education. According to the industrialization thesis of *Treiman's* (1970), the significance of this accumulation process for socio-economic success is increasing.

During education one can accumulate practical skills and knowledge as well as general competence and adequacy. Formerly, a school system provides partly vocational training, partly academic qualification. Accordingly, investments into education can be divided into two parts: following vocational track where mostly concrete labor-related expertise can be accumulated or following academic track where mostly general capabilities can be acquired. For entrepreneurs, this distinction is based on the assumption that higher participation in vocational training is associated with knowledge connected to the general industrialization and modernization tendencies. Higher participation in academic education, on the other hand, is associated with the emerging need of entrepreneurial capabilities like calculating, risk taking, building contacts, collecting the necessary information about market.

Human and cultural assets have always been of great importance for status attainment under communism. Communists were not able to nationalize these capitals or were able to control and redistribute them to a lesser degree than other (e.g. material) resources (*Róbert*, 1984, 1991; *Ganzeboom*, *Graaf* and *Róbert*, 1990).

Previous work experience before entrepreneurship

Considering previous work experience as a determinant of becoming an entrepreneur has definite conceptual grounds. Before starting an occupational career as self-employed, people in employee status accumulate appropriate assets they can utilize later when they enter entrepreneurship. These resources can be of two kinds: *1*. technical skills, knowledge, know-how; *2*. relational assets, contacts, 'know-how' acquired in employee status that can be used later in self-employed position. For these latter types of resources the term of social capital can also be applied in the sense as meant by *Coleman*: structural and interpersonal relations people can use to increase socio-economic (in this case entrepreneurial) success (*Coleman*, 1990).

Consequently, previous work experience indicates a kind of embeddedness in the labor force. The longer time one spends in labor market, the stronger their embeddedness can be, the more expertise they can accumulate, the more contacts they can make, etc. On the other hand, previous studies on career mobility proved that most of the mobility occurred at young age (*Blossfeld*, 1986; *Lujikx* et al., 1998). Consequently, longer time spent in the labour market in employee position decreases the chance of entry into entrepreneurship.

Political credentials

The fourth form of assets to be considered in this analysis as an influential factor of entry into entrepreneurship is political capital. By this capital, we practically mean Communist Party (CP) membership between 1949 and 1989 which could have an impact during this period as well as thereafter. In fact, there are two components of political creden

tials we intend to distinguish. First, CP membership could be a sign of loyalty with the political system and – as such – this had to be rewarded.[3] Second, party membership was a field where social capital could be accumulated in the sense as defined by Coleman (1990) and as discussed before. This is the strict meaning of political capital: as being a party member one could build structural and interpersonal relations to be used for upholding individual interest. Consequently, party membership also represents a kind of embeddedness, a way to get informed, to learn about the right persons for certain problems to be solved etc., and the longer time one spent in the Communist Party, the more political capital he was able to accumulate.

This research question is especially interesting for the period of post-communism, from the viewpoint of the debate of political capitalism. The core of the debate on political credentials was based on two hypotheses: elite circulation versus elite reproduction (*Szelényi* and *Szelényi*, 1995; *Szelényi–Wnuk-Lipinski* and *Treiman*, 1995). The advocates of elite reproduction argued that members of former political elite (the *Nomenclature*) would be able to use their accumulated political assets to maintain their advantageous social positions and would be able to convert their political capital into economic one (*Hankiss*, 1990; *Staniszkis*, 1991; *Stark*, 1990). This postulate is associated with the capital accumulating function of CP membership and, by this hypothesis, party membership would positively affect transition to entrepreneurship after 1989. By the alternate thesis of elite circulation, the impact of CP membership turns out to be insignificant or may be negative. This postulate is associated with the loyalty component of party membership that is not rewarded any more, but perhaps even penalized after the collapse of communism.

Osborn and *Slomczynski* (1997) found a negative effect between 1949 and 1988 for party membership in Poland and the impact for the last period of 1989-1993 turned out to be insignificant. Both *Mateju* (1993) for Czech Republic and Róna-Tas (1994) for Hungary found a significant impact of Communist Party membership on socio-economic success after 1989 but the effects disappeared when they were controlled for education. This means that human and cultural capital outweigh political assets. However, investigating social determinants of new entrepreneurship in six post-communist countries in 1993, Róbert and Sági (1997) found that CP membership in 1988 had a small effect even if it was controlled for other predictor variables.

2. Hypotheses: historical effects and over-time changes in influencing transition to petty bourgeoisie

Dividing the last four-five decades of Hungarian history into intervals and defining periods is a crucial part of the analysis. In this analysis five periods are distinguished: *1*. the pre-communist era before 1949; *2*. the orthodox communist era (or the long fifties) between 1950 and 1968; *3*. the period of reform-socialism between 1969 and 1979; *4*. the period of the decline of communism between 1980 and 1988; *5*. the transformation period between 1989 and 1992.

[3] On the relationship of status allocation, socio-economic success and CP membership under communism where some were 'more equal than the others', see e.g. *Parkin* (1969), *Connor* (1979) or in particular for the Hungarian context *Szelényi* (1987), *Tőkés* (1996).

The variation among these periods with respect to historical processes is the central assumption of the analysis. We posit discontinuity in transition to entrepreneurship between 1949 and 1950 (due to communist take-over), 1968 and 1969 (due to the introduction of System of New Economic Management), 1979 and 1980 (due to the start of decline of communist regime), as well as 1988 and 1989 (due to the formal collapse of communism).

As far as the concrete predictors of becoming self-employed are concerned, the first set of hypotheses relates to the impact of father's occupation:

*H*1.1. Inheritance of entrepreneurial position decreases first but increases later, i.e. it forms a U-shaped curve over time.

*H*1.2. Intergenerational mobility from service as well as from intermediate (skilled manual and service worker) classes into entrepreneurship increases over time but these effects are less pronounced as compared to inheritance of self-employment.

The second set of hypotheses relates to the impact of education:

*H*2.1. The effect of vocational track type of schooling on entry into entrepreneurship increases gradually over time.

*H*2.2. The increase of the effect of an academic type of schooling on entry into entrepreneurship becomes sharper only in the more recent periods.

The third set of hypotheses relates to the impact of political credentials:

*H*3.1. Communist party membership implying political loyalty affects entry into entrepreneurship negatively for the early period of communism but this impact becomes insignificant (maybe positive) for the most recent period of post-communism.

*H*3.2. The length of Communist Party membership implying accumulated political capital affects positively the transition into self-employment and this impact increases over time.

3. Operationalization

Data from the 1992 Social Mobility and Life History Survey of the Hungarian Central Statistical Office are used for the analysis. The survey is based on a household sample of the Hungarian population where all members aged over 14 have been interviewed (*N*=29 006). Methods of the survey were standardized questionnaires and face to face interviews. The analysis is restricted to male population, aged 18 and above (*N*=12 150).

Variables, measures, data-transformation

The dependent variable of the analysis is a dichotomous one indicating if someone entered into self-employment in a certain period. Only entry into non-agricultural entrepreneurship is considered since inflow mobility into farming has been very rare in Hun

gary. Although the number of cases is relatively large in the data-set, the event investigated did not occurre very frequently. Consequently, the dependent variable is quite skewed. (See Appendix 1.) It is also important to note that information on entry into self-employment is based on retrospective job history data. This means that some biases in the data cannot be rejected, especially for older cohorts. This problem is discussed in more details when interpreting the results.

The independent variables are as follows:

1. Father's class is defined by dividing the EGP scheme (*Erikson* and *Goldhorpe*, 1992 p. 36.) into five categories: Service (Class I+II); Intermediate (Class IIIa+b, Class V+VI); Petty bourgeoisie (Class IVa+b); Farmers (Class IVc); Unskilled (Class VIIa+b) (reference category). [*ORIG*]

2. For education a vocational track and an academic track have been defined. Secondary vocational training, secondary technical school diploma, college degree are parts of the former one, while grammar school and university degree belong to the latter one. Those without qualification (completed primary education) belong to the reference category. [*EDU*]

3. Age is measured by years. [*AGE*]

4. Relative labour force experience up to becoming entrepreneurs is computed as a percentage of number of years spent in labour market related to the total number of years between completion of highest educational level in day-course education and year of entry into self-employment. [*EXPE*]

5. Political credentials are measured by Communist Party membership. It is partly a dummy variable (1=member, 0=non-member) [*PLOY*]; partly a continuous variable indicating the proportion of time one spent in the Communist Party related to the duration of total relative labor force experience (up to entry into self-employment). [*PCAP*]

All independent variables (except father's class) are time-varying, i.e. they change their value from year to year according to the actual state of the variable. Father's class is a time-constant measure. Descriptive statistics of variables are given in Appendix 1.

The individual data-set has been transformed to an event history file following the method by *Blossfeld*, *Hamerle* and *Mayer* (1989). First, all jobs in the occupational history were considered as separate episodes. Second, the method of episode splitting was applied, the job episodes were divided into years, the smallest time unit in the data-set. The unit of observation was changed from the individuals to the spells (years) derived from the job episodes. All analyses are carried out on this person-period (in this case person-year) file (see also *Yamaguchi*, 1991). For more details on data transformation, see Appendix 2.

Causal models

Since we investigate the probability of becoming entrepreneur as well as various determinants of this event, and we have a dichotomous dependent variable indicating whether this event did or did not occurre, logistic regression is applied as a main analytical tool. Models are built in a hierarchical way, direct effect models are defined, first es

timating the impact of social origin (Model 1/*a*) as well as of education (Model 1/*b*) on entry into self-employment for the given historical periods separately:

$$\ln\frac{p_{ik}}{1-p_{ik}} = \alpha + \sum_{l=1}^{L-1}\beta_f ORIG_{il} \qquad \text{Model } 1/a$$

Here p_{ik} indicates the probability of the event when the *i*-th person becomes self-employed in the *k*-th historical period. *ORIG* means the effect of social origin measured by an *L-1* (here four) category bipolar variable where the *L*-th category (here unskilled worker) is the reference. The second baseline model is defined similarly where the direct effect of education is investigated:

$$\ln\frac{p_{ik}}{1-p_{ik}} = \alpha + \sum_{m=1}^{M-1}\beta_g EDU_{im} \qquad \text{Model } 1/b$$

In addition to the influence of social origin and education, the effect of embeddedness is also important. Consequently, the extended model contains the impact of age and work experience (Model 2).

$$\ln\frac{p_{ik}}{1-p_{ik}} = \alpha + \sum_{l=1}^{L-1}\beta_f ORIG_{il} + \sum_{m=1}^{M-1}\beta_g EDU_{im} + \beta_h AGE_i + \beta_j EXPE_i \qquad \text{Model 2}$$

Finally, the influence of communist party membership – operationalized in two ways – is investigated. First, the model contains only the direct effects without any control variables (Model 3/*a*):

$$\ln\frac{p_{ik}}{1-p_{ik}} = \alpha + \beta_p PLOY_i + \beta_r PCAP_i \qquad \text{Model } 3/a$$

Second, all variables of Model 2 are involved as control variables in the final model of the analysis (Model 3/*b*):

$$\ln\frac{p_{ik}}{1-p_{ik}} = Model\ 2 + \beta_p PLOY_i + \beta_r PCAP_i \qquad \text{Model } 3/b$$

In the logistic regression equations described before two categorical variables have been included (*ORIG* and *EDUC*). They are coded as indicator variables. The design matrix below shows the parameterization of these measures.

Father's class:					Educational track:		
service	1	0	0	0	academic track	1	0
intermediate	0	1	0	0	vocational track	0	1
self-employed	0	0	1	0	no qualification	0	0
farmer	0	0	0	1			
unskilled-agricultural labourer	0	0	0	0			

In the paper, when presenting results of logistic regression models, unstandardized (metric) coefficients (*B*), standard errors (*SE*) and the so-called odds (Exp(*B*)) will be shown in the tables. The latter one is used for a substantive interpretation of the findings. Exp(*B*) is based on the following formula of logistic equation written in terms of odds:

$$\text{Exp}(B) = \frac{p(\text{event})}{1-(p(\text{event})} = e^{B_0} e^{B_1 X_1} \ \ldots \ e^{B_p X_p}$$

Here *e* raised to the power of B_i is the factor by which the odds (the probability divided by 1 minus the probability) change when the *i*th explanatory variable increases by one unit. If B_i is positive, this factor is greater than 1, which means that the odds are increased; if B_i is negative, the factor is less than 1, which means that the odds are decreased.

Investigating historical trends – spline regression analysis

The central issue in the research is how the effect of the predictor variables varies over historical periods defined above. In order to test these changes, a multilevel analysis is performed (see *DiPrete* and *Grusky*, 1990). The last and most complete model (Model 3/*b*) is estimated for each historical year between 1940 and 1992, and the unstandardized regression coefficients (weighted by the reciproque of their standard error) serve as dependent variables for estimating trends in the impact of social origin, education and political capital. Since we assume discontinuity in the effect of independent variables for the different periods (i.e. determinants of entry into entrepreneurship vary over historical periods), the spline regression method is applied. This makes it possible to fit data on various lines or curves from different time periods and the separate functions of predictor variables are displayed for the successive time periods.[4]

The research design will be the following: first, spline regressions are calculated for the different periods assuming continuity. These models – spline models with knots – will serve as baseline. Second, we calculate the spline regressions without knots, i.e. dummy variables representing interruptions are added to the model, assuming discontinuity for all breaks between the periods. If this second model turns out to be significantly worse than the first one, the hypothesis of discontinuity over historical periods is false. If the second model turns out to be significantly better than the first one, we continue to search for an even better model testing the various possible combinations of continuity and discontinuity, fitting various spline models with different numbers of dummies representing interruptions. Since spline models are, in fact linear regressions, deciding on the best model (i.e. selection of the variables) is based on *F*-statistics (with different degrees of freedom) and the adjusted R^2 values.

4. Causal models for transition to self-employment

In the following section of the paper the results of model-based computations will be presented.

[4] For additional discussion and the mathematical background of the method see *Smith* (1979 pp. 57–62.) and *Greene* (1993 pp. 235–238); for previous applications see *Deng* and *Treiman* (1997) and *Luijkx* et al. (1997). A statistical appendix at the end of the paper written by *Erzsébet Bukodi* provides more insight into the method (see Appendix 3.)

The basic models: direct effects

The basic models of transition to entrepreneurship focus on the effect of social origin and education. For such types of models where one has these two predictor variables investigating their impact in historical perspective, the industrialization thesis by *Treiman* (1970) provides an obvious framework for interpretation.

Table 1

Direct effects of social origin and education on the odds of entry into self-employment
(logistic regression estimates)

Model (variable) statistics	Period of entry into self-employment				
	x–1949	1950–68	1969–79	1980–88	1989–x
Father's class [a]					
Service class					
B	.1032	.0896	- .2333	.4203	.3126
S. E.	(.5335)	(.4774)	(.4302)	(.2539)	(.2026)
Exp(*B*)	1.1087	1.0937	.7919	1.5225	1.3670
Intermediate class					
B	- .2401	- .0582	- .0477	.4045*	.3910*
S. E.	(.5331)	(.4131)	(.3086)	(.2008)	(.1540)
Exp(*B*)	.7865	.9434	.9534	1.4985	1.4785
Self-employed class					
B	1.8738***	1.2180***	.3794	.5274	.7051**
S. E.	(.2316)	(.2577)	(.3189)	(.2728)	(.2227)
Exp(*B*)	6.5132	3.3804	1.4614	1.6946	2.0240
Farmer class					
B	- .2772	.0721	- .6933*	- .3810	-1.5319**
S. E.	(.2657)	(.2411)	(.3085)	(.2594)	(.4174)
Exp(*B*)	.7579	1.0747	.0623	.6440	.2161
Constant	-5.291***	-6.845***	-7.481***	-6.788***	-5.732***
	(.1040)	(.1240)	(.2000)	(.1741)	(.1402)
Log-likelihood ratio test	94.09	22.36	8.66	13.02	44.08
Significance	.0000	.0000	.0702	.0112	.0000
Educational track [b]					
Vocational track					
B	1.0532***	.9136***	1.4541***	1.2481***	.9583***
S. E.	(.1995)	(.1905)	(.2303)	(.1953)	(.1578)
Exp(*B*)	2.8669	2.4932	4.2806	3.4836	2.6072
Academic track					
B	- .4255	- .1470	.4357	1.0389***	.5871*
S. E.	(.7157)	(.5148)	(.4548)	(.2794)	(.2415)
Exp(*B*)	.6535	.8633	1.5461	2.8260	1.7987
Constant	-5.457***	-6.7881***	-6.553***	-6.011***	-5.136***
	(.1830)	(.1667)	(.1349)	(.1080)	(.0863)
Log-likelihood ratio test	24.28	22.32	48.79	50.80	43.55
Significance	.0000	.0002	.0000	.0000	.0000

[a] Reference category: unskilled agricultural worker.
[b] Reference category: no qualification.

Note. In Tables 1–3 the log-likelihood ratio has been calculated as: -2 log (L_1 / L_0), where L_1 refers to the log-likelihood value of the model with predictor variables and L_0 refers to the log-likelihood value of the intercept model without any predictor variables. Significance: * p < .05; ** p < .01; *** p < .001.

Due to modernization and industrialization, this thesis assumes that influence of social origin tends to decrease while that of education tends to increase.

Table 1 displays the direct effects of father's class and education, separately. For intergenerational mobility, service class origin does not increase the odds of entry into entrepreneurship significantly compared to the unskilled manual and agricultural worker class origin positions. By terms of *Erikson* and *Goldthorpe* (1992), this means that hierarchical effects are stronger than positive affinity effects. Sector effects turn out to be also stronger than positive affinity effects as we can observe a negative impact of farmer class origin on the odds of becoming self-employed artisans or shopowners. The intermediate class origin improves the probability of entry into entrepreneurship significantly only for the recent two periods after 1980.

For social origin, father's self-employment position is the strongest predictor. The trend of ascription indicates a decline over time as expected, however, we can observe a return in the inheritance of entrepreneurial position for the post-communist era. According to the odds, having a self-employed father increases the chance to become self-employed 6 and half times before 1949 compared to the case of having a father in unskilled manual or agricultural labourer position. The same odds are a bit more than 3 for the long fifties. Then the estimates are insignificant for the two subsequent periods in the 1970s and 1980s. Finally, the odds of reproduction of self-employed position are again 2 times larger for the post-communist era compared to the reference category.

As expected, the influence of education on becoming self-employed turns out to increase over the periods though the trend is not monotonous. Vocational skills matter a bit less in the long fifties and their importance tends to decline for the 1980s and the post-communist period. The highest odds for vocational education are 4 times larger compared to the state without any qualification and we can observe them in the reform-socialist period. Academic education, however, plays the strongest role for becoming self-employed precisely during the decline of communism, in the 1980s when the odds are nearly 3 times larger compared to the reference category.

The role of age and work experience: controlled effects

By the multivariate analysis in Table 2, for social origin, father's self-employed position is the only significant predictor of entry into entrepreneurship. If controlled for the other independent variables (education, age, work experience), service, intermediate or farmer class origin do not increase or decrease the odds of becoming self-employed compared to unskilled manual and agricultural labourer class origin. The characteristic *U*-shaped curve pattern of the reproduction of self-employment, however, persists: the effect of father's self-employed position declines first and increases thereafter over periods. In fact, the impact of father's self-employment becomes even stronger for the post-communist era than what it was without controls.

The growing influence of education on becoming self-employed also persists. The multivariate model reveals a reversed *U*-shaped curve for the vocational track of education. Compared to the pre-communist era, this was what new entrepreneurs needed to an increasing extent under the orthodox and reform-socialist period, in the 1950s, 1960s, and 1970s. For the time during the decline of communism, in the 1980s, the

academic track turns out to be a significant predictor. For the post-communist era, when the influence of self-employed class origin starts to return, the relative significance of education declines.

Table 2

Controlled effects of social origin and education on the odds of entry into self-employment
(logistic regression estimates)

Model (variable) statistics	Period of entry into self-employment				
	x–1949	1950–68	1969–79	1980–88	1989–x
Father's class [a]					
Service class					
B	.0437	- .1121	- .3671	.2463	.1559
S. E.	(.5508)	(.4893)	(.4375)	(.2610)	(.2080)
Exp(*B*)	1.0446	.8930	.6928	1.2793	1.1687
Intermediate class					
B	- .3443	- .2316	- .2690	.2072	.1873
S. E.	(.5365)	(.4168)	(.3108)	(.2026)	(.1564)
Exp(*B*)	.7087	.7932	.7641	1.2303	1.2060
Self-employed class					
B	1.7750***	1.1230***	.6016	.6947*	.9158***
S. E.	(.2364)	(.2618)	(.3253)	(.2769)	(.2248)
Exp(*B*)	5.9001	3.0741	2.0031	1.8250	2.4987
Farmer class					
B	- .1987	1834	- .0382	.2268	- .8249
S. E.	(.2666)	(.2446)	(.3244)	(.2761)	(.4252)
Exp(*B*)	.8198	1.2012	.9625	1.2545	.4383
Educational track [b]					
Vocational track					
B	.8666***	.9103***	1.2182***	.9199***	.4957**
S. E.	(.2370)	(.2243)	(.2703)	(.2180)	(.1684)
Exp(*B*)	2.3788	2.4850	3.3811	2.5089	1.6417
Academic track					
B	-1.0775	- .0482	.5226	.7180*	.2103
S. E.	(1.0135)	(.5343)	(.4791)	(.3088)	(.2640)
Exp(*B*)	.3404	.9529	1.6864	2.0502	1.2340
Age (time-varying)					
B	- .0525**	.0005	- .0432***	- .0335***	- .0500***
S. E.	(.0198)	(.0110)	(.0120)	(.0084)	(.0067)
Exp(*B*)	.9488	1.0005	.9577	.9670	.9512
Labour force experience (time-varying)					
B	- .4871	- .1792	.2303	.5894	.5989*
S. E.	(.3462)	(.4053)	(.4936)	(.4674)	(.2887)
Exp(*B*)	.6144	.8360	1.2590	1.8029	1.8200
Constant	-4.003***	-6.944***	-6.183***	-6.029***	-4.243***
	(.5126)	(.4385)	(.5501)	(.4863)	(.3427)
Log-Likelihood ratio test	118.88	40.13	67.23	69.84	129.72
Significance	.0000	.0000	.0000	.0000	.0000

[a] Reference category: unskilled agricultural worker.
[b] Reference category: no qualification.

In the multivariate perspective, the effect of age is significantly negative indicating that entry into entrepreneurship occurred at young age. This result is more pronounced for the pre- and post-communist periods. Relative labour force experience is significant only for the post-communist era when embeddedness into labour force and capital accumulation matter the most.

The effect of political credentials

As outlined in the conceptual part of the paper, we state that political credentials involve two parts. Members of Communist Party, on the one hand, can be rewarded (later perhaps penalized) for the fact that they signed up to the party and expressed a true (or hypocritical, we do not know) political loyalty to the communist system in this way. CP members, on the other hand, can use their membership to accumulate political capital, join to networks, gather and mobilize information, etc. This dual character is displayed in Table 3.

The upper panel of Table 3 displays the direct effects of political loyalty (a dichotomous measure for party membership) and that of accumulated political capital (measured by the ratio of years spent in the party and years of relative labour force experience upto entry into self-employment). The pattern reveals that the two kinds of operationalization have, indeed, different impacts on the odds of becoming entrepreneurs. Party membership has no significant effect on the transition to self-employment in the period of long fifties. A positive influence would have been a big surprise but our data do not indicate a negative effect either as we expected. The fact of CP membership (political loyalty), however, was already rewarded for entry into self-employment after 1968, in the reform-socialist period in Hungary. The time, however, one spent in the party (social/political capital accumulation) affects negatively the transition to entrepreneurship. This means, CP members who started their own business flying on the wings of the new economic reforms in Hungary were freshmen in the party but not orthodox communists who were already party members since the 1950s. In the reform-socialist period, entry into self-employment was partly an individual economic decision but it was a difficult administrative procedure as well. People had to apply for different permissions and party membership could be helpful. The situation changed for the 1980s when the nomenclature system disintegrated and a shift occurred from the politically rewarded selection of entrepreneurs to stronger market circumstances in respect of starting private business. Political loyalty for transition to entrepreneurship was not so important any more but the duration of party membership is also insignificant for this period. The accumulated political capital begins to be paid back and has a positive impact on entry into self-employment in the post-communist era. For this period, it is already obvious that the longer time one's labour force career is connected to party membership, the higher the probability is of becoming an entrepreneur. Accordingly, the simple fact of party membership was not enough for capital conversion but accumulated knowledge, information, network membership connected to the length of time one spent in the party turned out to be significant for starting private business after 1988. (In fact, the estimation for political loyalty in the most recent period is negative: reward is replaced by penalty, but it is not statistically significant.)

The lower panel of Table 3 displays the same effects, controlled (but not shown) for social origin, education, age and relative work experience. The pattern described earlier persists, moreover, the effects for the period of reform-socialism are even stronger. The influence of accumulated political capital for the post-communist era cuts back to less than half but it remains weakly significant.

Table 3

Effects of political credentials on the odds of entry into self-employment
(logistic regression estimates)

Model (variable) statistics	Period of entry into self-employment				
	x–1949	1950–68	1969–79	1980–88	1989–x
Direct effects					
Political loyality [a)]					
B	–	.3201	.3652*	.2578	- .1733
S. E.	–	(.6797)	(.1755)	(.4917)	(.4103)
Exp(*B*)	–	1.2628	1.4408	1.2940	.7726
Accumulated political capital [b)]					
B	–	- .4550	-1.7852*	- .7464	1.5841*
S. E.	–	(1.0052)	(.7705)	(.6988)	(.6584)
Exp(*B*)	–	.6345	.1678	.4741	4.4362
Constant	–	-6.527***	-6.582***	-5.901***	-5.004***
		(.0954)	(.0997)	(.0782)	(.0629)
Log-Likelihood ratio test	–	2.24	4.25	0.73	10.45
Significance	–	.2921	.0471	.3834	.0009
Controlled effects [c)]					
Political loyality [a)]					
B	–	.0706	.8127*	.0323	- .1862
S. E.	–	(.6849)	(.3998)	(.5131)	(.3950)
Exp(*B*)	–	1.0732	2.2539	1.0328	.8301
Accumulated political capital [b)]					
B	–	-1.2953	-2.7754*	- .4400	.6810*
S. E.	–	(1.1352)	(1.3386)	(.7267)	(.3399)
Exp(*B*)	–	.2738	.0623	.6440	2.0571
Constant	–	-6.978***	-6.346***	-6.094***	-4.335***
		(.4376)	(.5581)	(.4911)	(.3479)
Log-Likelihood ratio test		44.07	73.77	71.05	134.71
Significance		.0000	.0000	.0000	.0000

[a)] It is a dummy variable indicating whether one is the member of Communist Party or not (time-dependent variable), for the period 1989–1992 it means the party membership in 1988.
[b)] It is measured by the ratio of time interval one spent in the Communist Party to the duration of cumulated work experience.
[c)] For age, work experience, education, and social origin.

Trends for historical differences: continuities and discontinuities

Models estimated for the different historical periods brought results on varying strength of the explanatory variables on the odds of transition into self-employment. The spline models add to these results further information on the continuity and discontinuity of trends over historical periods, i.e. how the determination of entry into entrepreneurship varies from one period to the next one.

Table 4

Selection among different spline models
(Best models are shaded)

Model description	*F*-statistics	Degree of freedom	Adjusted R^2
Effect of self-employed origin			
continuity (model with knots)	3.90*	5	34,2
discontinuity (all breaks between the periods)	1.99	9	24,2
Effects of academic track			
continuity (model with knots)	25.74*	5	70,4
discontinuity (all breaks between the periods)	15.69*	9	71,8
discontinuity in 1968	35.78*	6	74,2
Vocational track			
continuity (model with knots)	1.49	5	4,5
discontinuity (all breaks between the periods)	6.07*	9	12,6
Political loyalty [a)]			
continuity (model with knots)	0.66	4	1,3
discontinuity (all breaks between the periods)	1.10	7	1,7
discontinuity in 1968	3.52*	5	5,8
Political capital [a)]			
continuity (model with knots)	18.42*	4	62,3
discontinuity (all breaks between the periods)	21.01*	7	74,9
discontinuity in 1968	28.01*	5	79,1

Significance: * p < .05
[a)] The pre-communist era is omitted from the models. This is the reason why the degree of freedom for the baseline models is 4 and not 5.

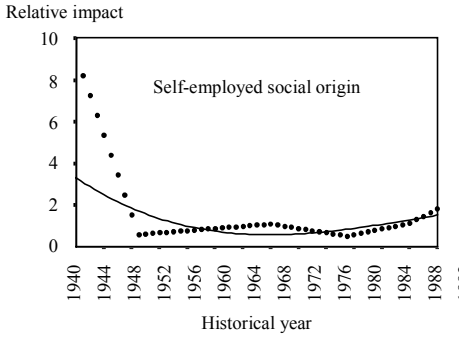
Table 4 informs about the various spline models fitted on the data testing whether the changes are continuous or discontinuous. For self-employed origin, the model assuming continuity turned out to be the best. This does not mean, of course, that there is no change in the effect of social origin on entry into entrepreneurship over time. However, the changes are more gradual, evolutionary and the assumption of strong discontinuity between the periods is not supported. In all other cases of independent variables, the model supposing historical discontinuities between the periods fits better than the model of continuous change. With the exception of the impact of vocational training, the changes in the effect of the other explanatory variables on the odds of becoming an entrepreneur turned out to be discontinuous only for the break between the second and third periods, in 1968.

Results of second level analysis with spline regressions are displayed in Figures 1-3. The dotted lines on the figures display the trends for the different historical periods as calculated by the method, the continuous line is a fitted curve for the whole interval between 1940 and 1992, the period that our data cover in the research. The effects displayed in the figures are, controlled for the other explanatory variables.

F-statistics in Table 4 indicate that changes in the effect of self-employed origin are not discontinuous. This holds for the break between the first and second period too representing the communist take-over in 1949.[5]

[5] Assuming discontinuity for time-point in 1949 results in a model with *F*-statistics of 3.16 with 6 degree of freedom (significant at .5 level) but the adjusted R^2 value is 31.7, smaller than 34.2 percent of the model of continuity.

Figure 1. Historical changes in the effect of self-employed origin on entry into self-employment



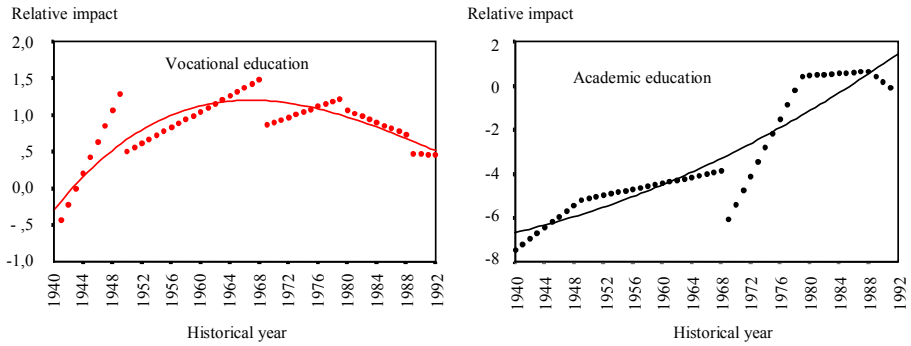
Indeed, Figure 1 reveals a surprising finding; the reproduction of self-employment has steeply dropped during the 1940s, in the era before and during World War II. Accordingly, it is not the communist take-over in 1949 that produced a dramatic change in the inheritance of self-employment. Instead, we are probably faced here with a strong historical effect of World War II, perhaps also a consequence of historical events that happened to Jews at that time, regarding that Jews were overrepresented among entrepreneurs in Hungary in the pre-communist era. Most probably, there are different demographic effects in the background of this finding as well: mortality caused by the war; selective mortality influencing our sample (retrospective job history data of a population sampled in 1992 are used); and an impact of out-migration which occurred between 1946 and 1949.[6]

The effect of father's self-employed position on entry into entrepreneurship became weak throughout the subsequent periods after 1949 but a slight fluctuation can be observed. It seems that the impact started to increase already in the 1980s and this tendency continued in the post-communist period. Thus, the long-term trend displays the *U*-shaped curve mentioned before but the inheritance of entrepreneurship is far from being so strong as what it used to be 50 years ago.

Figure 2 show the results of spline regression analysis with respect to education. Vocational track and academic track differ in respect of historical continuity. The previous one is completely discontinuous; its effect varies strongly over periods as the best model reveals in Table 4. Academic track, however, displays less discontinuity; changes between periods are mostly continuous with the exception of the one in 1968. The impact of vocational training on becoming self-employed has increased in the first three periods. The rise was definitely steeper in the pre-communist era and the growing trend is less steep for the second and third periods. The analysis reveals the expected discontinuity for 1949 and 1968. The effect of vocational education reached its maximum at the end of the 1960s. The discontinuity between the 1970s and 1980s is smaller. By the time communism started to decline, the 1980s, however, the effect of vocational education had already decreased and the relative influence of human capital investments is even smaller for the post-communist era. Accordingly, the long-term trend fitted on the data displays a reversed *U*-curve.

[6] Since our analysis is based on retrospective job histories collected in 1992, results regarding the historical period before 1949 should be handled with large caution.

Figure 2. Changes in the effect of vocational and academic education on entry into self-employment



As far as the impact of academic education on entry into self-employment is concerned, a really strong rise can be observed during the reform-socialist period after 1968. In the earlier two periods, accumulated cultural capital was not a requirement for becoming self-employed. In fact, the relative impact of academic education was negative in the first two periods. A significant discontinuity can be observed for 1968. The steep rising trend in the 1970s, however, did not continue in the 1980s when the effect of academic education became stable but weak. In addition, data indicate even a slight decline in the influence of academic education in the post-communist era. The relative decrease in the effect of education can relate to the increase of the impact of social origin. These latter changes, however, are rather continuous. Thus, the long-term trend that fits the data indicates a growing tendency for the influence of academic education on the transition to self-employment.

Figure 3. Changes in the effect of political loyalty and self-employed social origin on entry into self-employment

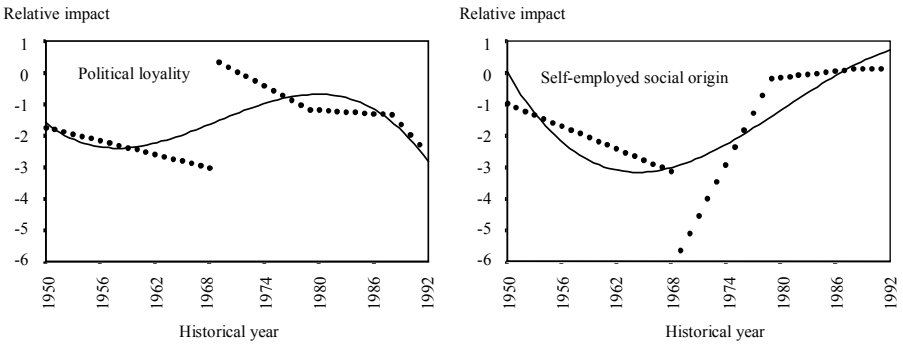


Figure 3 display the historical trends for the two types of political credentials. (The pre-communist era is omitted from the models.) In both cases, the spline regression method revealed significant discontinuity only for 1968, while the changes are milder and continuous for the other break points between the periods. The effect of political loyalty on transition into entrepreneurship was negative in the long fifties, party mem

bership decreased the odds of entry into self-employment and this impact even increased during the period. Results indicate strong discontinuity between the periods before and after 1968. In the beginning of the reform-socialist era political loyalty influenced entry into self-employment positively but the trend declined during the period and turned to negative. In the 1980s the effect of party membership controlled by the other predictors was weak and negative. Finally, the influence of (former) party membership drops for the post-communist era, political loyalty decreases the probability of becoming self-employed to a great extent. Consequently, the curve of the long-term trend for political loyalty reveals a lying *S*-shape: a decline is followed by an increase and followed by a decline again.

Just like in the case of political loyalty, the effect of accumulated political capital on becoming self-employed is negative and this impact increased during the era of orthodox communism in Hungary. The discontinuity in 1968 is sharp in this respect as well. The influence of the duration of time spent in the party on transition to entrepreneurship showed steep rise in the reform-socialist period after 1968. The accumulated information, connections in the party became positive predictors of self-employment for the 1980s, though the increase of their influence was not so steep anymore during the decline of communism. The impact of accumulated political capital on entry into self-employment continues to grow slightly for the post-communist period, between 1989 and 1992. All in all, the long-term trend displays a *U*-shaped curve, a decline is followed by an increase.

5. Conclusion

The paper analyzed transition into entrepreneurship in Hungary in a historical perspective. Five historical periods have been specified separately assuming that they express certain discontinuities in Hungarian history and consequently social composition and selection mechanisms of entrepreneurs differ for these intervals.

The research supported most of the hypotheses. In the light of Treiman's (1970) industrialization thesis, the intergenerational reproduction of entrepreneurship (ascription) displays the expected declining tendency, while the effect of education (achievement) shows an increase until the beginning of the 1980s. Thereafter, however, a return can be observed producing a *U*-shaped and a reversed *U*-shaped curve, respectively. In case of the effect of education, this reversed *U*-curve is more pronounced for human capital investments (vocational track) than cultural capital investments (academic track). Distinguishing between vocational and academic tracks made it clear that returns to investment into education varied for the different historical periods in the sense of what kind of skills, knowledge, expertise and capabilities someone could accumulate and utilize. The *U*-shaped curve of intergenerational reproduction of self-employment seems to support the interrupted embourgeoisement thesis by Szelényi (1988) and Szelényi and Manchin (1989), and is in line with the previous findings on the topic by Ganzeboom, Luijkx and Róbert (1991).

As far as political influences are concerned, Communist Party membership (as an indicator of political loyalty and as a basis for rewards) affects entry into self-employment less than expected. The negative impact of CP membership found by Osborn and

Slomczynski (1997) in their analysis is not present in Hungary. However, we found more marked influence of accumulated political capital in line with Coleman's (1990) theory on social capital which means in this particular case knowledge, information and network assets accumulated in the party.

The spline method verified our main assumption about discontinuity among historical intervals for becoming self-employed in Hungary. The pattern of determination of transition into entrepreneurship varied from period to period. One of the most important findings in historical perspective shows that a considerable decline in the reproduction of self-employed position occurred during World War II, and not after the communist take-over. Another meaningful result of the analysis is the radical increase in the effect of cultural and political assets on entry into entrepreneurship after 1968. Comparing Figures 2 and 3 we can observe a very similar pattern of these effects. For the reform period of communism, an academic type of education became an increasingly important precondition of transition to self-employment, and – at the same time – new entrepreneurs started to use party membership as a stepping-stone to a greater extent. The results of the analysis contribute to the debate on the political capitalism thesis, the reconversion of political capital into economic one (Hankiss, 1990; Staniszkis, 1991), and show that accumulated assets connected to party membership can be utilized for starting private business after the collapse of communism. However, it is an even more important lesson from this study that this process started already at the end of the 1970s and became general in the 1980s in Hungary.

Separation of political loyalty and accumulated political capital helped to display a more refined picture about the influence of party membership. Consequently, our results differ in this respect from those of other studies which measured only political loyalty using a dummy variable for CP membership and found smaller impact of party membership. With respect to the effect of political capital on becoming self-employed, the change of mechanism over time reveals the following shifts: *1*. Party membership as the expression of loyalty started to influence entry into entrepreneurship in the 1970s but the role of political loyalty had a decreasing trend, while that of accumulated political capital had an increasing trend during the period of reform-socialism. *2*. Both accumulated cultural and social capital (academic educational track and duration of party membership) turned out to be crucial predictors of transition into self-employment during the decline of communism, in the 1980s while political loyalty seemed to be less substantial. *3*. Former political loyalty seemed to be somewhat penalized in the post-communist era after 1988 for new entrepreneurs while both their cultural and political investments continued to have returns.

Opening a broader focus on transition to self-employment rather than investigating only the era of post-communist transformation is another important feature of the analysis. This provides an opportunity to answer the question on the evolutionary versus revolutionary character of historical changes raised at the beginning of the paper. Based on long-term trends derived from the research design applied, we can conclude that the evolutionary theory fits better the Hungarian situation than the revolutionary one. In fact, on the basis of our results from the spline regression analysis, we state that changes that occurred in 1968 were 'more revolutionary' for entry into self-employment than those in 1989.

APPENDIX I

Descriptive statistics for individuals becoming self-employed in different historical periods

Variables	Period of entry into self-employment					Total
	x–1949	1950–68	1969–79	1980–88	1989–92	
Father's occupational class (percent)						
service	3.5	4.3	6.4	11.0	11.5	8.5
intermediate (routine non-manual, skilled worker)	3.5	5.3	12.8	19.8	24.1	16.0
self-employed	42.1	24.5	12.8	8.1	7.9	16.1
unskilled, agricultural manuals	26.3	35.1	55.2	49.5	52.5	45.8
farmers	24.6	30.8	12.8	11.6	4.0	13.6
total	100.0	100.0	100.0	100.0	100.0	100.0
Educational track (percent)						
no qualification	73.2	60.8	26.5	25.0	24.2	37.5
vocational track	25.2	36.3	70.6	67.2	69.7	57.6
academic track	1.6	2.9	2.9	7.8	6.1	4.9
total	100.0	100.0	100.0	100.0	100.0	100.0
Age at becoming self-employed (mean)	23.5	30.1	29.2	33.0	32.0	30.2
Relative labour-force experience (mean)	.56	.61	.74	.77	.78	.71
Communist Party membership before entry into self-employment (percent)	–	4.9	5.9	8.9	2.7	4.6
Proportion of time spent in the CP related to the duration of the total relative labour-force experience (mean)	–	.58	.53	.58	.60	.58
Number of persons entering into self-employment	127	102	102	180	264	775

APPENDIX II.

In general, survey data are recorded in a rectangular file format in which rows represent the *subjects* and columns indicate *variables* related to subjects. In order to use event-history methods this rectangular file must be converted into a special data-file, the name of which is *person-period file*. In such a file the observation unit is not the individual any more but the discrete-time points at which the individuals are at risk of experiencing the event of interest. Since this analysis investigates events which can be experienced during the whole occupational history, every discrete-time point between entry into labour force and the time of survey is included in the data-file. There are two kinds of variables: *1*) time-constant variables (their values do not vary over time) and *2*) time-varying variables (their values are functions of time). In the following a simplified illustration of the structure of the data-set is presented.

Idnum	Year	Age	Education	Self
1	1985	25	2	0
1	1986	26	2	0
1	1987	27	2	0
1	1988	28	2	0
1	1989	29	2	1
1	1990	30	2	.
1	1991	31	2	.
1	1992	32	2	.

The example shows records of one individual identified by number 1. This respondent is observed for 8 years from 1985 to 1992. The natural starting point of the analysis is the year of his entry to the labour market. At this time the individual was 25 years old and the value of the variable expressing age is increasing as he gets

older. Respondent's highest educational attainment is university (academic track). He became self-employed in 1989. This variable has a value of 0 as long as the person is not self-employed and it turns to 1 in the year when he enters into self-employment. The variable has no value during the years when respondent is self-employed because during this period he is not at risk of becoming self-employed.

APPENDIX III.

Statistical appendix to the application of spline regression methods

To assess how the effect of different attributes of individuals on the odds of becoming self-employed varies over time, a fixed-effects model of trends is estimated (*Smith*, 1979; *Greene*, 1993). This model posits discontinuities in the effect of individuals' traits at the different points in the last decades.

To represent this pattern of trend, the following model is estimated:

$$\begin{aligned} b_0 = {} & \alpha^0 + \beta^0 \text{YEAR, if YEAR} < 1950, \\ & \alpha^1 + \beta^1 \text{YEAR, if YEAR} >= 1950 \text{ and YEAR} < 1968, \\ & \alpha^2 + \beta^2 \text{YEAR,if YEAR} >= 1969 \text{ and YEAR} < 1979, \\ & \alpha^3 + \beta^3 \text{YEAR,if YEAR} >= 1980 \text{ and YEAR} < 1988, \\ & \alpha^4 + \beta^4 \text{YEAR, if YEAR} >= 1989, \end{aligned} \qquad /1/$$

where b_0 is the single-year estimates of the impact of origin on the likelihood of becoming self-employed, and YEAR is the single historical year. The thresholds (knots) which represent the discontinuities of historical trend can be defined by using dummy variables:

$d_1 = 1$, if YEAR >= t_1 otherwise it sets 0,
$d_2 = 1$, if YEAR >= t_2 otherwise it sets 0,
$d_3 = 1$, if YEAR >= t_3 otherwise it sets 0,
$d_4 = 1$, if YEAR >= t_4 otherwise it sets 0,

where $t_1 = 1950$ and $t_2 = 1969$ and $t_3 = 1980$ and $t_4 = 1989$.

Combining the above outlined equations:

$$\begin{aligned} b_0 = {} & \beta_1 + \beta_2 \text{YEAR} + \gamma_1 d_1 + \delta_1 d_1 \text{YEAR} + \gamma_2 d_2 + \delta_2 d_2 \text{YEAR} + \\ & + \gamma_3 d_3 + \delta_3 d_3 \text{YEAR} + \gamma_4 d_4 + \delta_4 d_4 \text{YEAR} + \varepsilon. \end{aligned} \qquad /2/$$

The slopes of the five time segments are as follows: β_2, $\beta_2 + \delta_1$, $\beta_2 + \delta_1 + \delta_2$, $\beta_2 + \delta_1 + \delta_2 + \delta_3$ and $\beta_2 + + \delta_1 + \delta_2 + \delta_3 + \delta_4$.

To make this function continuous, the segments are required to join at the knots:

$\beta_1 + \beta_2 t_1 = (\beta_1 + \gamma_1) + (\beta_2 + \delta_1) t_1$, and
$(\beta_1 + \gamma_1) + (\beta_2 + \delta_1) t_2 = (\beta_1 + \delta_1 + \delta_2) + (\beta_2 + \delta_1 + \delta_2) t_2$, and
$(\beta_1 + \gamma_1 + \gamma_2) + (\beta_2 + \delta_1 + \delta_2) t_3 = (\beta_1 + \gamma_1 + \gamma_2 + \gamma_3) + (\beta_2 + \delta_1 + \delta_2 + \delta_3) t_3$ and
$(\beta_1 + \gamma_1 + \gamma_2 + \gamma_3) + (\beta_2 + \delta_1 + \delta_2 + \delta_3) t_4 = (\beta_1 + \gamma_1 + \gamma_2 + \gamma_3 + \gamma_4) + (\beta_2 + \delta_1 + \delta_2 + \delta_3 + \delta_4) t_4$.

These are the linear restrictions on the coefficients. Collecting these terms:

$$\begin{aligned} & \gamma_1 + \delta_1 t_1 = 0 \Rightarrow \gamma_1 = - \delta_1 t_1, \\ & \gamma_2 + \delta_2 t_2 = 0 \Rightarrow \gamma_2 = - \delta_2 t_2, \\ & \gamma_3 + \delta_3 t_3 = 0 \Rightarrow \gamma_3 = - \delta_3 t_3, \\ & \gamma_4 + \delta_4 t_4 = 0 \Rightarrow \gamma_4 = - \delta_4 t_4. \end{aligned} \qquad /3/$$

Inserting these in equation /2/:

$$\begin{aligned} b_0 = {} & \beta_1 + \beta_2 \text{YEAR} + \delta_1 d_1 (\text{YEAR} - t_1) + \delta_2 d_2 (\text{YEAR} - t_2) + \delta_3 d_3 (\text{YEAR} - t_3) + \\ & + \delta_4 d_4 (\text{YEAR} - t_4) + \varepsilon. \end{aligned} \qquad /4/$$

Because discontinuities are assumed in the effect of origin on individual's chance to become self-employed over historical time, the dummy variables representing interruptions are added to this model. Thus, the final equation is:

$$b_0 = \beta_1 + \beta_2 \text{YEAR} + \gamma_1 d_1 + \delta_1 d_1 (\text{YEAR} - t_1) + \gamma_2 d_2 + \delta_2 d_2 (\text{YEAR} - t_2) + \gamma_3 d_3 + \\ + \delta_3 d_3 (\text{YEAR} - t_3) + \gamma_4 d_4 + \delta_4 d_4 (\text{YEAR} - t_4) + \varepsilon. \qquad /5/$$

The identical models are constructed to estimate a historical trend of the effect of other characteristics of individuals on the odds of becoming self-employed.

The coefficients formulated this way indicate how the effects of individuals' attributes change over time. This sort of model is known as the spline model, and its estimates are derived from the OLS regression (detailed discussion of this method can be found in *Smith*, 1979). The most interesting property of this approach is that it can represent the successive time segments by separate functions, thus if the data are believed to behave in a different way in the different time periods, we can fit several possibly different lines or curves to the data.

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