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Prolific Inventor Productivity and Mobility: A Western/Asian com-parison. Evidence from US Patent Data for 12 Countries[1]

Abstract

This paper provides new insights into the role of individual inventors in the innovation process. Individuals are central in this creative process because innovation is not simply a product of firms and organizations; it requires individual creativity (Rothaermel and Hess, 2007). We focus our analysis on prolific *inventors (a rich sub category of inventors) because they contribute so hugely to national invention totals (Le Bas* et al.*, 2010) and tend to produce inventions that have more economic value (Gambardella* et al.*, 2005; Gay* et al.*, 2008). Converging empirical evidence has established the significance of prolific inventors (Ernst* et al.*, 2000). Previous studies of prolific (or "key") inventors have focused more on the firms in which they work or on the industries in which the firms operate. Narin and Breitzman's (1995) seminal work on the topic is based on an analysis of only four firms in a single sector and a recent paper by Pilkington et al. (2009) uses only two firms. In contrast to these studies on small samples, we use a very large data set which includes thousands of inventors in thousands of firms from several countries.*

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1. Introduction

The core of the research is to investigate the role that mobility plays in the behaviour of prolific inventors. Labour mobility is a means for transferring knowledge (and newly created knowledge in particular) across countries and region (Saxenian, 2006). In general considerate seems that interregional mobility is weak. Breschi et al. (2010) find that inventors diffuse knowledge across social networks within regions but not across regions. Felsenstein, (2011) concludes that inventor mobility provides support for knowledge spillovers across agents and regions. The knowledge spillovers are important determinants of regional economic growth. Our approach is a little different: our goal is not to assess the rate and the direction of knowledge spillovers. Instead we attempt to account for the determinants of inventor mobility and measure its impact on inventor productivity. The scale, determinants and effects of inventor mobility have been analysed by Hoisl (2007 and 2009), Schankerman *et al.* (2006), Tratjenberg (2004) and Tratjenberg *et al.* (2006) among others. Hoisl, using European patents and a survey of 3049 German inventors, finds that an increase in inventor productivity, measured as the number of patents per inventor, decreases the number of moves. She tests the effect of inventor productivity on inventor mobility and finds that *more productive inventors are not more mobile*. For Hoisl (2007), a move increases productivity but an increase in productivity decreases the probability of observing a move. Schankerman *et al*. (2006) have studied the mobility of inventors using patents in the software industry in the US. Their findings are in accord with Hoisl's: they show that the very productive inventors have a decreasing probability of moving between assignees as their careers progress (Schankerman et *al*. 2006; 26).

We focus our research on prolific inventors. Previous papers have justified the identification of prolific inventors as those who have been issued at least 15 patents (Le Bas et al., 2010; Latham et al. 2011; Latham et al. 2012). In those papers we generally hypothesized that mobility of prolific inventors, as measured by their average numbers of inventions per year over their active inventive lives, affects both their productivity and the value of their inventions, measured as the numbers of citations a patent receives in the years after it is issued, positively. Our previous papers present evidence supporting these hypotheses for the five largest countries in terms of technological activity (the US, Japan, Germany, the UK, and France). Our data come from patents filed by inventors from each of the countries in the US Patent and Trademark Office during the period from 1975 to 2010. While we focus on the activities of prolific inventors, our data set includes all inventors so the unique characteristics of prolific inventors can be identified.

In Le Bas et al. (2010), Latham et al.(2011), and Latham et al.(2012) we extended the literature to prolific inventors in multiple countries, using alternative indicators for different kinds of mobility. In these papers we measure inventor mobility in two dimensions: across companies (“interfirm mobility”) and across regions (“geographic mobility”). For each country we estimate equations for productivity, value and mobility. Our results for the determinants of inventor productivity, mobility and invention value in Germany, France, and the UK show (Latham *et al.* 2011): 1) In all three countries productivity is positively related to inter-firm mobility and temporal concentration of patenting is also positively related to productivity. However, for France, productivity is negatively related to geographic mobility, 2) For all three countries the value of inventions (as measured by citations per patent) is positively related to productivity. For UK and Germany the equations show consistent positive and significant relationships between value and inter-firm mobility (by contrast the coefficient is not significant for France), 3) The mobility equations show that productivity is positively associated with mobility and value is negatively associated with it. Inventor technological specialization is also negatively related to inter-firm mobility while the temporal pattern of inventing seems to be unrelated.

This paper extends the previous results in an important dimension. By focusing on Asian countries (China, Japan and Korea and Taiwan) in addition to North America and Western Europe, we are able to test whether the determinants and the effects of inventor mobility are the same in Asia as they are elsewhere. In the two last decades the three main Asian countries after Japan (China, Korea, and Taiwan) have caught up with the rest of the developed world by targeting the technologically most progressive industries (Fagerberg and Godinho 2006), and by creating R&D industrial clusters of sufficient size. They have established and developed significant domestic capabilities, first for imitation and then for innovation (Ernst, 2005; Lundvall et al., 2009). They have developed coherent national systems of innovation and are becoming important international contributors to innovation (Dodgson and Gann 2010). As a consequence, populations of researcher-inventors (including highly productive groups of prolific inventors) have been established in these countries.

2. Data, Variables and Models Data

Our data are from the NBER Patent Data Base (http://www.nber.org/patents/) which contains data for more than 5million patents granted to more than 2 million inventors by the USPTO from 1975 to 2010. For this paper we extract data for patents issued to inventors from eleven countries. For each patent we obtain the application and grant dates, the inventor's name and city of residence), assignee name and location, the US and international technical classifications, citations of prior patents, and the number of separate technical claims the patent makes. The data are compiled for individual inventors; we focus on as the prolific inventors, those who with at least 15 patents[2].

Primary Variables

Inventor productivity (PATENTS_PER_YEAR) is our most important variable**.** The simplest measure of an inventor's productivity is the number of patents he has obtained over a career. We adjust this for his career length to obtain the average number of patents per year as our productivity variable.

Value of inventor patents (CITATIONS_PER_PATENT)**.** For large patent data sets, many studies have accepted the number of citations as a proxy for the value of a patent (e.g., Gay and Le Bas 2005). The value of all of an inventor's patents can then be measured as the total number of citations they have received. The value of an inventor's patents might alternatively be measured as (a) his average number of citations per patent, (b) his average number of citations per year or (c) his average number of citations per patent per year, but we use the total number of career citations because it can be interpreted as capturing the concept of an inventor's potential.

Inventor technological specialization (TECH_CAT_CONC). Inventors may patent inventions in a few technological domains or in many. A small number of different technological fields might be a good proxy for inventor technological specialization. We use the Herfindahl-Hirschman Index (HHI) applied to the distribution of the inventor's for technological fields because of its emphasis (by squaring each field's percentage) on higher concentrations. We implemented the HHI at the level of the NBER's six broad technological fields. **Inter-firm mobility** (FIRMS_MOVES)**.** A simple way of identifying inter-firm mobility is to count the number of firms for which an inventor has worked and assume that the number of moves is this number minus one. . When it is the dependent variable we use FIRMS_MOVES/ CAREER_DURATION as a measure of the scale of inventor mobility over his career.

Regional and international mobility. The same principle applies for the geographic mobility. RES_MOVES_CITY describes the numbers of moves

[2] In some papers we have defined prolific inventors as those in the top 1 percent or top 5 percent of inventors by the number of patents in their corresponding countries.

between cities. RES_MOVES_INTL gives a measure of the scale of the inventor's international mobility. International moves do not duplicate inter-city moves.

Control Variables

In our dataset we observe that there are some inventors with careers of patenting that span many years and others whose patents are all produced in a very short period. To account for this variation we measure the duration of an inventor's career (years from first to last invention, inclusive= CAREER_DURATION). We wish to control for another phenomenon happening through an inventor career. When we look at the data we observe that inventors do not invent continuously. They seem interrupt the invention activity their activity over a more or less long time period. The variable is measured as the maximum number of years between two consecutive patent applications: CAREER_TIME_GAP. We also observe that the career patterns of inventing are highly variable from prolific inventor to prolific inventor with some inventors having most patents at the beginning, some having most at the end, some showing a pattern of increase followed by decrease and still others having multi-modal distributions. To determine whether particular types of patterns are associated with our measures of productivity, mobility and value, we create measures of the temporal skewness and peakedness (kurtosis) of each inventor's own temporal patenting distribution (the variables are respectively PATENT_TIME_SKEWNESS, PATENT_TIME_KUR). We observe from our data and for particular inventors a dispersion of patenting activity over the inventor's career. We decide to control for this phenomenon. The measure we use in our analysis is the inverse of dispersion; it is the Herfindahl-Hirschman Index for the time pattern of the number of patents in each year (PATENT_TIME_HHI. Hoisl (2007) uses a "time concentration" variable similar to ours. In technological fields for which patenting is an effective means of protecting inventions and where several patents are necessary for protecting a single invention inventors will tend to have more patents than in fields where these conditions do not hold. As a consequence inventor productivity differs across technological fields. We control for these differences by using dummy variables for the primary technological field in which each inventor patents. The control variables are TECH_CAT_i, where i = 1, …,6 for (1) Chemicals, (2) Computers & Communications, (3) Drugs & Medical, (4) Electrical & Electronic, (5) Mechanical and (6) Other (the omitted category in the regressions).

The way in which we deal with the *career truncation problem* are discussed in Latham et al. (2011)

In this paper our interest is in the relationships between interfirm and interregional (inter-city) mobility and the productivity of inventors. We estimate the parameters of three regression models for each country. The first model assesses the impacts of some determinants of inventor productivity (included mobility); the second model accounts for the scale of the inventor's interfirm mobility; and Table 1 the third examines the determinants of inter-city mobility. The dependent variables for the first and second models (patents per year and moves per year) are quantitative continuous variables so OLS is the method of estimation. For third model, where the dependent variable is a simple count, we fit a Poisson model. The parallel specifications of the equations are the result primarily of the limitations of our data. For example, while we are well-aware that there are both theories and empirical studies of productivity that highlight the roles of inventors' education and training, the capital available to them, the nature of the rewards system and the role of institutional constraints such as retirement ages and the nature of the patent system, we do not have those variables available to us. Consequently our work is not in the framework of those that attempt to propose and test comprehensive theories of the determinants of inventor productivity and mobility. Instead ours is a partial but coherent approach. We examine the ways in which productivity and mobility influence each other given our limited range of knowledge about other variables.

Table 1. Determinants of inventor productivity

Dependent Variable: PATENTS_PER_YEAR	USA	Canada	UK	France	Germany	Italy	Finland	Netherlands	Japan	Korea	Taiwan	China	All
	Coef.												
RES_MOVES_CITY	-0.074 ***	-0.004	0.000	-0.011	-0.047 ***	0.012	0.002	0.077 *	-0.016 ***	0.079 ***	-0.029 *	-0.161 *	-0.033 ***
RES_MOVES_INTL	0.006	-0.015	0.004	0.032	0.085 ***	0.013	0.116	-0.220 **	0.104 ***	-0.231 ***	0.215 ***	0.170	0.078 ***
CITATIONS_PER_PATENT	-0.006 ***	-0.005	-0.002	-0.013 ***	-0.023 ***	-0.011 *	0.001	-0.011 ***	0.001	-0.032 ***	0.018 *	0.009	-0.005 ***
TECH_CAT_CONC	0.192 ***	0.178 **	0.203 ***	0.230 ***	0.257 ***	-0.068	0.293 ***	0.076	0.218 ***	0.301 ***	0.427 ***	0.431	0.208 ***
FIRM_MOVES	0.069 ***	0.046 ***	0.036 ***	0.054 ***	0.052 ***	0.074 ***	0.062 ***	0.074 **	0.034 ***	0.025 ***	0.046 ***	0.112 ***	0.042 ***
PATENT_TIME_HHI	2.837 ***	3.731 ***	2.453 ***	2.059 ***	2.597 ***	3.220 ***	2.173 *	5.702 ***	1.697 ***	1.273	5.519 ***	3.658	2.706 ***
PATENT_TIME_SKEW	0.038 ***	-0.067	0.055 **	-0.018	0.020 *	0.009	-0.055	0.070	0.013 *	0.107 **	0.075	0.132	0.018 ***
PATENT_TIME_KURT	0.083 ***	0.046 ***	0.039 ***	0.079 ***	0.082 ***	0.061 ***	-0.002	-0.012	0.087 ***	0.125 ***	0.079 ***	0.027	0.088 ***
CAREER_DURATION	-0.029 ***	-0.027 ***	-0.042 ***	-0.035 ***	-0.020 ***	-0.035 ***	-0.047 ***	-0.052 ***	-0.021 ***	-0.039 ***	-0.028	-0.150	-0.025 ***
CAREER_TIME_GAP	-0.150 ***	-0.179 ***	-0.090 ***	-0.157 ***	-0.189 ***	-0.147 ***	-0.121 ***	-0.084 ***	-0.159 ***	-0.273 ***	-0.252 ***	-0.096	-0.169 ***
TECH_CAT_1	0.063 ***	0.324 ***	0.003	0.158 ***	0.208 ***	-0.261 **	-0.243	-0.260 *	-0.044 **	0.064	-0.285 *	-0.877	0.041 ***
TECH_CAT_2	0.195 ***	0.177	0.149 **	0.442 ***	0.148 ***	0.284 *	0.164	0.137	0.148 ***	0.419 ***	-0.050	-0.172	0.22 ***

Dependent Variable: PATENTS_PER_YEAR	USA	Canada	UK	France	Germany	Italy	Finland	Netherlands	Japan	Korea	Taiwan	China	All
	Coef.												
TECH_CAT_3	-0.107 ***	-0.198 *	-0.158 **	0.239 ***	0.095	-0.342 **	-0.453	-0.48 ***	-0.127 ***	0.021	-0.329	-1.657	-0.056 ***
TECH_CAT_4	0.270 ***	-0.053	0.023	0.159 ***	0.099 **	-0.087	-0.026	0.160	0.126 ***	0.209 *	0.253 **	-0.373	0.235 ***
TECH_CAT_5	0.047 **	0.076	0.008	0.105 *	0.050	0.041	0.142	0.714 ***	0.083 ***	0.571 **	0.094	0.649	0.061 ***
C	2.296 ***	2.147 ***	2.184 ***	2.247 ***	2.392 ***	2.175 ***	2.132 ***	1.821 ***	2.335 ***	3.059 ***	2.347 ***	4.369 ***	2.371 ***
R-squared	0.348	0.409	0.487	0.482	0.358	0.492	0.613	0.528	0.669	0.818	0.432	0.333	0.443
Number of Observations	54798	1111	1744	1847	7910	842	289	499	29225	2323	1803	157	106223

Notes: Sample: All prolific (15+) inventors. ***p-value<=0.01, **p-value<=0.05, *p-value<=0.10

Source: own calculations.

Table 2. Determinants of inventor interfirm mobility

DependentVariable:FIRM_MOVES/CAREER_DURATION	USA	Canada	UK	France	Germany	Italy	Finland	Netherlands	Japan	Korea	Taiwan	China	All
	Coef.												
PATENTS_PER_YEAR	0.136 ***	0.095 ***	0.116 ***	0.155 ***	0.092 ***	0.153 ***	0.349 ***	0.100 ***	0.531 ***	0.601 ***	0.262 ***	0.092 **	0.296 ***
CITATIONS_PER_PATENT	0.000	-0.001	-0.001	0.002 *	-0.001	0.006 **	0.002	-0.004 ***	-0.009 ***	0.01 *	-0.024 ***	-0.013	-0.002 ***
DependentVariable:FIRM_MOVES/CAREER_DURATION	USA	Canada	UK	France	Germany	Italy	Finland	Netherlands	Japan	Korea	Taiwan	China	All
	Coef.												
TECH_CAT_CONC	-0.231 ***	-0.184 ***	-0.174 ***	-0.088 ***	-0.245 ***	-0.053	-0.097	-0.073	-0.360 ***	-0.460 ***	-0.499 ***	-0.565 **	-0.371 ***
PATENT_TIME_HHI	-0.758 ***	-0.303	-0.608 ***	-0.035	-0.216 *	-0.870 ***	-1.732 ***	-0.872 **	-0.925 ***	-1.207 **	-1.051 *	-0.199	-0.902 ***
PATENT_TIME_SKEW	-0.026 ***	0.033 **	-0.021 ***	0.008	-0.021 ***	-0.009	0.054 **	-0.020	-0.038 ***	-0.042	-0.112 ***	-0.076	-0.041 ***
PATENT_TIME_KURT	0.012 ***	0.021 ***	0.007	0.009	0.016 ***	0.003	0.035 **	0.015 *	-0.002	-0.025 *	0.014	0.013	0.015 ***
CAREER_DURATION	0.007 ***	0.007 **	0.006 ***	0.008 ***	0.007 ***	0.003	-0.001	-0.001	0.040 ***	0.067 ***	0.081 ***	0.078	0.028 ***
CAREER_TIME_GAP	-0.020 ***	-0.019 ***	-0.016 ***	-0.010 **	-0.025 ***	-0.004	0.003	-0.008	-0.007	0.014	-0.120 ***	-0.131 **	-0.031 ***
TECH_CAT_1	0.007	-0.042	-0.037	0.050 **	0.027 **	0.078 **	0.122	-0.070	0.081 ***	-0.102	-0.122	0.156	0.029 ***
TECH_CAT_2	0.075 ***	-0.074 *	0.001	-0.048 *	0.072 ***	-0.070	0.133	-0.040	0.019	-0.168 **	0.265 ***	0.295	0.091 ***
TECH_CAT_3	0.181 ***	0.208 ***	0.144 ***	0.127 ***	0.089 ***	0.118 **	0.223 *	0.109 *	0.094 ***	0.054	0.252 **	0.820 **	0.176 ***

TECH_CAT_4	0.004	0.029	-0.043	0.022	0.054 ***	-0.004	0.157	-0.047	0.012	-0.027	0.258 ***	0.289	0.056 ***
TECH_CAT_5	-0.011 *	0.035	-0.069 **	0.058 *	0.007	-0.077 **	-0.020	-0.174 ***	-0.018	-0.447 ***	-0.055	0.202	-0.006
C	0.335 ***	0.371 **	0.378 **	-0.001	0.354 ***	0.157	0.127	0.418 ***	-0.824 ***	-1.305 ***	-0.138 ***	0.312	-0.128 ***
R-squared	0.241	0.173	0.185	0.199	0.170	0.269	0.474	0.176	0.691	0.869	0.525	0.241	0.441
Number of Observations	54798	1111	1744	1847	7910	842	289	499	29225	2323	1803	157	106223

Notes: Sample: All prolific (15+) inventors, ***p-value<=0.01, **p-value<=0.05, *p-value<=0.10

Source : own calculations.

Table 3. Determinants of inventor intercity mobility

Dependent Variable: RES_MOVES_CITY	USA	Canada	UK	France	Germany	Italy	Finland	Netherlands	Japan	Korea	Taiwan	China	All
	Coef.												
FIRM_MOVES/CAREER_DURATION	0.272 ***	0.456 ***	0.511 ***	0.471 ***	0.537 ***	0.395 ***	0.465 ***	0.311 ***	0.161 ***	-0.015	0.202 ***	0.352 ***	0.184 ***
RES_MOVES_INTL	0.330 ***	0.373 ***	0.219 ***	0.445 ***	0.241 ***	0.501 ***	0.573 ***	0.581 ***	0.044 ***	0.061 ***	0.083 ***	0.395 ***	0.201 ***
PATENTS_PER_YEAR	-0.134 ***	-0.020	-0.036	-0.022	-0.093 ***	0.010	-0.063	0.064	-0.068 ***	0.042 ***	-0.031 ***	-0.085 **	-0.097 ***
CITATIONS_PER_PATENT	-0.006 ***	-0.002	-0.001	0.005	-0.010 ***	-0.012	-0.010	0.002	-0.016 ***	-0.026 ***	-0.017 ***	-0.029 *	-0.019 ***
TECH_CAT_CONC	-0.464 ***	-0.153 ***	-0.210 ***	-0.25 ***	-0.42 ***	-0.219 **	-0.210	0.051	-0.368 ***	-0.318 ***	-0.225 ***	-0.387 ***	-0.559 ***
PATENT_TIME_HHI	-1.536 ***	-0.229	-0.926 ***	-0.243	-0.949 ***	-0.364	-0.345	-1.610 *	-3.566 ***	-5.359 ***	-3.265 ***	-0.772	-3.125 ***

PATENT_TIME_SKEW	-0.068 ***	-0.028	-0.043 ***	-0.018	-0.014	-0.034	-0.094	0.049	-0.067 ***	-0.039	-0.079 ***	0.006	-0.094 ***
PATENT_TIME_KURT	0.018 ***	0.000	0.018 ***	-0.012	0.026 ***	-0.014	0.042	0.031 *	0.055 ***	0.040 ***	0.02 ***	0.008	0.045 ***
CAREER_DURATION	0.046 ***	0.039 ***	0.032 ***	0.033 ***	0.047 ***	0.028 ***	0.038 ***	0.022 **	0.063 ***	0.057 ***	0.039 ***	0.075 ***	0.052 ***
Dependent Variable: RES_MOVES_CITY	USA	Canada	UK	France	Germany	Italy	Finland	Netherlands	Japan	Korea	Taiwan	China	All
	Coef.												
CAREER_TIME_GAP	-0.051 ***	-0.019	-0.024 ***	-0.003	-0.033 ***	0.002	-0.066 *	-0.012	-0.098 ***	-0.08 ***	-0.045 ***	-0.055	-0.092 ***
TECH_CAT_1	-0.005	-0.038	-0.024	0.012	0.094 ***	0.085	-0.076	0.068	0.026	-0.198 **	-0.044	-0.681	0.05 ***
TECH_CAT_2	0.151 ***	0.010	-0.103 *	0.087	0.255 ***	0.533 ***	0.101	-0.267	0.080 ***	0.145 *	0.085 *	-0.292	0.310 ***
TECH_CAT_3	0.046 **	-0.149 *	-0.119 **	-0.112	0.033	-0.112	-0.058	0.578 ***	-0.031	-0.344 *	0.040	-1.537 **	-0.007
TECH_CAT_4	0.036 **	-0.147 *	-0.136 **	0.072	0.129 ***	0.339 ***	-0.243	-0.276 *	0.059 ***	0.115	0.160 ***	-0.686	0.231 ***
TECH_CAT_5	-0.057 ***	-0.128	-0.062	0.080	0.082 **	0.245 **	-0.109	-0.270	0.048 ***	-0.086	-0.021	-0.833	0.105 ***
C	0.735 ***	0.046	0.891	-0.009 ***	0.360	-0.038	0.017	-0.163	1.425 ***	2.295 ***	1.779 ***	0.981	1.377 ***
R-squared	-0.094	0.446	0.571	0.409	0.233	0.189	0.310	0.401	0.733	0.801	0.719	0.833	0.336
Number of Observations	54798	1111	1744	1847	7910	842	289	499	29225	2323	1803	157	106223

Notes: Sample: All prolific (15+) inventors, ***p-value<=0.01, **p-value<=0.05, *p-value<=0.1

Source : own calculations.

3. Estimations Results and Findings

Table 1 give the estimated coefficients for inventor productivity relation, table 2 for the determinants of inventor interfirm mobility, and table 3 for inventor intercity mobility. For the productivity model we find that the coefficient for interfirm mobility is always positive, indicating that inventors with many moves are more productive and conversely. Of course we cannot infer any causal relation between the two. Our regressions simply show that the relationship between mobility and productivity well established by the literature is clearly confirmed. As to the sign of the coefficient related to intercity mobility we did not find consistent results; no relationship emerges from the results. The same is true for international mobility except for Korea, for which the coefficient is significantly positive. The coefficient related to the inventor degree of technological specialization is always positive when significant (for 9 countries on 12). It indicates that more specialized inventors are more productive than those less specialized. This result is in lines with the evolutionary view of the determinants of inventor productivity. In general temporal concentration of inventions has a positive effect on inventor productivity. This result appears in opposition with the finding by Hoisl ‘s (2007) for a population of German inventors. One reason for the difference may because we study only the the more productive inventors.. For this variable differences appear between Western and Asian countries. For instance the result is not valid for Korea and China. Career duration has a negative coefficient (except for Taiwan and China) expressing the idea that inventors with a longer career are less productive (to some extent this last result is in accordance with the result related to time concentration). Here we find again differences between Western and Asian countries. It might be that for China one reason for the difference is the very short time period in which we observe inventor productivity because of China’s late entry into patenting. Finally the variable CAREER_TIME_GAP matters as expected: inventors with a long time period without patented inventions have lower productivity (the two directions of causality are equally possible). This trend is pervasive and matches the situation of 11 countries out of 12 (the case of China is particular: fewer inventors and a shorter observation period).

For the interfirm mobility model we note that inventor productivity has a positive impact on the scale of interfirm mobility for all 12 countries of the sample. But we still cannot interpret this result in causal terms. Strong inventor technological specialization is related to less mobility. And conversely less specialized inventors are more mobile. This trend is true for the largest western countries but not for the smallest (Italy, Finland, and the Netherlands). By contrast it applied to all the Asian countries. Temporal concentration of patenting is always negative and very often significant. This result is partly due to a mechanical effect; if the inventor's patenting is really concentrated in a short time period he has fewer opportunities for moving. The opposite is true when we consider the variable CAREER_DURATION. A longer career generates many opportunities for moving. The coefficient related to CAREER_DURATION is positive and significant for 8 countries out of 12. For the small European countries (Italy, Finland, and the Netherlands) the variable has significant effects. The variable CAREER_TIME_GAP has negative and significant effects for many countries. Inventors with a long time period of time without patenting (all other things being equal) move less (we know from the first regression that they are less productive as well).

The determinants of intercity mobility are strongly linked to interfirm and international mobility. To put it in other terms: a great proportion of interfirm moves match geographic mobility (intercity or international). After controlling for different types of inventor mobility and career profile it appears that technological specialization matters significantly and for all the countries (the Netherlands excepted): the more specialized an inventor is, the less he moves geographically. Career duration has a trivial effect. The estimated coefficients related to CAREER_TIME_GAP are negative when significant. The same explanative reasons put forth for interfirm mobility can be applied here as well.

4. Conclusions

Two lessons can be drawn from this study. First the set of variables we have constructed and tested have been found to be highly relevant for explaining inventor mobility. For instance the new variable CAREER_TIME_GAP has significant explanatory power. One interesting finding is that the role played by inventor technological specialization that is not the same for inventor productivity and mobility. This variable is found to matter significantly in all the three regression models. Second, with respect to our goal of comparing the dynamics of inventor productivity and mobility according to the types of countries, the main finding is that there is not much difference between Western and Asian countries. The evolutionary laws determining inventor productivity apply generally, whatever the country. Moreover we have shown there are significant differences within the set of Western countries and within the Asian countries as well. As a consequence this second block of countries is not homogeneous. However, because the sizes of our samples of prolific inventors are very different across the countries, and are quite small in some cases, one must interpret the comparative results with caution.

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Streszczenie

PRODUKTYWNOŚĆ I MOBILNOŚĆ KLUCZOWYCH WYNALAZCÓW: ANALIZA PORÓWNAWCZA DANYCH PATENTOWYCH 12 PAŃSTW AZJI, AMERYKI ORAZ EUROPY ZACHODNIEJ

Artykuł przedstawia nowe spojrzenie na rolę indywidualnych wynalazców w procesie tworzenia innowacji. Wynalazcy indywidualni stanowią element centralny procesu twórczego. Innowacja nie jest produktem firm i organizacji, wymaga indywidualnej kreatywności (Rothaermel i Hess 2007). Badanie koncentruje się na analizie płodnych wynalazców. Wynalazcy tej kategorii mają najwyższy udział w generowaniu ogółu wynalazków (Le Bas et al. 2010) o wysokiej wartości ekonkomicznej (Gambardella et al. 2005). Poprzednie badania kluczowych wynalazców skupiały się analizie firm, w których pracują lub w branżach, w których te firmy działają.