

Use of Grace period and its impact on knowledge flow: evidence from Japan

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Outline

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2. Grace period system in Japan
3. Globalization of the patent applications and the use of the grace period
4. Three views of the grace period system and knowledge flow implications
5. Results of estimations
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1. Background and research objective

- One of the most important differences among the national patent systems lies in the grace period system: in the US it is automatic for one year while there is almost none in Europe, and Japan in between.
- The increasing globalization of the patent applications has made the search for the best system and the harmonization of the patent systems toward that goal more urgent.

Research objectives of our paper

- i. To assess how significantly the globalization of the patent applications can account for the recent reduction of the use of the grace period exception in Japan
- ii. To assess how significantly the grace period system promotes the knowledge spillover to the third parties, in order to assess the economic effect of the grace period system

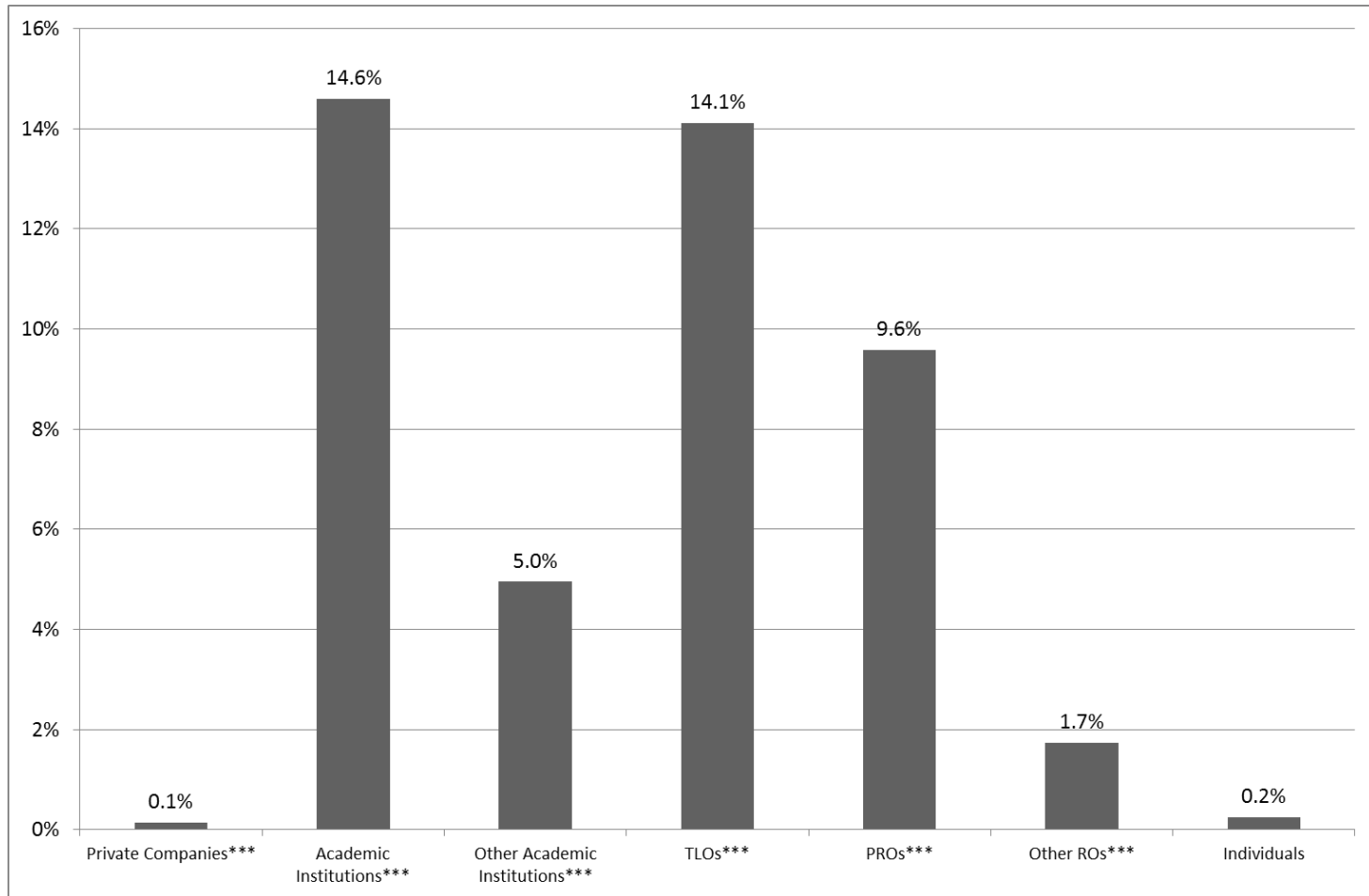
Research strategy

- Prior empirical research on the grace period is very limited, significantly due to the design of the grace period.
 - No records on the use of the grace period exist in the US, since the grace period is automatic.
 - The grace period other than for international exhibition barely exists in Europe.
- The experience of the grace period system in Japan which requires the notification of the prior disclosure offers a unique chance to analyze the above two issues.

2. Grace period system in Japan

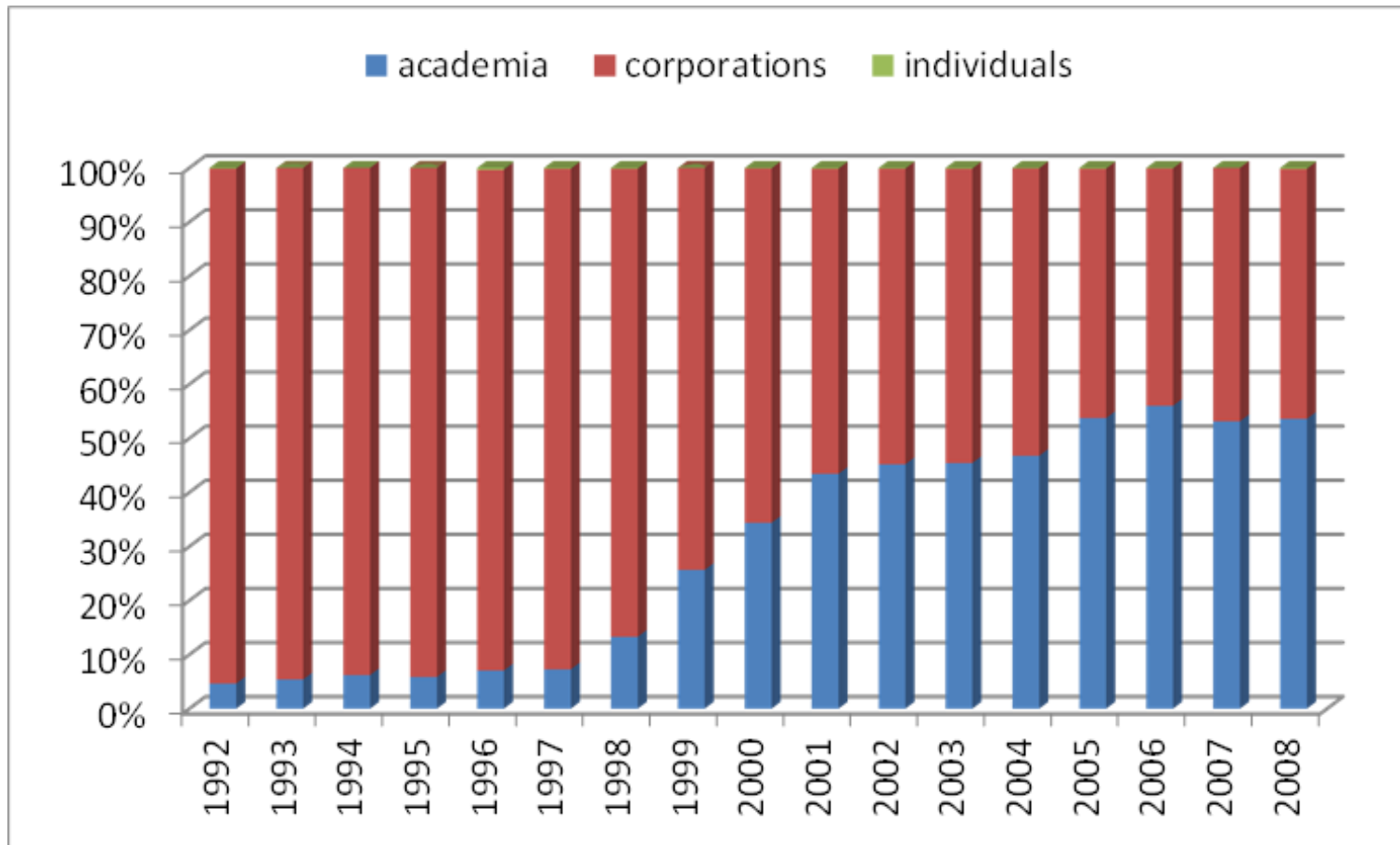
- 6 months
- The scope of prior disclosure significantly liberalized over time
 - after 2000 reform, it covers the disclosure through internet-site, conferences approved by the JPO, printed materials, experiment, exhibitions
 - 2011 reform, all most all forms of public disclosures are eligible.
- Our data covers 1992-2008 period
 - Exhibitions account for around 5% of the use of the grace periods.
 - Corporations account for around a half of the use of the grace period.

Applicant type and the intensity of the use of grace period exception

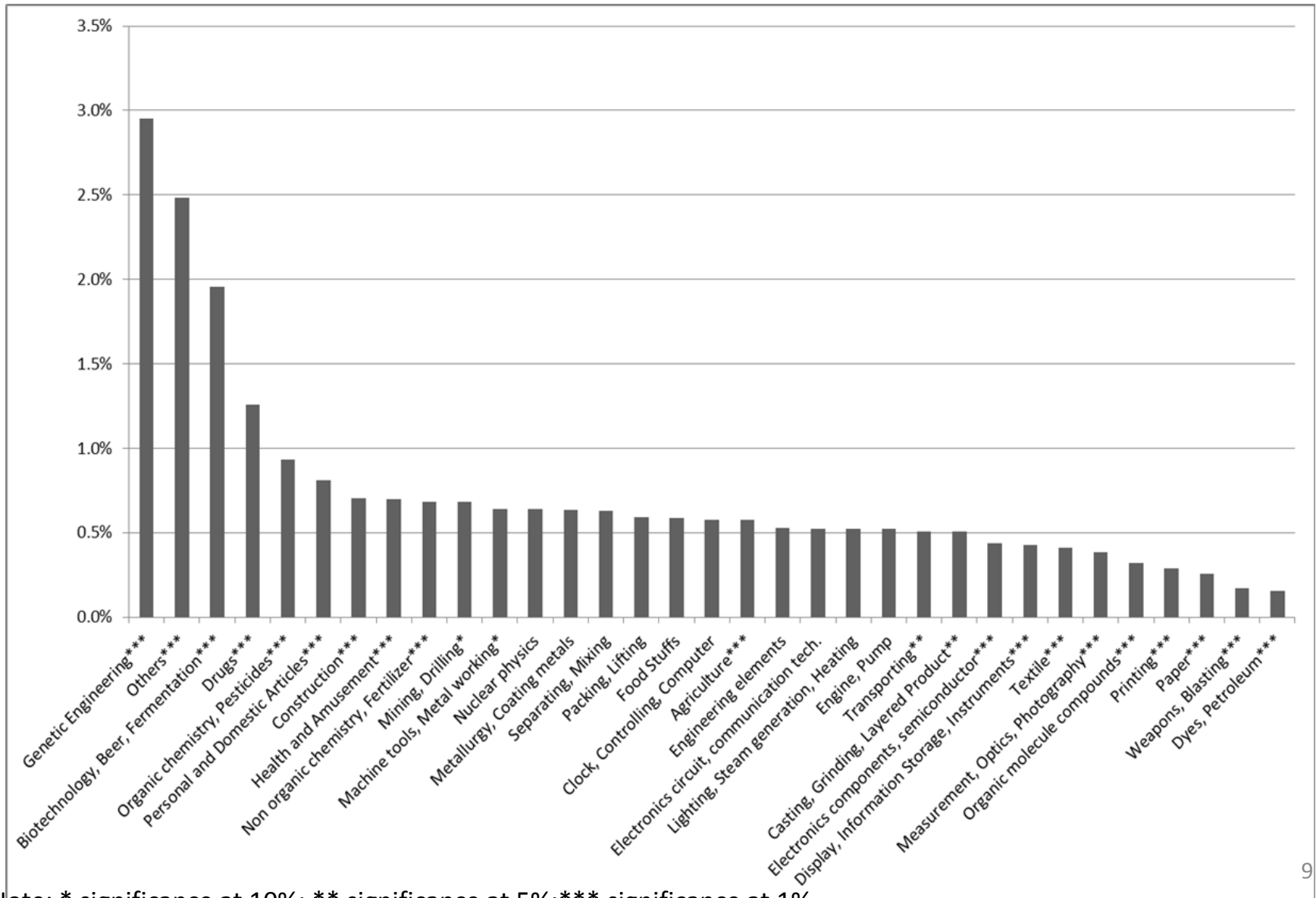


Note: * significance at 10%; ** significance at 5%;*** significance at 1%.

Appendix Figure 3 Share of the patent applications using grace period across the type of institutions



Technology field and use of grace period exception

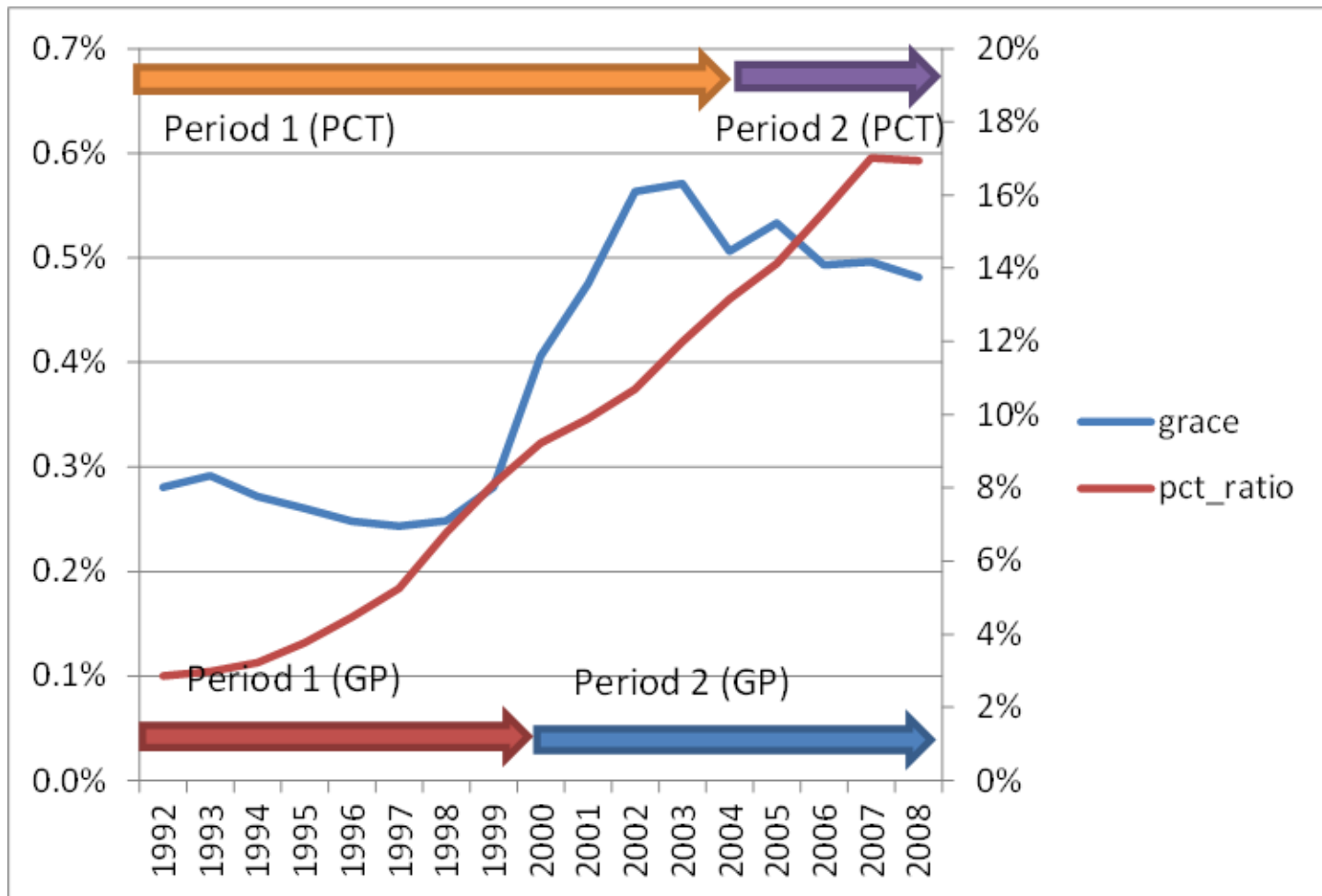


Note: * significance at 10%; ** significance at 5%; *** significance at 1%.

3. Globalization of the patent applications and the use of the grace period

- The use of the grace period increased in early 2000s by the liberalization of internet form of disclosure in 2000.
- However it started to decline since 2004. The main reason is likely to be the globalization of the applications.
 - Designation-of-states rule for PCT filing system was abolished in 2004, so that a PCT application gives its applicant a bundle of options to apply for a patent in any number of countries within 30 months from the priority date.
 - More global applications by Japanese firms

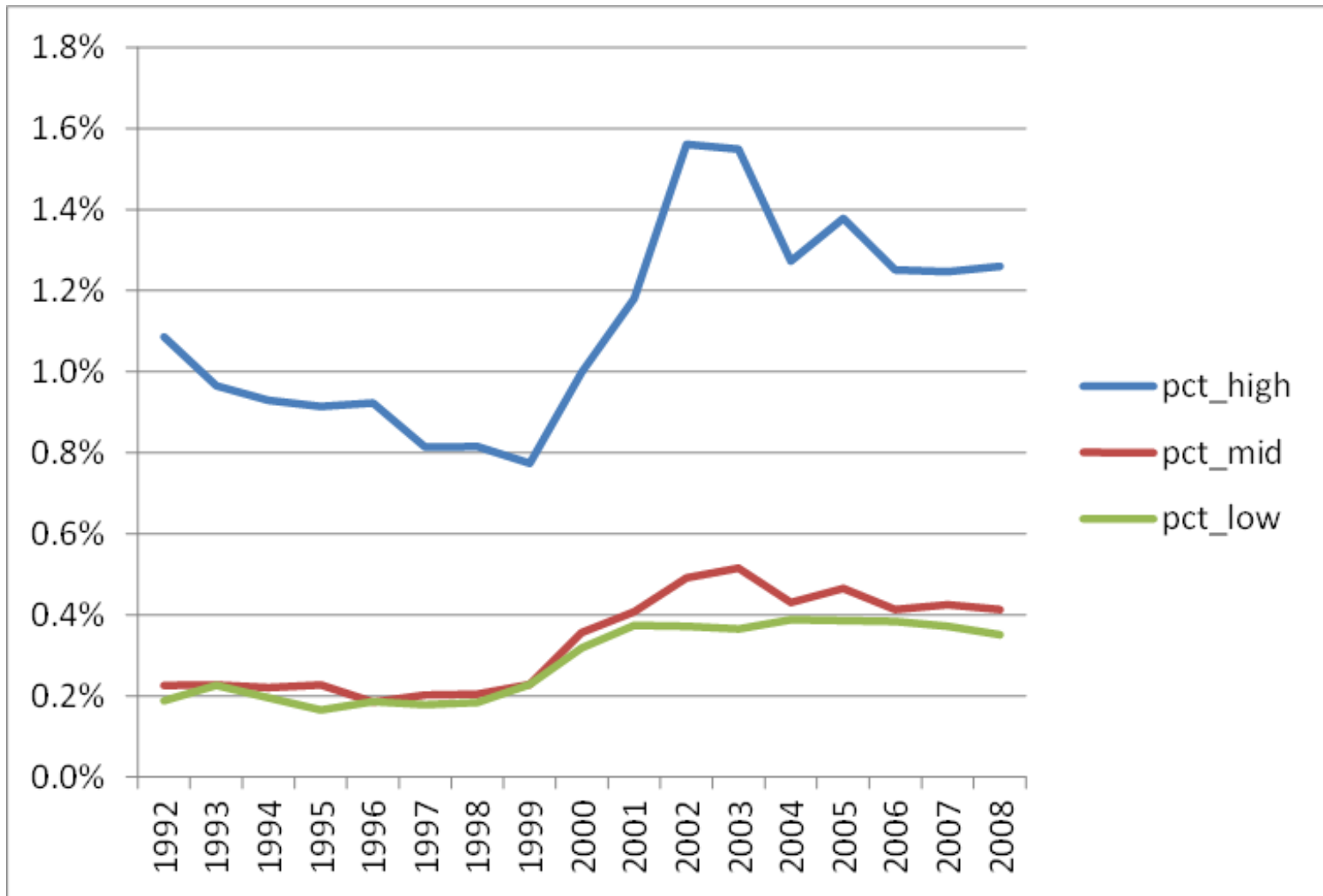
Use of grace period and the share of PCT applications in Japanese patent applications



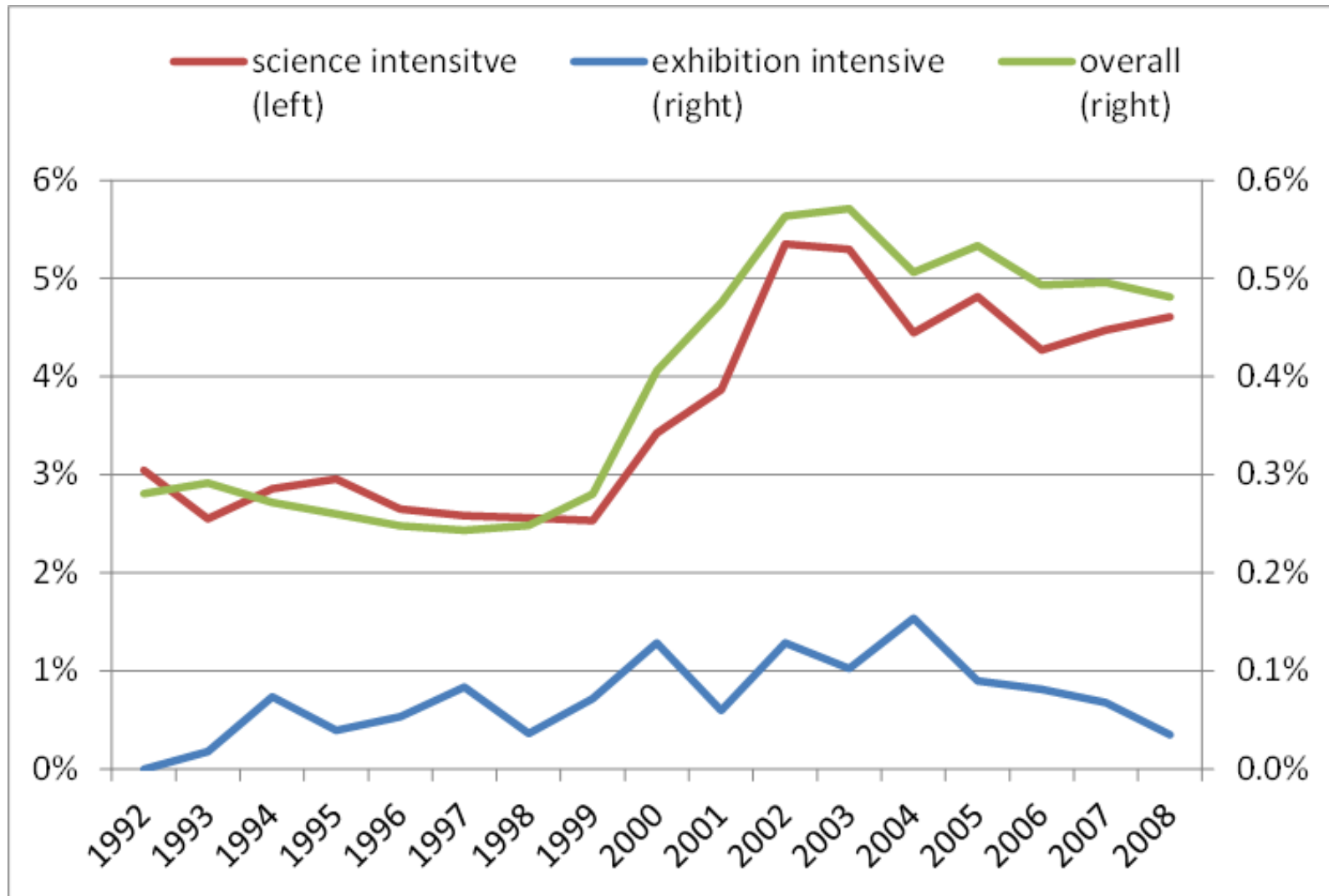
Two evidences for the effect of the globalization

- The effect of the PCT reform on the use of the grace period is stronger in those sectors with more international applications
- Placebo test: What happened to the use of the grace period on the basis of exhibitions

Use of the grace period by intensity of the use of PCT



Grace period on the basis of academic disclosures and that on the basis of exhibitions



4. Three views of the grace period system and knowledge flow implications

- We would like to assess which of the three views best account for the effects of the grace period system:
 - Acceleration of disclosure view*: It promotes an early academic disclosure of the research output), since early disclosure does not constrain the patentability.
 - Deferral of domestic patent filing view*: It allows the applicant to postpone the filing of the patent application.

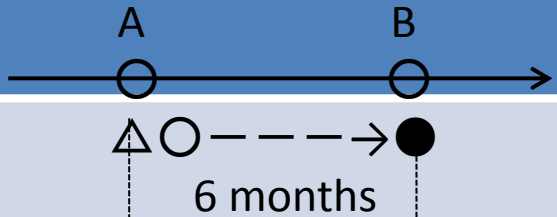

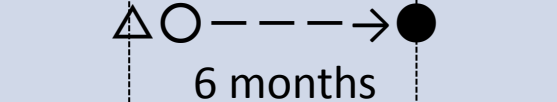
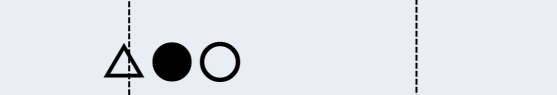
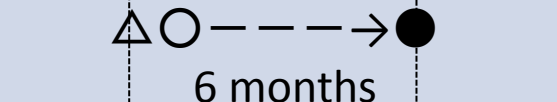
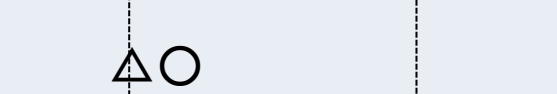
“The authors of published material “reserve” their inventions for a certain period of time without the inconvenience or cost of filing a patent” (de Saint-Georges and van Pottelsberghe de la Potterie (2013))

iii. *Promotion of domestic patenting view*: The grace period encourages the university researcher with primary interest on academic publication to obtain the patent on the invention after the disclosure of the output of scientific research

- “Around 50% of the (European TTO) respondents say that the loss of patent protection due to premature public disclosure occurred “very often” or “fairly often”.
“(Edmondson et al., 2013).

Identifications of which view more explains the grace period?

- Key difference is the effect on the knowledge flow to the third party.
 - Grace period promotes the knowledge flow to the third parties only if “acceleration of disclosure view” holds.
 - Since the inventors gain from the grace period, its welfare effect depends on the effect on the third parties. Knowledge spillover is an important part.
- In this study we can assess only the knowledge flow as measured by patent citations.

Several Views on the effect of grace period	Choice on the use of grace period	Timing	Knowledge diffusion to the third party begins at	Effect of grace period on knowledge spillover
Acceleration of disclosure view	Yes		A	YES
	No		B	
Deferral of domestic patent filing view	Yes		A	NO
	No		A	
Promotion of domestic patenting view	Yes		A	NO
	No		A	

△: Invention Completed, ○: Academic disclosure, ●: patent filing

Other identification

- The determinants of the use of the grace period also provides information on which view is more correct at the margin:
- If “acceleration of disclosure view” holds
 - The use of the grace period increases monotonically with its science linkage.
 - The use of the grace period declines with private value of the patent, but not necessarily under the other views.

Several Views on the effect of grace period	Effects on the Use of the grace period		
	More chance to make global applications	High science linkage	High private value of a patent
Acceleration of disclosure view	Minus	Plus	Minus
Deferral of domestic patent filing view	Minus	Plus but may turn to becoming flat	Can be plus
Promotion of domestic patenting view	None	Plus (+) but may turn to negative	Plus

5. Results of estimations

- We use inventor non-self forward citations to assess the effect of the grace period on knowledge flow.
 - Spillover to science is more difficult to assess, partly because a significant part of the disclosures occur in the conference and the other academic meetings (not journals)
- There is an endogeneity issue: more science intensive project has high spillover and simultaneously more likely to use the grace period (unobserved heterogeneity).
- We control such endogeneity by the combination of
 - Taking the difference between the non-self forward citations and the self forward citations (difference in logarithmic terms)
 - Introducing the level of science linkage as a control
- We use the sample of corporate inventions

The results on knowledge flow

- The level of forward citations, both self and non-self, increases with the science linkage of the invention (to a similar degree).
- The level of non-self forward citations of the invention using the grace period is significantly higher than that of the invention without the grace period, relative to the corresponding difference of the self-citations.
- This knowledge flow effect to the third parties is larger for small and medium size firms.
 - average 5.5%
 - large firms (listed firms) 2.7% and SMEs 6.1 %

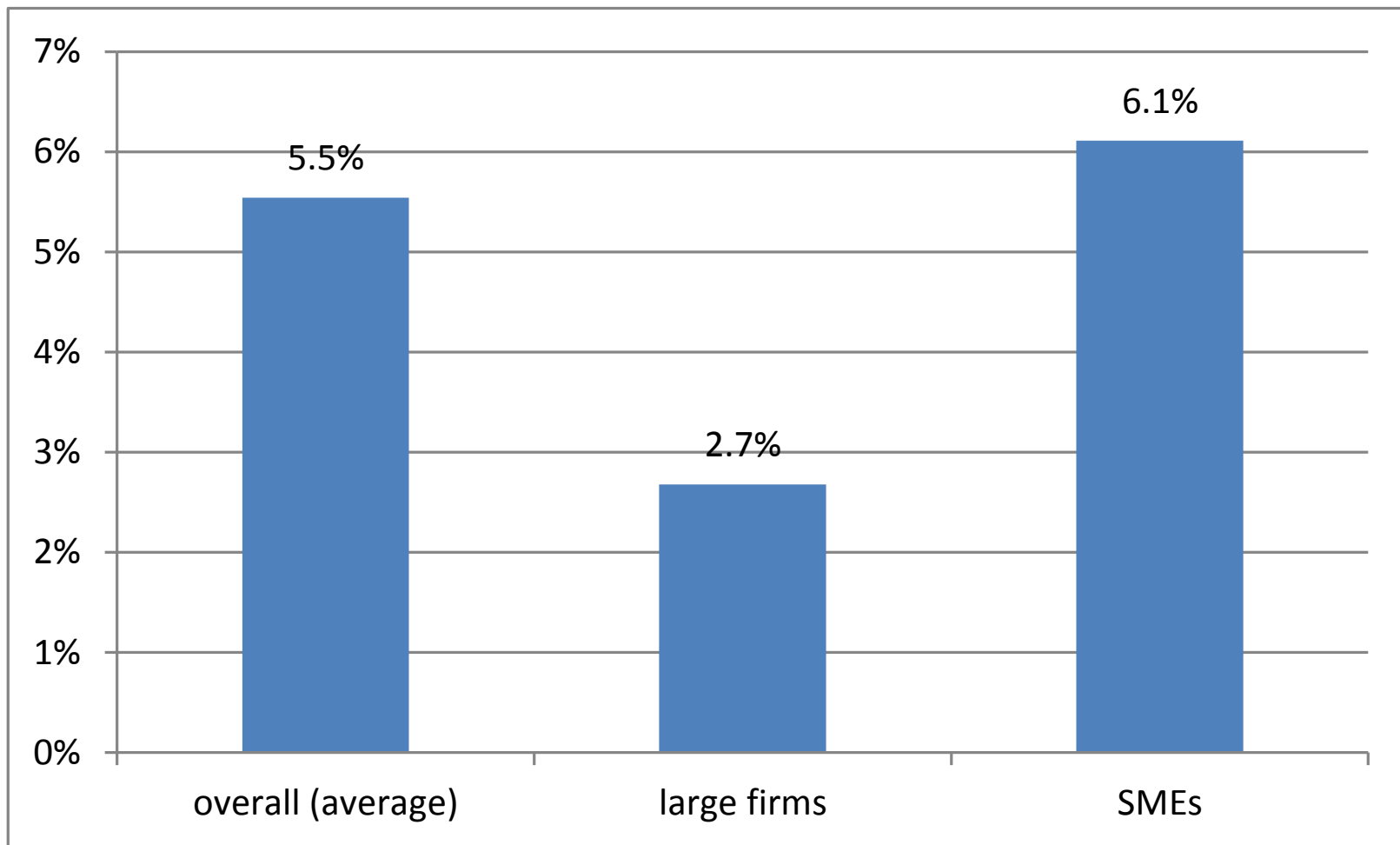
Impact of using grace period on knowledge spillover (1):by type of citations

	(4a) OLS					(5a) OLS				
	dependent variable is self-forward citations					dependent variable is non self-forward citations				
	Coef.	Std. Err.	t	P> t	signifi- cance	Coef.	Std. Err.	t	P> t	signifi- cance
GRACE	-2.864	0.402	-7.13	0	***	2.675	0.619	4.32	0	***
ln(CLAIM)	2.503	0.034	72.98	0	***	6.593	0.053	124.67	0	***
ln(SCIENCE+1)	3.696	0.056	65.59	0	***	3.633	0.087	41.81	0	***
ln(INV)	2.574	0.033	78.16	0	***	4.279	0.051	84.25	0	***
CONSTANT	10.390	0.243	42.84	0	***	15.128	0.374	40.45	0	***
TECHNOLOGY sector dummies	YES					YES				
APPLICANT type dummies	YES					YES				
application YEAR dummies	YES					YES				
Number of observations		3,476,151					3,476,151			
Adj R-squared		0.0189					0.0565			

Impact of using grace period on knowledge spillover (2): difference

	(1a) OLS					(2a) OLS					(3a) OLS				
	received from all firms					received from large firms					received from SMEs				
dependent variable is based	Coef.	Std. Err.	t	P> t	significance	Coef.	Std. Err.	t	P> t	significance	Coef.	Std. Err.	t	P> t	significance
GRACE	5.5392	0.6768	8.18	0	***	2.6753	0.6275	4.26	0	***	6.1097	0.4997	12.23	0	***
ln(CLAIM)	4.0906	0.0578	70.8	0	***	2.9445	0.0536	54.96	0	***	-0.3838	0.0427	-9	0	***
ln(SCIENCE+1)	-0.0623	0.0949	-0.66	0.512		-0.7208	0.0880	-8.19	0	***	-2.1641	0.0701	-30.87	0	***
ln(INV)	1.7050	0.0555	30.73	0	***	0.8879	0.0514	17.26	0	***	-1.0808	0.0410	-26.38	0	***
CONSTANT	4.7378	0.4086	11.6	0	***	-3.8502	0.3789	-10.16	0	***	-1.6675	0.3017	-5.53	0	***
TECHNOLOGY sector dummies	YES					YES					YES				
APPLICANT type dummies	YES					YES					YES				
application YEAR dummies	YES					YES					YES				
Number of observations	3,476,151					3,476,151					3,476,151				
Adj R-squared	0.0249					0.0202					0.0061				

Impact of using grace period on knowledge spillover (2)



Note: All coefficients of GRACE in any models are statistically significant at 1% level.

Results on the use of the grace period

- Impact of PCT reform of 2004
 - highly significantly negative level effect
 - no significant effect for the grace period based on exhibitions
- Grace period is
 - monotonically more used for the invention with high science linkage and a large team
 - less used for the invention with more claims (high private value)
- Consistent with the acceleration of disclosure view of the grace period system, but not either of the alternative views

Impact on the use of a grace period

	sample				
	overall	Science intensive sectors	exhibition disclosure	academia	corporation
	model 3	model 9	model 6	model 7	model 10
ln(SCIENCE+1)	+	+	+	+	+
ln(SCIENCE+1) *SCI_P95	+	+	NA	NA	+
ln(INV)	+	+	insignificant	+	+
ln(CLAIM)	-	-	-	-	-
REFORM_PCT *PCT	-	-	insignificant	-	-

Note: All signs of coefficients listed above are statistically significant at 1% level.

5. Conclusions

- We have found a significant evidence for
 - the negative effect of globalization of patent applications on the use of the grace period in Japan, and
 - the grace period enhances the knowledge flow to the third parties.
- Global introduction of the grace period system could significantly enhance the knowledge diffusion, without harming the interest of the inventors.
- Design issues for the transparency of the grace period
 - notification of the earlier disclosure
 - early publication of the patent application reliant on the grace period

Selected References

- de Saint-Georges, M., van Pottelsberghe de la Potterie, B., 2013. A quality index for patent systems. *Research Policy* 42, 704-719
- Edmondson, G., Holmes, J., Henschel, R.F., McCollam, S., 2013. A Grace Period for Patents: Could it help European universities innovate? *The Science | Business*.
- Franzoni, C., Scellato, G., 2010. The grace period in international patent law and its effect on the timing of disclosure. *Research Policy* 39, 200-213.