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Patent Cooperation Treaty (PCT)
Working Group

**Tenth Session
Geneva, May 8 to 12, 2017**

SECOND SUPPLEMENT TO "ESTIMATING A PCT FEE ELASTICITY" STUDY

Document prepared by the International Bureau

INTRODUCTION

1.   At the seventh session of the Working Group in 2013, the International Bureau presented a study entitled "*Estimating a PCT Fee Elasticity*" (document PCT/WG/7/6), which provided a first ever estimate of the overall fee elasticity of PCT applications, that is, how an applicant's choice on whether to use the PCT or the Paris route for filing patent applications abroad is affected by changes in the international filing fee. It showed that universities and public research organizations (PROs) are more price sensitive than other applicants – even if all elasticity estimates suggested a highly inelastic fee responsiveness.

2.   As a follow up, the Working Group asked the Secretariat to work with the Chief Economist to provide a supplementary study exploring the effects of possible fee reductions for universities and public research organizations originating in different country groups. This supplementary study (document PCT/WG/8/11) was presented to the eighth session of the Working Group in 2015.

3.   At its ninth session in 2016, the Working Group discussed a proposal by Brazil on PCT fee policy to stimulate patent filings by universities and public funded research institutions from certain countries, notably developing and least developed countries (document PCT/WG/9/25). These discussions are recorded in paragraphs 85 to 122 of the Report of the session (document PCT/WG/9/28); paragraphs 119 and 120 outline the further work agreed by the Working Group as follows:

> "119. Following informal discussions, the Working Group requested the Secretariat to work with the Chief Economist to provide a supplement to the study presented at the eighth session (document PCT/WG/8/11), for discussion at the next session of the Working Group. That supplement should provide:

>> (a)   further information, similar to the information provided in tables 4 and 5 of document PCT/WG/8/11, using the elasticity estimates presented in table 3 of document PCT/WG/8/11 and then calculating the number of additional filings, the average fee payment and the income effect, both in absolute terms and relative to total PCT income, separately for universities and public research organizations benefitting from the hypothetical fee reductions, on a range of hypothetical fee reductions for both developed countries and countries complying with the criteria set out in item 5(a) of the PCT Schedule of Fees;

>> (b)   information on the income effect in case of a hypothetical limitation of the number of applications which could be filed by any university or public research organization benefitting from the hypothetical fee reductions to a range of international applications per year, including values of 5, 10 and 20 international applications per year; and

>> (c)   more detailed information on the approach taken to identify universities and public research institutions from among all PCT applicants, as referred to in paragraph 118, above.

> "120. The Working Group further requested the Secretariat to make that supplement available well in advance of (at least four months prior to) the next session of the Working Group."

4.   This document presents the supplementary study requested by the Working Group at its ninth session.

5.   As discussed in the first supplementary study, it is unfortunately not possible to perform simulations of hypothetical fee reductions for public research organizations (PROs) from developing countries. This is because the coefficient estimate on the fee variable in the underlying econometric investigation was not statistically significant (see paragraph 5 of document PCT/WG/8/11). As explained in the study, this result very likely does not reflect that PRO applicants are not fee-responsive; it rather reflects the small estimation sample that constrains statistical inference[1].   For this reason, the new simulations presented in this document focus entirely on university applicants.

6.   This (second) supplementary study is divided into two parts. The first part describes the approach taken to identify universities and PROs in the PCT's applicant base. The second part presents additional simulation results on hypothetical fee reductions, particularly those that would limit such reductions to a certain number of international applications per applicant and per year.

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[1]   In particular, the econometric estimation only relied on 78 PRO patent families originating in developing countries, of which 90 per cent had a PCT equivalent

IDENTIFYING UNIVERSITIES AND PUBLIC RESEARCH ORGANIZATIONS IN THE PCT APPLICANT BASE

7.   PCT records do not classify applicants by institutional category. The only possible way of doing so is to search the names of applicants as recorded in PCT documents and determine, based on the name, whether the applicant is a university, PRO, company or an individual.

8.   WIPO's Economics and Statistics Division (ESD) employs the following procedures to categorize PCT applicants as a university or PRO:

- As a first step, ESD harmonizes and consolidates all applicant names, using name-cleaning algorithms that account for typos, abbreviations, and other sources of name discrepancy.

- Next universities and PROs are identified through a list of keywords for universities, university hospitals and PROs. In the case of universities, these keywords encompass all types of educational entities, including universities, colleges, polytechnics, and others. They also take account of the different languages of PCT applicant names.

- The list of keywords undergoes continuous refinement reflecting manual checks - including web-based searches of applicant names of ambiguous institutional nature - and the availability of new PCT records.

9.   By nature, name-based searches invariably lead to false positives (an applicant wrongly identified as a university or PRO) and false negatives (a university or PRO applicant not identified as such). However, since the institutional nature of universities and PROs are in most cases reflected in their names, their identification through keyword lists is likely to be meaningful, if not reliable.

ADDITIONAL SIMULATIONS OF VOLUME AND INCOME EFFECTS IN THE PRESENCE OF ELIGIBLE APPLICATION CEILINGS

10.   To better understand how different ceilings of numbers of applications per applicant and per year influence the volume and income effects associated with hypothetical fee reductions, it is first helpful to look at the distribution of PCT applications in the PCT's applicant base. Table 1a presents this distribution for developed country university applicants and Table 1b does so for developing country university applicants[2].

11.   In the case of developed countries, around 64 per cent of all PCT-using universities file between one and five applications per year and this share has remained fairly stable between 2011 and 2015. The share of large university filers – defined as those filing 26 or more applications – stands at around 8 per cent and has equally remained stable.

12.   By contrast, around 80 per cent of PCT-using universities from developing countries file between one and five applications per year, though this share has fallen from 84 per cent in 2011 to 71 per cent in 2015. Large university filers account for only 3 per cent of the university applicant base in developing countries, although this share has risen from 2 per cent in 2011 to 5 per cent in 2015.

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[2]   As in PCT/WG/8/11, this document defines developing countries as the ones listed in *Official Notices (PCT Gazette)* – 12 February 2015; all other countries are defined as developed countries. It relies on PCT filing data from 2011 to 2015.

13.   Simulating the effect of a hypothetical fee reduction with a ceiling of eligible applications per year is not straightforward. The fee elasticities estimated in the first supplementary study applied to all university applicants from the two groups of countries, regardless of their filing volume. In practice, small and large existing filers as well as universities currently not using the PCT system may exhibit different fee elasticities. As the introduction of a ceiling would imply a steeper fee discount for some universities than for others, this may bias the simulation analysis[3].

14.   In the absence of a better alternative, this document simulates a hypothetical fee reduction with a ceiling by applying the fee reduction only to the number of eligible university filings at or below the ceiling. To illustrate with an example, in 2015, there were 1,693 PCT filings from universities in developing countries. If a fee reduction had applied to up to five applications per university, 698 applications – or 41.2 per cent of the total – would have qualified. Using the elasticity estimate of -0.164 from the first supplementary study (see Table 3 of document PCT/WG/8/11), a fee discount of 25 per cent would have yielded an additional 29 filings. As a result, with an average filing fee of 1,150 Swiss francs in 2015, PCT income would have been 200,579 Swiss francs lower.

15.   Tables 2a and 2b present the baseline figures for the simulation analysis – namely, the actual filing performance from 2011 to 2015, the income from those filings, the implied average fee, and the absolute number as well as the share of applications that would have been eligible with different ceilings[4]. Reflecting the distributions shown in Tables 1a and 1b, for any value of the ceiling, a higher percentage of university applications from developing countries would have been eligible for the fee discount.

16.   Figures 1a and 1b then depict the number of additional filings depending on the size of the fee discount and for ceilings of 5, 10, 20, and 30 applications. For comparison purposes, the figures also show the filing effect if no ceiling were imposed. For presentational efficiency, only results in relation to the 2015 baseline are shown. In addition, while – as a mathematical matter – one can apply the elasticity estimate to any fee discount, the figures stop at 75 per cent. As pointed out in the first supplementary study, the econometric model underlying the fee elasticity estimate imposes a log-linear function form on the impact of the international filing fee. This assumption – which explains the linear impact of the fee reductions in Figures 1a and 1b – may be especially questionable for large fee changes that exceed historical experience. For this reason, the simulation of additional filings for large fee reductions – especially 50 per cent and above – should be treated with due caution.

17.   Reflecting a lower number of total university filings but a higher fee elasticity, the same fee discount yields a smaller absolute filing response but a bigger relative response in developing compared to developed countries. In addition, the lower the ceiling for eligible applications, the weaker the filing response.

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[3]   Estimating different fee elasticities for different sub-groups of applicants (e.g., according to annual filing volumes) is not straightforward, partly because some applicants change groups from one year to the next and partly because further dividing the group of university applicants from developing countries would reduce statistical inference.

[4]   Note that the filing figures presented in this document differ from those presented in PCT/WG/8/11, for two reasons. First, the data are more up-to-date and thus reflect additional information received by the International Bureau, including information on ownership changes. Second, the definition of university applicants differs. In particular, in the previous supplementary study, a PCT application was considered to be a university filing if at least one of the applicants was a university; in this document, a PCT application is considered to be a university filing if at least one of the applicants is a university and none of the co-applicants (if any) is a corporate entity. This reflects current practice of only extending fee discounts to applications for which all applicants meet the relevant eligibility criteria. Of course, this is without prejudice to any future fee reduction eligibility criteria.

Number of universities
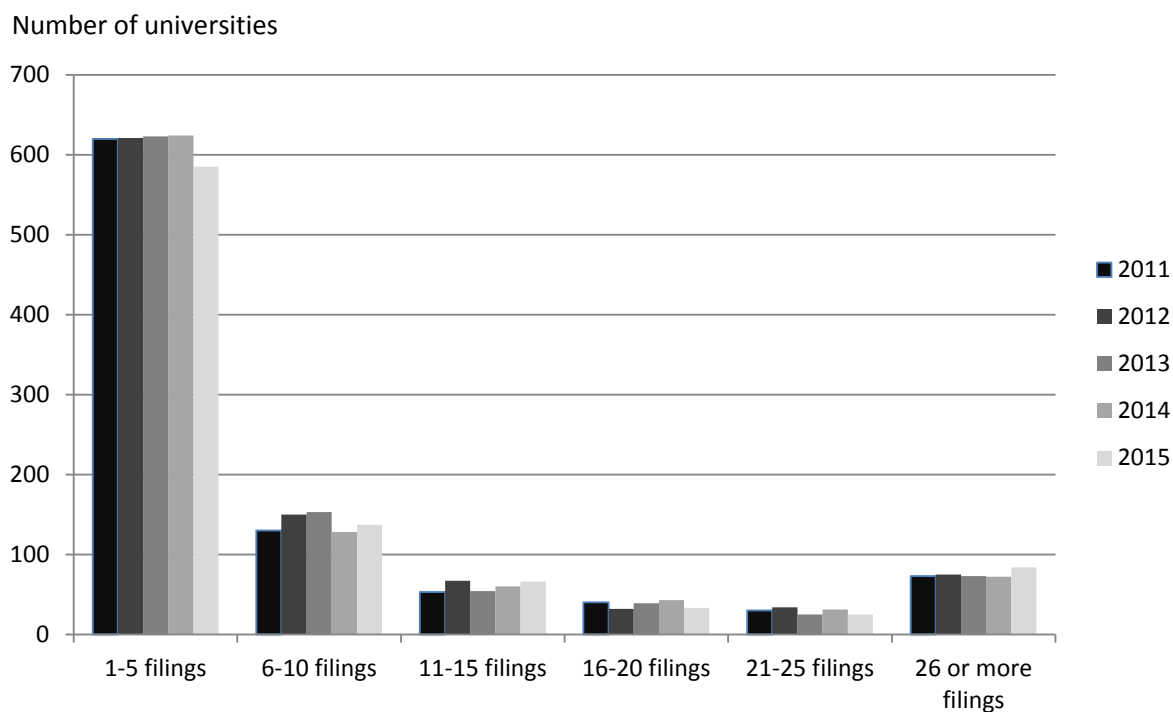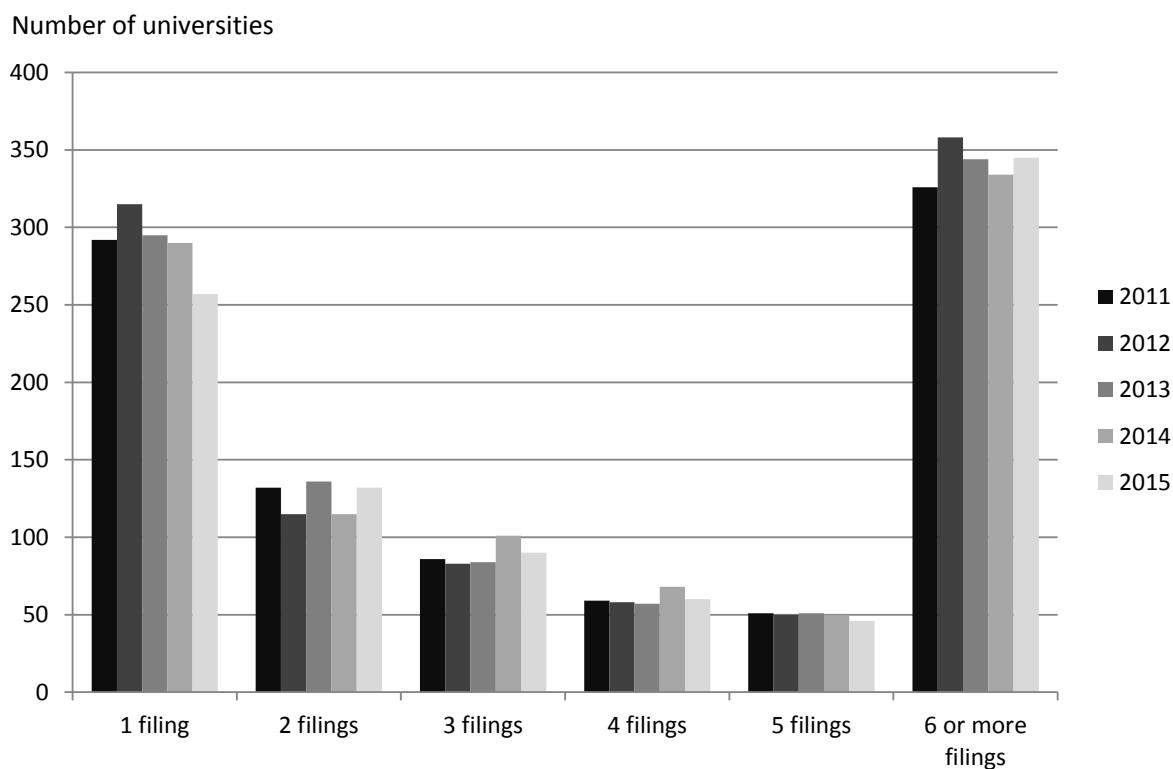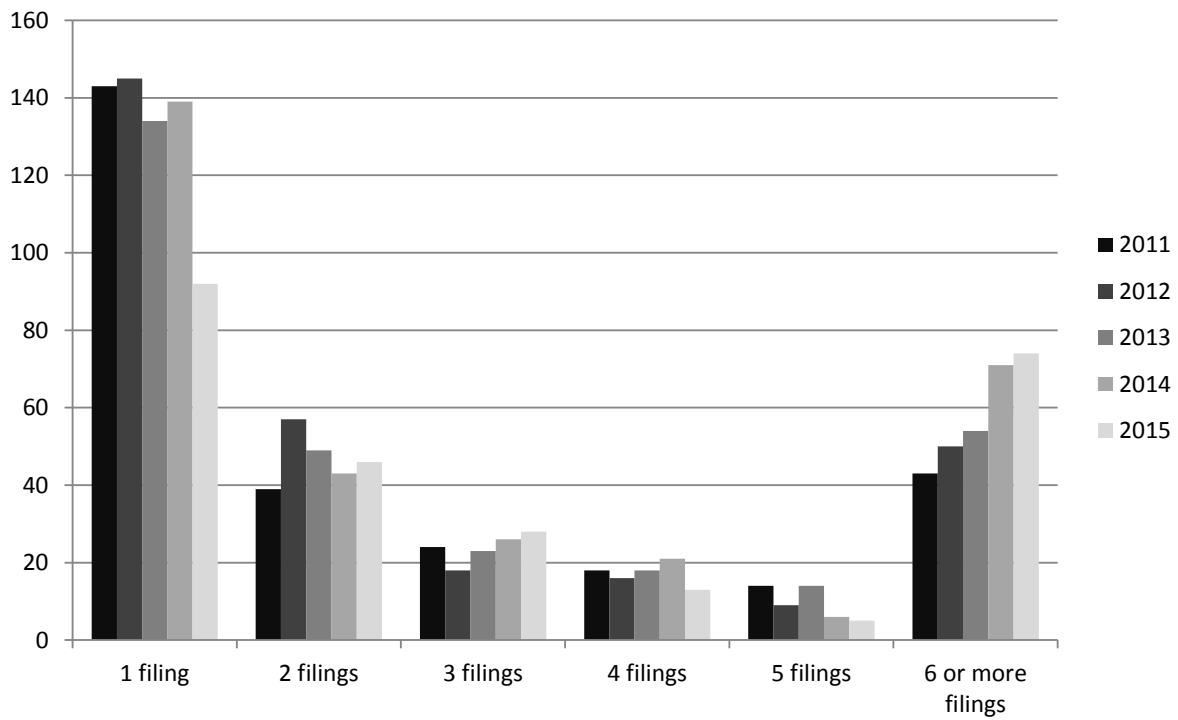

Number of universities

Table 1a: Distribution of University PCT Applicants, Developed Countries

Number of universities
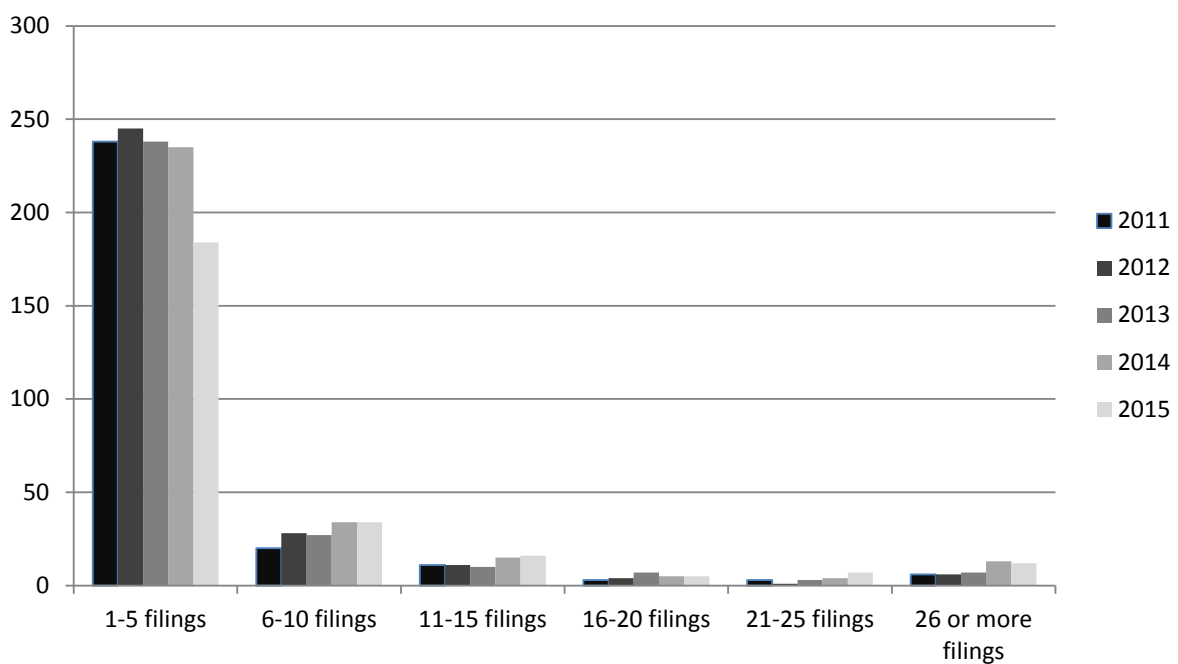

Number of universities

Table 1b: Distribution of University PCT Applicants, Developing Countries

Table 2a: Baseline for Simulation, Developed Countries

	Number of PCT filings	Income from those filings (in CHF millions)	Implied average fee (in CHF)	Ceiling of 5		Ceiling of 10		Ceiling of 20		Ceiling of 30	
				Number of eligible filings	Share	Number of eligible filings	Share	Number of eligible filings	Share	Number of eligible filings	Share
2011	7,742	8.9	1,146	2,788	36.0%	4,033	52.1%	5,436	70.2%	6,165	79.6%
2012	8,186	9.7	1,181	2,931	35.8%	4,232	51.7%	5,654	69.1%	6,405	78.2%
2013	8,012	9.2	1,144	2,886	36.0%	4,165	52.0%	5,486	68.5%	6,217	77.6%
2014	8,272	9.6	1,167	2,842	34.4%	4,129	49.9%	5,539	67.0%	6,264	75.7%
2015	8,188	9.3	1,139	2,841	34.7%	4,147	50.6%	5,553	67.8%	6,300	76.9%

Table 2b: Baseline for Simulation, Developing Countries

|	Number of PCT filings	Income from those filings (in CHF millions)	Implied average fee (in CHF)	Ceiling of 5		Ceiling of 10		Ceiling of 20		Ceiling of 30	
				Number of eligible filings	Share	Number of eligible filings	Share	Number of eligible filings	Share	Number of eligible filings	Share
2011	1,099	1.3	1,180	636	57.9%	812	73.9%	957	87.1%	1,015	92.4%
2012	1,030	1.2	1,176	653	63.4%	830	80.6%	958	93.0%	1,009	98.0%
2013	1,189	1.4	1,140	690	58.0%	884	74.3%	1,055	88.7%	1,122	94.4%
2014	1,547	1.9	1,208	754	48.7%	1,029	66.5%	1,270	82.1%	1,401	90.6%
2015	1,693	1.9	1,150	698	41.2%	980	57.9%	1,253	74.0%	1,382	81.6%
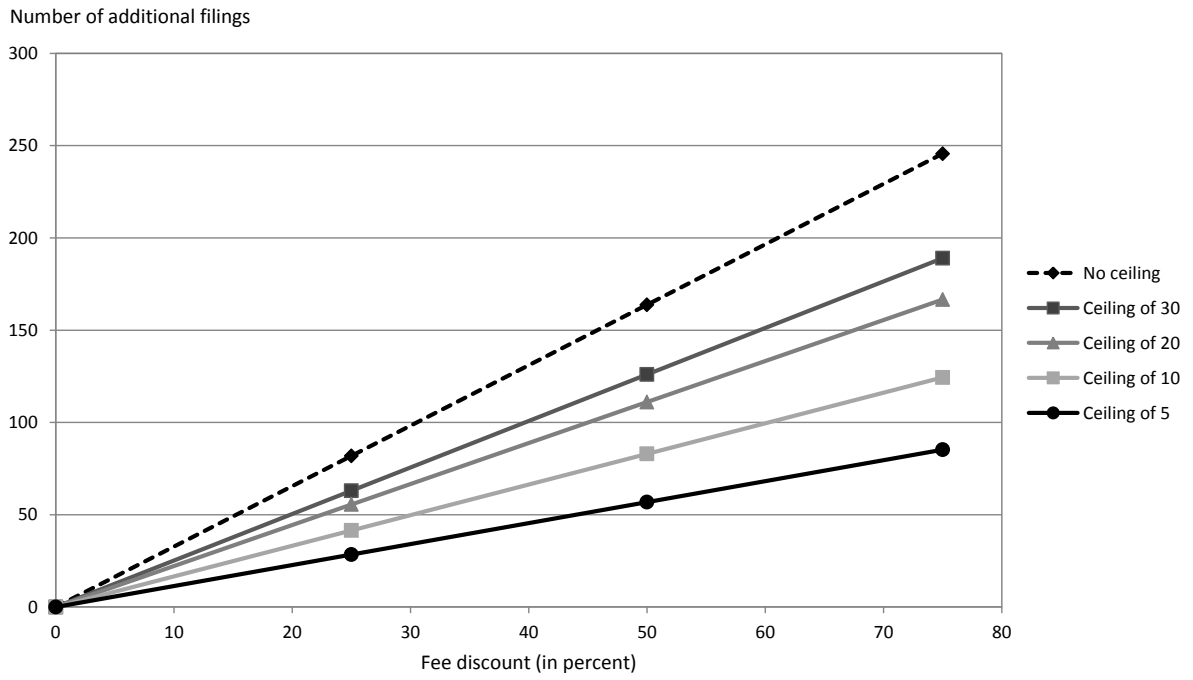
Figure 1a: Additional Filings from Hypothetical Fee Reductions, Developed Countries, 2015
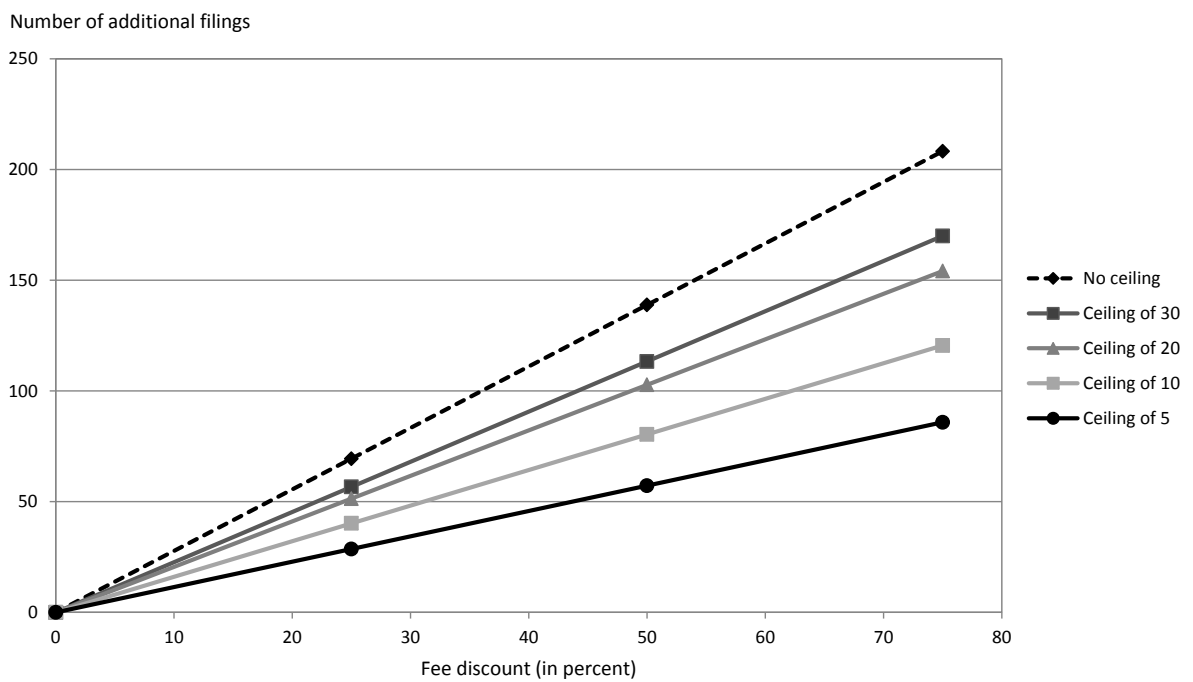

Figure 1b: Additional Filings from Hypothetical Fee Reductions, Developing Countries, 2015
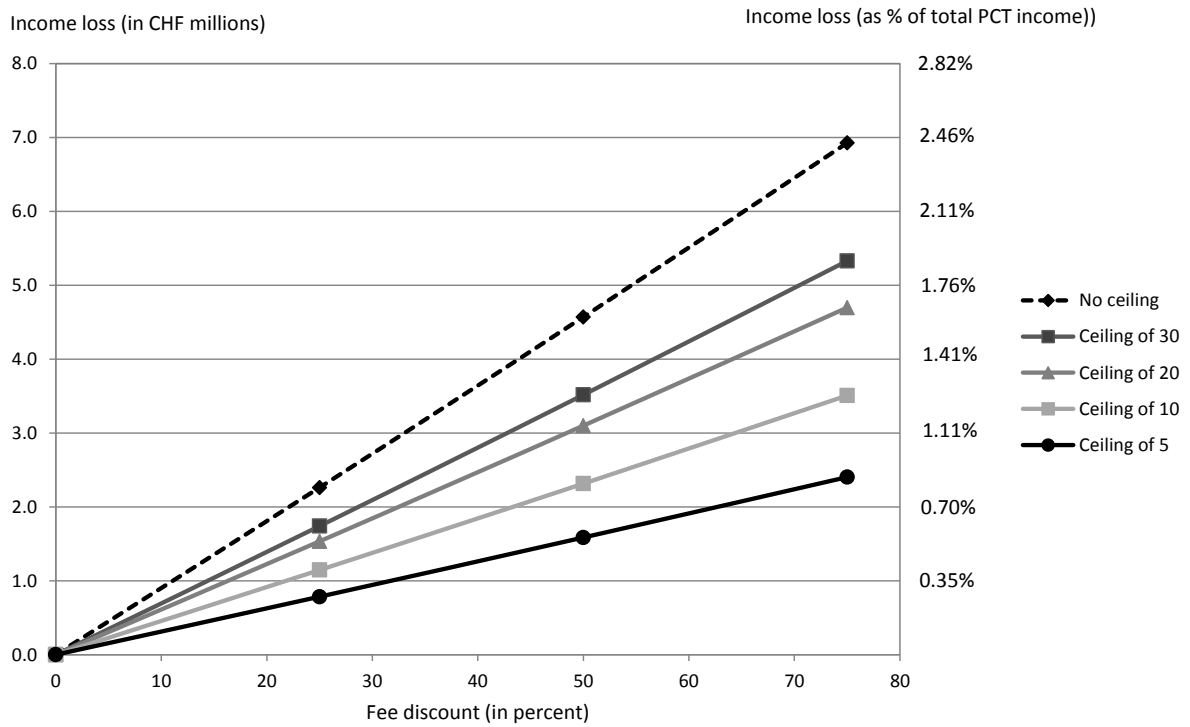
Income loss (in CHF millions)

Income loss (as % of total PCT income))

Figure 2a: Income Loss from Hypothetical Fee Reductions, Developed Countries, 2015

Income loss (in CHF millions)

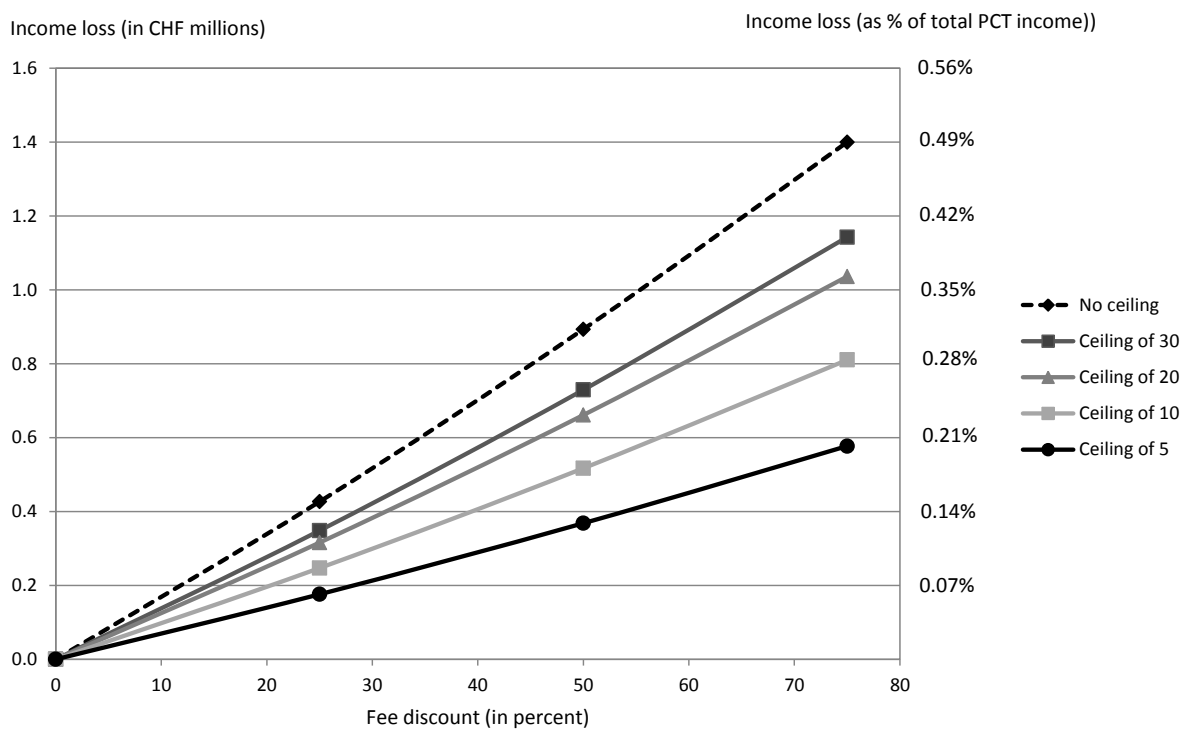Income loss (as % of total PCT income))

Figure 2b: Income Loss from Hypothetical Fee Reductions, Developing Countries, 2015

18.   Figures 2a and 2b present the income loss associated with the same hypothetical fee reductions – both in absolute terms (left vertical axis) and relative to total PCT income (right vertical axis)[5]. Reflecting lower filing volumes, the same fee discount implies smaller income losses for developing compared to developed countries.

19.   Finally, it is worthwhile to calculate the cost of additional filings in terms of the implied loss of income per predicted additional application. For developed countries, this cost ranges from 27,340 Swiss francs per filing for a fee discount of close to zero to 28,480 Swiss francs per fee filing for a fee discount of 100 per cent. For developing countries, it ranges from 5,860 Swiss francs per filing for a fee discount of close to zero to 7,010 Swiss francs for a fee discount of 100 per cent. It turns out that this cost per application does not depend on the existence and value of any eligibility ceiling. Intuitively, a ceiling reduces the income loss associated with a fee discount, but it also lowers the number of additional filings; the two effects exactly offset each other[6]. It is also important to point out that the difference in the per application income loss between developed and developing countries is mainly due to the different fee elasticity values for these two country groups[7]. Possible estimation biases in the fee elasticity – as outlined above – may thus have an important bearing on this loss estimate.

20.   As a summary, Tables 3a and 3b present the simulated income loss – per application and in total – for fee discounts of 25, 50, and 75 per cent.

Fee discount (in percent)	Income loss per application (in CHF)	Income loss (in CHF millions)				
		Ceiling of 5	Ceiling of 10	Ceiling of 20	Ceiling of 30	No ceiling
25	27,625	0.78	1.15	1.35	1.74	2.26
50	27,910	1.59	2.31	3.10	3.52	4.57
75	28,195	2.40	3.51	4.70	5.33	6.93

Table 3a: Simulated Loss of Income for various Levels of Discounts and Ceilings, Developed Countries, 2015

Fee discount (in percent)	Income loss per application (in CHF)	Income loss (in CHF millions)				
		Ceiling of 5	Ceiling of 10	Ceiling of 20	Ceiling of 30	No ceiling
25	6,147	0.18	0.25	0.32	0.35	0.43
50	6,435	0.37	0.52	0.66	0.73	0.89
75	6,722	0.58	0.81	1.04	1.14	1.40

Table 3b: Implied Loss of Income for various Levels of Discounts and Ceilings, Developing Countries, 2015

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[5]   Note that the fee income data used in this document accounts for fee discounts for electronic filing. This explains why the average annual fees shown in Tables 2a and 2b and the income losses if Figures 2a and 2b are somewhat lower than in Table 4 in document PCT/WG/8/11, which did not account for such discounts.

[6]   Mathematically, if E denotes the number of applications eligible for a fee discount, f the percentage fee reduction, ε the estimated fee elasticity, and a the average fee, the number of additional filings, X, generated by the fee discount is given by $X = f*E*\varepsilon$ and the (net) income loss, I, by $I = f*a*E - (1-f)*a*X$. It is then easy to show that the income loss per application amounts to $I/X = a*(1-(1-f)*\varepsilon)/\varepsilon$, which is independent of the number of eligible filings E.

[7]   As shown in the previous footnote, the income loss per application depends on the average fee in the baseline scenario and the elasticity value. As the average fee between the two country groups is similar, the main difference in the income loss is due to the value of the elasticity.

CONCLUDING COMMENT

21.   The main contribution of this second supplementary study is to provide simulations on the effects of hypothetical fee reductions in the presence of eligible application ceilings. As one would expect, the introduction of such a ceiling limits the number of additional filings and the income losses induced by such reductions. Figures 1a, 1b, 2a, and 2b offer quantitative guidance to this effect.

22.   However, the simulated figures come with important caveats. First, the introduction of a ceiling implies a steeper fee reduction for some university applicants compared to others. Applying the average fee elasticities across all university applicants from the two country groups may bias the estimated fee responsiveness. Second, the log-linear functional form underlying the fee elasticity estimate may render simulations of steep fee reductions that go beyond the historical variation in the data especially unreliable[8].

> *23.   The Working Group is invited to take note of the contents of the present document.*

[End of document]

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[8]   As described in document PCT/WG/8/11, another limitation is that econometric model underlying the fee elasticity estimate captures the choice applicants face between the Paris and the PCT routes towards international patent filing; it ignores that the level of the PCT fee might affect applicants' decision on whether to file for patent protection internationally to begin with.