THE POLICY DILEMMA OF THE UNITARY PATENT

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Highlights

- This paper provides new evidence about the budgetary consequences – for patent offices – of the coexistence of the forthcoming Unitary Patent (UP) with the current European Patent (EP). Simulation results illustrate a dilemma between (1) high UP renewal fees to ensure enough financial income for all national patent offices (NPOs) and (2) low UP renewal fees to make the UP system affordable, with very few NPOs losing on financial revenues. The simulations help to understand the positions of several patent offices, and underline an alternative way to proceed with the negotiations while reducing financial risks for the whole system.

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NOVEMBER 2014

1 INTRODUCTION

For many years, the European patent system has been recognised as highly fragmented, being the sum of numerous national patent systems. Only the grant process of European Patents (EP) is centralised at the European Patent Office (EPO). Once an EP is granted, it is subject to the national rules and practices of each member state where firms seek patent protection. This fragmentation reduces the effectiveness of the European patent system, especially because of its prohibitive costs (multiple validation, translation and renewal fees), substantial legal uncertainty and the economic incongruities it generates (see van Pottelsberghe, 2009; Mejer and van Pottelsberghe, 2012).

The implementation of the Unitary Patent (UP) – a single patent automatically covering the territory of 25 EU member states, for both the application procedure and the legal enforcement after grant – would not only reduce the cost of patenting in Europe, it would also make the system more attractive. Recent policy developments could actually be considered as important leaps towards an improved patent system in Europe[1].

Two important dimensions are subject to intense political debate[2]: the level of renewal fees and the operational design of the Unified Patent Court (UPC). The first dimension, setting up renewal fees, is more complex than could appear at first sight. Renewal fees are an important factor in the decision to renew a patent from the applicant's viewpoint (for which low renewal fees are expected) and they have a direct effect on patent offices' budgetary prospects. Indeed, since the creation of the European patent system, any EP patent renewed in a country leads to the payment of renewal fees paid to the national patent office, which in turn retrocedes half the revenue to the EPO.

The lead question therefore is to assess whether the new UP system would lead to similar 'revenues' at the aggregate level (the EPO would collect the UP renewal fees). The mechanical subsequent question relates to the distribution key of half the UP fees to national patent offices (the other half remaining in the EPO budget). This question is legitimate and worrying for patent offices: will they benefit from higher or smaller revenue streams than in the past? This question has already been addressed by Danguy and van Pottelsberghe (2011a) in case of a total switch from the EP system to the UP system – the authors found that the total income should be higher with the UP than with the EP. However, as the two systems will coexist, simulations must take stock of the substitution effect between the two systems: if the most valuable EP (which have a higher chance to be protected in a large number of countries) switch towards the UP system, then one could expect smaller revenue streams. This substitution between the two systems will logically depend on the level of renewal fees (Europe Economics, 2014).

The applied research question addressed in this paper is to assess whether and to what extent the coexistence of the EP and UP systems will affect the renewal fee incomes for the EPO and for national patent offices. While Danguy and van Pottelsberghe (2011a) provided an overview of the costs and benefits of the unitary patent for the different stakeholders of the patent system (eg in terms of patenting costs and intermediary costs for applicants), this paper focuses essentially on the budgetary consequences for patent offices. In particular, it approximates the conditions under which patent offices would be better off with the forthcoming dual system.

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[1] In December 2012, the EU Council adopted two regulations with a view to implementing enhanced cooperation (involving 25 EU member states) for the creation of unitary patent protection and its translation arrangements. These regulations delegate to the EPO the task of granting European patents with unitary effect. In February 2013, the international agreement for establishing a Unified Patent Court (UPC) was signed to contribute to a greater access to patent protection and a better patent enforcement at European level. Straathof et al. (2012) suggest that the unitary patent project offers great opportunities for improvements in patent laws by the adoption of best practises. Nevertheless, there are still concerns about the unitary patent package (see for example, Hilty, Jaeger, Lamping, and Ullrich, 2012). In particular, the UP will add an additional layer in the European patent landscape rather than simplify the current system.

[2] This policy debate has been recently pointed out by the President of the EPO (see Battistelli, 2013) and by the EPO Economic and Scientific Advisory Board (see ESAB, 2013).

The simulation results are twofold. On the one hand, the higher the UP fees and the stronger the substitution between the EP and the UP, the faster the break-even of the system is reached. On the other hand, with very high fees, applicants would have no incentives to use the UP route and would prefer to continue to enforce their EP at the national level. Such limited use of the UP route would not lead to a structural improvement of the whole European patent system, hence on its potential effect on innovation in Europe. With low renewal fees the German Patent Office might actually lose a significant amount of renewal fees, which exceed by far the income of other national patent offices under the current system. Alternative mechanisms are presented to mitigate these financial risks: (1) increasing national renewal fees and, (2) increasing the UP income through greater attractiveness of the new system.

This paper is structured as follows. Section 2 compares the renewal fee income generated by an average European patent (EP) with that generated by an average Unitary patent (UP). The substitution between EP and UP is investigated in Section 3. At the core of Section 4, a break-even analysis allows identification of the conditions such that patent offices would not be worse off with the coexistence of the UP and EP patent systems. The consequences for national patent offices are presented in Section 5. Section 6 concludes and puts forward policy implications.

2   AVERAGE EUROPEAN PATENT VS. AVERAGE UNITARY PATENT

Before investigating the coexistence of European Patents (EP) and Unitary Patents (UP), it is necessary to better understand the differences between these two types of patents. For this purpose, this section compares the total renewal fee income that would be generated by each type of patent. From a methodological point of view, this comparison is made at the patent level such that the results are independent of the relative switching between EP and UP, and of the number of granted patents at the EPO.

2.1   TOTAL RENEWAL FEE INCOME AND MAINTENANCE RATE MODEL

As described in Danguy and van Pottelsberghe (2011a), the total renewal fee income generated by an average European patent (EP) in 25 EU National Patent Offices (NPOs) depends on three main factors (see equation (1)):

- The validation rate (π_i): the probability that the patent is validated in country i;
- The maintenance rate $(1 - \delta_{it})$: the probability that it is maintained each year t for a maximum of 20 years[3] (given the depreciation rate δ_{it}) ;
- The level of renewal fees (F_{it}) in each country and over time.

$$VEP = \sum_{i=1}^{25} \sum_{t=6}^{20} \pi_i (1 - \delta_{it}) F_{it} \tag{1}$$

This total renewal fee income is shared between EPO and NPO. Indeed, half of the renewal fee income generated by EP at each NPO is transferred to the EPO and the other half is for the NPO itself.

Concerning the unitary patent (UP), a similar formula (see equation (2)) can be used with the exception that the validation rate of the UP is by definition equal to 100 percent. As the UP renewal fees would be collected by the EPO, half of the amount generated would be transferred back to the NPOs.

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[3] We assumed that any European patent starts to generate renewal fees income for national patent offices from its 6th year. This assumption corresponds to the average grant duration at the EPO (Lazaridis and van Pottelsberghe, 2007; van Zeebroeck, 2011).

$$VUP = \sum_{t=6}^{20} (1 - \delta_t^{UP}) F_t^{UP} \qquad (2)$$

The major determinants of the total income generated by UP after grant are its maintenance rates over time and the level of renewal fees. Danguy and van Pottelsberghe (2011a) showed that the former parameter partly depends on the latter one, as confirmed by an econometric model evaluating the impact of renewal fees on the aggregate maintenance rate of patents across countries (see equation (3)).

$$(1 - \delta_{it}) = \beta_0 + \beta_1 GDP_i + \beta_2 NPOAGE_i + \beta_3 IPI_i + \beta_4 PATAGE_t + \beta_5 F_{it} + \varepsilon_{it} \qquad (3)$$

The dependent variable is the average maintenance rate of granted patents validated in country i at year t.[4] In addition to the renewal fees[5] (F), this model takes into account the age of the patent and three country-level explanatory variables: the gross domestic product (GDP), an indicator of the strength of the national patent system (IPI, most recent series provided by Park, 2008, of an index that was introduced in Ginarte and Park, 1997), and the age of membership of the country in the European Patent Convention (NPOAGE). We performed this estimation with a database composed of the most up-to-date information for 30 countries presenting enough availability of maintenance information. Table 1 presents the econometric results.

The updated model confirms for a larger sample of countries the results of Danguy and van Pottelsberghe (2011a). First, GDP has a positive and significant impact on the maintenance rates, illustrating the role of market attractiveness for patent enforcement strategies (see Harhoff, Hoisl, Reichl, and van Pottelsberghe, 2009, for similar results in terms of the validation behaviour). Second, the level of renewal fees (FEES) significantly impacts the maintenance rates. High fees reduce the maintenance rate (or increase the drop-out rate). Third, countries that have been part of the EPC for a longer period of time (NPOAGE) have higher maintenance rates, thanks to a learning curve: a longer experience with the European patent system increases the attractiveness of the country for patent protection (de Rassenfosse and van Pottelsberghe, 2007). Fourth, PATAGE captures the life cycle of patented technologies. The older a patent, the lower its maintenance rate is. Finally, the strength of national patent system – in terms of subject matter, enforcement and reliability (measured by IPI) – has a positive and significant impact. The stronger the enforcement of patent rights, the longer patents are maintained at the national patent office.

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[4] See Appendix B of Danguy and van Pottelsberghe (2011a) for more details on the computation of average maintenance rates at the country level. For the current paper, this computation has been repeated with the most up-to-date data.

[5] Note that for some countries, a validation fee has to be paid in addition to the renewal fees. This validation fee has been taken into consideration at year 6 of the patent age. See Appendix Table A.1 for the renewal fees currently in place in the 25 EU countries.

Table 1: Results of the maintenance rate econometric model

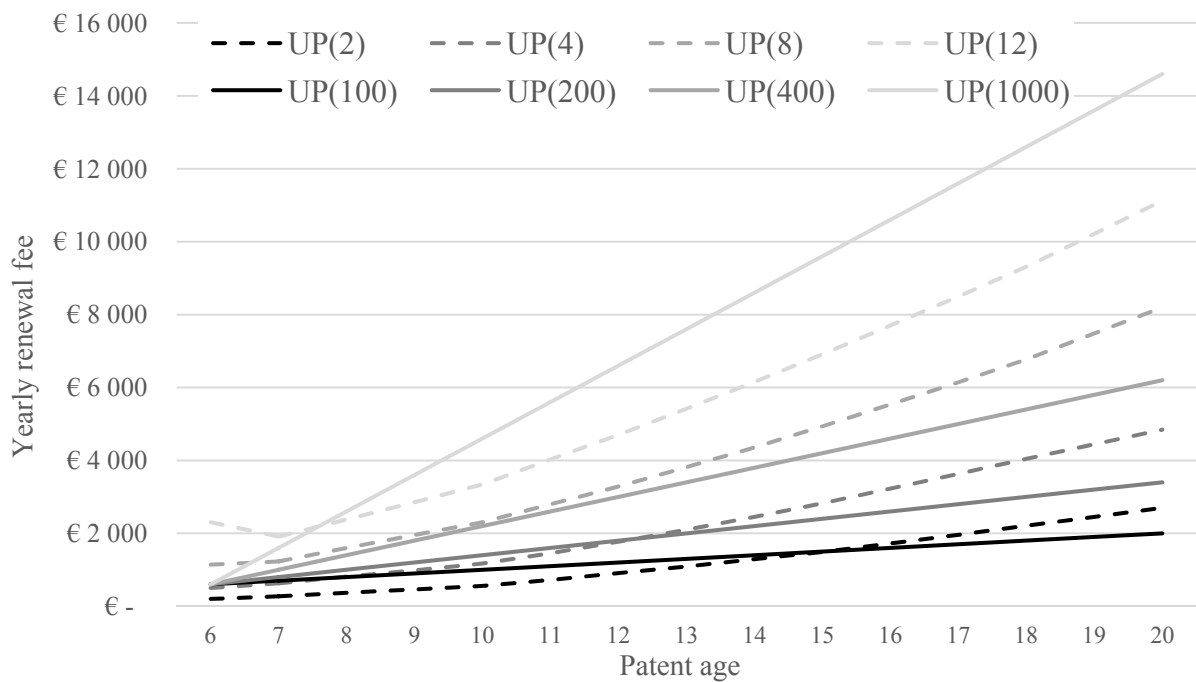| Variables	Danguy and van Pottelsberghe (2011a)	Updated data	explanation
Dependent variable: MAINTENANCE RATES			
GDP	0.0637***	0.0654***	country size
	(0.007)	(0.00434)	
FEES	-0.11912***	-0.150***	fee elasticity
	(0.026)	(0.0239)	
NPOAGE	0.00791***	0.00541***	learning curve
	(0.001)	(0.000580)	
PATAGE	-0.02944***	-0.0128***	technology cycle
	(0.002)	(0.00161)	
IPI	0.17181***	0.0322*	enforcement
	(0.044)	(0.0200)	
Constant	-0.25616	0.165**	
	(0.207)	(0.0839)	
Observations	243	438	
Number of countries	17	30	
Adjusted R-squared	0.756	0.670	

Notes: Standard errors are in parentheses; ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. The dependent variable is the maintenance rate (own calculation based on EPO statistics and trilateral statistical report); GDP is expressed in '000 billion $ (World development indicators 2012); FEES stands for the national annual renewal fees and are expressed in '000 € (EPO statistics, see Appendix Table A. 1); NPOAGE is the age of membership in the EPC; IPI corresponds to the value of the Intellectual Property Index in 2005 (Park, 2008).

2.2 RENEWAL FEES SCHEDULES AND SIMULATED MAINTENANCE RATES FOR UP

Beyond the impact of renewal fees on the maintenance rates, the level and the structure of renewal fees remains at the core of the policy discussion about the unitary patent system[6]. Two structures of renewal fees for UP can be considered: (1) summing up the fees of *X* countries, for instance those in which most of the patents are validated in the current European patent system; (2) adding a constant increment of *X€* each additional year in the patent age. Figure 1 illustrates four alternatives for the former structure – the sum of fees of the first 2 (4, 8, or 12) countries – and four alternatives for the latter one – starting fee of €600 on year 6 and then an increment of €100 (€200, €400 or €1000) each additional year.

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[6] See Europe Economics (2010), Danguy and van Pottelsberghe (2011b), and de Rassenfosse and van Pottelsberghe (2013) for a discussion on the optimal patent fee structure.

Figure 1: Renewal fees schedules for UP

Note: Dashed lines show fees structures which sum the fees of X countries. Plain lines show the fees structures with fixed annual increment.

In Danguy and van Pottelsberghe (2011a), we already argued that the proposed UP(200) is the most appropriate fees schedule since it has the advantage of being simpler than the additive fees structures and it corresponds to what the business sector is currently paying. Indeed, van Pottelsberghe and van Zeebroeck (2008) showed that the average geographical scope of protection is about four countries – UP(4) is similar to UP(200) – for a 15-year old patent. With UP(200), the applicant would pay total renewal fees of about €30,000 to keep its patent enforced for 20 years in the 25 EU member states. This absolute renewal patent cost is relatively affordable in comparison with current patenting costs in Europe[7] and given the large geographical scope of protection provided by UP.

Based on the new econometric results presented in Table 1 and the alternative fees schedules displayed in Figure 1, we simulated the maintenance rates of the UP given by equation (3). Figure 2 illustrates the results of these simulations. Maintenance rates for UP vary according to the chosen renewal fees structure. The higher the fees, the lower the maintenance rates. Note also that the lower bound of maintenance rates is assumed to be 10 percent for all fees schedules. The higher the fees, the faster the simulated maintenance rates converges towards this lower bound.

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[7] For more discussion on the absolute and relative patenting costs, see van Pottelsberghe and François (2009), van Pottelsberghe and Mejer (2010), and Danguy and van Pottelsberghe (2011a).

Figure 2 - Simulated maintenance rates for UP
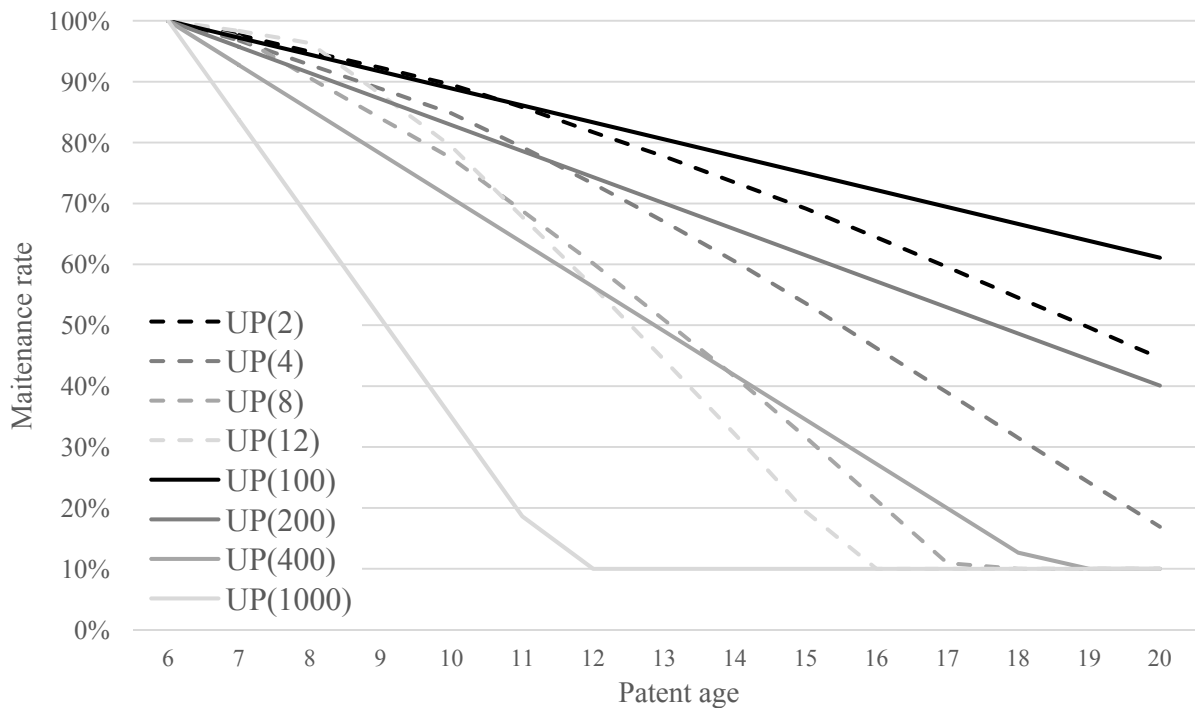
Note: the simulated maintenance rates for UP were normalised to 100 percent at year 6 and the lower bound is assumed to be equal to 10 percent.

2.3   SIMULATED UP RENEWAL FEES INCOME

The estimated parameters of Table 1 are used to simulate the total renewal fee income generated by an average UP (according to equation (2)). Figure 3 presents this total income for different fee structures and compares the incomes generated by UP (see VUP bars) with the one generated by a current average EP (VEP according to equation (1)).

Figure 3 confirms that the UP would generate at least the same total renewal fee income as the current EP and most likely significantly more, thanks to higher maintenance rates and higher renewal fees. Renewal fees have a positive impact on the total income generated by granted patents. The patent offices could thus have a preference for higher fees since it would increase the level of their total income. Note that these total fee incomes do not include the part related to the EPC member states which are not part of the unitary patent system (Spain, Italy, and Croatia, and non-EU member states such as Switzerland and Turkey) because this part of renewal fee income is not supposed to change with the new unitary patent. For the sake of clarity, the remainder of this analysis will rely on incremental fees schedules only.

Figure 3: Simulated total renewal fee income for an average EP and an average UP
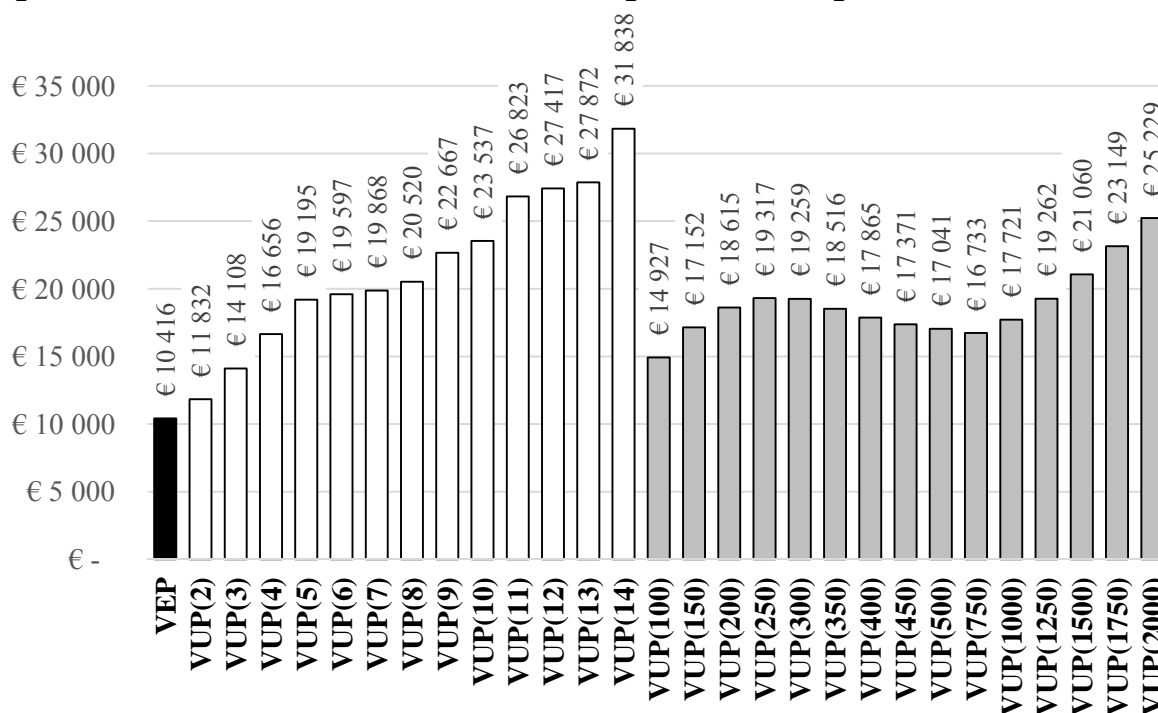
Note: for VEP, own calculation based on equation (1) with the observed data for the 25 EU member states. For VUP, own calculation based on equation (2) with the simulated maintenance rates and different fees schedules (the parentheses (1) to (14) show the impact with UP renewal fees computed as the sum of (1) to (14) EP renewal fees in the current system; the parentheses (100) to (2000) show the total income of an average UP with steady yearly increases of renewal fees).

These simulations are actually valid in the frame of a total switch from the current EP system towards the UP system. The reality is that the two systems will coexist and hence the degree of substitution between the two must be taken into account.

3 THE SUBSTITUTION EFFECT

Although an average UP would generate more income than an average EP, the total renewal fees collected by patent offices within the unitary patent system (including UP and EP) might even be lower than the income with the current EP system. If both types of patent coexist, applicants will have the opportunity to choose either to validate the granted European patent in individual countries (ie the current EP situation) or to validate the patent with unitary effect across the 25 EU countries (the UP system). This choice would be made for each patent according to the expected market for the protected technology and the desired geographical scope of protection. The fear of patent offices is that only the patents that are currently validated in a large number of countries (and hence generate significant renewal fees income) would opt for the unitary patent. In other words, national patent offices could be worse off with the UP if the most valuable current EP switch to UP (with lower absolute fees than the current cumulative fees paid for a large geographical scope of protection in the EU).

This paper precisely aims to better understand the budgetary consequences of this substitution effect between EP and UP on the total renewal fees income collected by patent offices. In particular, this section extends the comparison between one average UP and one average EP (introduced in Danguy and van Pottelsberghe, 2011a, and presented in Section 2) by taking into consideration the relative distribution between the two types of patents.

3.1 Renewal fees income under the dual system

Given the coexistence of UP and EP, the total renewal fee income collected by patent offices after the grant of European patents would depend on three key factors:

- the renewal fee income generated by the EP, $\widehat{VEP}$ (which depends on their validation and maintenance rates);
- the renewal fee income generated by the UP, $\widehat{VUP}$ (and hence their maintenance rates and the level of UP fees);
- the share of EP (SH_{EP}) and the share of UP (SH_{UP}) in the total number of granted patents by the EPO.

The total income for patent offices would also depend on the total number of granted patents. For the sake of simplicity, it is assumed that the number of granted patents is stable. More precisely, the focus is on the total renewal fee income generated by one average granted patent at the EPO given by the weighted sum defined in equation (4). This methodological choice is a conservative assumption since it does not take into account the potential increase in patent applications due to an improved attractiveness of the European patent system, thanks to the unitary patent.

$$Total\ fees\ income = \widehat{VEP} * \frac{EP}{UP + EP} + \widehat{VUP} * \frac{UP}{UP + EP} = \widehat{VEP} * SH_{EP} + \widehat{VUP} * SH_{UP} \qquad (4)$$

3.2 Working hypotheses

In addition to performing simulations at the patent level, three working hypotheses are at the core of the analysis, ensuring cautious lower bounds estimates:

- The upper bound of the maintenance rates for $\widehat{VEP}$ corresponds to the case of an average EP (VEP) estimated in Section 2;
- The lower bound of maintenance rate for $\widehat{VUP}$ corresponds to the case of an average UP (VUP) estimated in Section 2;
- The lower the share of UP (SH_{UP}), the higher the maintenance rates for those UP.

In other words, it is assumed that the first patents which will opt for the UP route would be those that would have been validated in a larger number of countries (with respect to their sectorial benchmark) and maintained for a longer duration in the current EP system. This kind of patents would most largely benefit from the unitary patent system. On the one hand, it means that the first UP would generate on average a higher renewal fees income ($\widehat{VUP}$ due to a higher maintenance) than the average UP patent in case of a total switch (VUP simulated in Section 2). On the other hand, it means that the remaining EP would generate on average a lower renewal fees income ($\widehat{VEP}$ would be smaller due to smaller validation and maintenance rates) than the current situation with only EP (VEP computed in Section 2).

Figure 4 illustrates the evolution of simulated maintenance rates related to UP, according to the last three working hypotheses. The lowest curve represents the maintenance rate of an average UP if all patents opt for the UP system. It is obtained through the simulations performed in Section 2. The upper lines correspond to different scenarios in terms of the share of UP (SH_{UP} varying between 10 percent and 90 percent) in total EPO granted patents.

Figure 4 - UP maintenance rates according to its market share
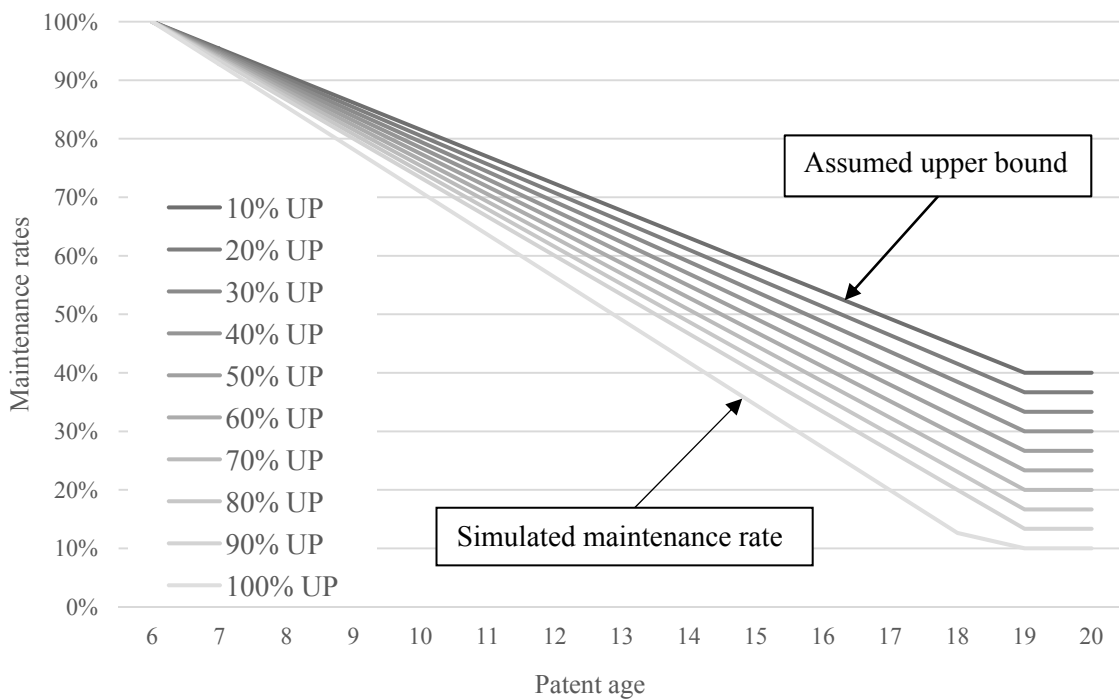
Note: This figure is based on UP(400) renewal fees. The lowest line (100 percent UP) corresponds to the simulated maintenance rate presented in Figure 2. The other lines are equally shared between this simulated line and the upper bound. This upper bound is assumed to correspond to a maintenance rate of 40 percent after 20 years for the lowest share of UP. For the lowest fees schedules UP(100) and UP(200), this assumption is set up at 80 percent and 60 percent, respectively.

4 BREAK-EVEN ANALYSIS

This section aims to identify the break-even conditions for patent offices, ie the conditions such that the total renewal fees income collected by patent offices with the UP would be at least equal to the one generated by the current situation (100 percent EP). Since the total renewal fee income depends on several factors, our break-even analysis is presented in four subsections that focus on one particular dimension of the total income.

4.1 EP BREAK-EVEN ANALYSIS

The assumptions made in terms of UP maintenance rates (see Figure 4) allow us to compute the renewal fees income generated per patent by the first UP, $\widehat{VUP}$, according to equation (2). The upper rows of Table 2 present these simulation results for the different UP fees schedule (see Figure 1). First, the row related to a 100 percent share of UP (in case of a total switch) corresponds to the simulated total income per average patent presented in Section 2.3. Second, for a given fees schedule, we observe that the lower the share of UP, the higher the unitary patent income ($\widehat{VUP}$). This is due to the fact that the first patents that will opt for UP would be those with higher maintenance rates (see discussion in Section 3.2) on average. Third, the results presented in Table 2 confirm that the unitary patent income tends to increase with the level of UP fees.

Based on the unitary patent income, one can measure the required EP income per patent that would ensure the break-even of patent offices with the UP system (see the lower part of Table 2):

$$BE_{EP} = \frac{VEP - SH_{UP} * \widehat{VUP}}{SH_{EP}} \qquad (5)$$

Considering the UP(200) fees schedule and assuming that 20 percent of granted patents at the EPO would opt for the UP, the results presented in Table 2 can be interpreted as follow (cf. the shaded cells):

- an average UP would generate about €22,000;
- an average remaining EP should generate at least €7,525 (in comparison with €10,416 generated by a current average EP) to ensure that patent offices will not be worse off.

The interpretations of the break-even conditions in terms of EP are twofold. First, the higher the UP fees, the faster the break-even of the system is reached. Second, the greater the share of UP, the faster the system breaks even, because an average UP generates more revenue than an average EP in case of a total switch. To balance their budgets, national patent offices could have the tendency to put in place very high fees for the UP. However, very UP high fees would be synonymous with a low attractiveness of the system and hence the share of UP would tend to be low. The policy arbitrage is to find a balance between (1) high UP fees to have a high income per average UP and (2) low UP fees to have a large number of patents opting for the UP route.

Table 2: $\widehat{VUP}$ and break-even EP

European Patent			Unitary Patent income: $\widehat{VUP}$ (€)							
VEP	SH_{EP}	SH_{UP}	UP(100)	UP(200)	UP(300)	UP(400)	UP(500)	UP(1000)	UP(1500)	UP(2000)
10416	100%	0%								
	90%	10%	17150	22400	24750	29640	32760	50360	69750	89920
	80%	20%	16903	21979	24140	28453	31163	46824	64375	82749
	70%	30%	16656	21559	23530	27267	29567	43289	59000	75578
	60%	40%	16409	21138	22920	26080	27970	39753	53625	68407
	50%	50%	16162	20718	22309	24893	26373	36218	48250	61236
	40%	60%	15915	20297	21699	23707	24777	32682	42875	54064
	30%	70%	15668	19877	21089	22520	23180	29147	37500	46893
	20%	80%	15421	19456	20479	21333	21583	25611	32125	39722
	10%	90%	15174	19036	19869	20147	19987	22076	26750	32551
	0%	100%	14927	18615	19259	17865	17041	17721	21060	25229

|			Break-even EP: BE_{EP} (€)							
	SH_{EP}	SH_{UP}	UP(100)	UP(200)	UP(300)	UP(400)	UP(500)	UP(1000)	UP(1500)	UP(2000)
	100%	0%	10416	10416	10416	10416	10416	10416	10416	10416
	90%	10%	9667	9084	8823	8280	7933	5977	3823	1582
	80%	20%	8794	7525	6985	5906	5229	1314	0	0
	70%	30%	7741	5640	4795	3194	2208	0		
	60%	40%	6420	3267	2080	0	0			
	50%	50%	4670	114	0					
	40%	60%	2167	0						
	30%	70%	0							
	20%	80%								
	10%	90%								
	0%	100%								

Note: The blank cells concerning the break-even EP correspond to cases for which patent offices will be better off than the current situation regardless of the renewal fees income generated by remaining EP.

4.2 WHAT WOULD EP GENERATE?

The previous subsection showed that the level of EP break-even decreases with the share of UP (the higher the share of UP the lower the risk of losing renewal fees income). However, the extent to which the real EP fee income would be decreasing according to the share of UP is not taken into account. The distribution of EP renewal fee income according to the age of patents provides interesting insights on this matter. Since the level of annual renewal fees tends to increase with the age of patents, the distribution of income over time is not uniform. In other words, patents that are maintained for a longer period tend to generate a relatively higher share of the total income collected by patent offices. Once the UP is be created, we can expect that those valuable patents would have a high probability to opt for UP. This switch from EP to UP would most probably lead to a larger relative loss of EP renewal fees than the relative share represented by those valuable patents in the total granted patents.

In order to estimate the reduction in EP income, we computed the cumulative renewal fee income according to the maintained patents in three main EU member states (Germany, France and United Kingdom). Figure 5 shows this distribution of current EP renewal fees income. For instance, we observe that the first 15 percent of patents that are maintained for the longest duration represent more than 30 percent of total renewal fee income collected in Germany. This curve for Germany is used as a conservative assumption to estimate $\widehat{VEP}$ according to the share of UP. It is assumed that the first patents that will opt for UP will be those maintained for a longer average duration in the current system. This methodology allows us to better approximate the extent to which the average renewal fee income generated by remaining EP evolves according to the share of UP (see the first column of Table 3).

Figure 5: Distribution of current EP renewal fees income
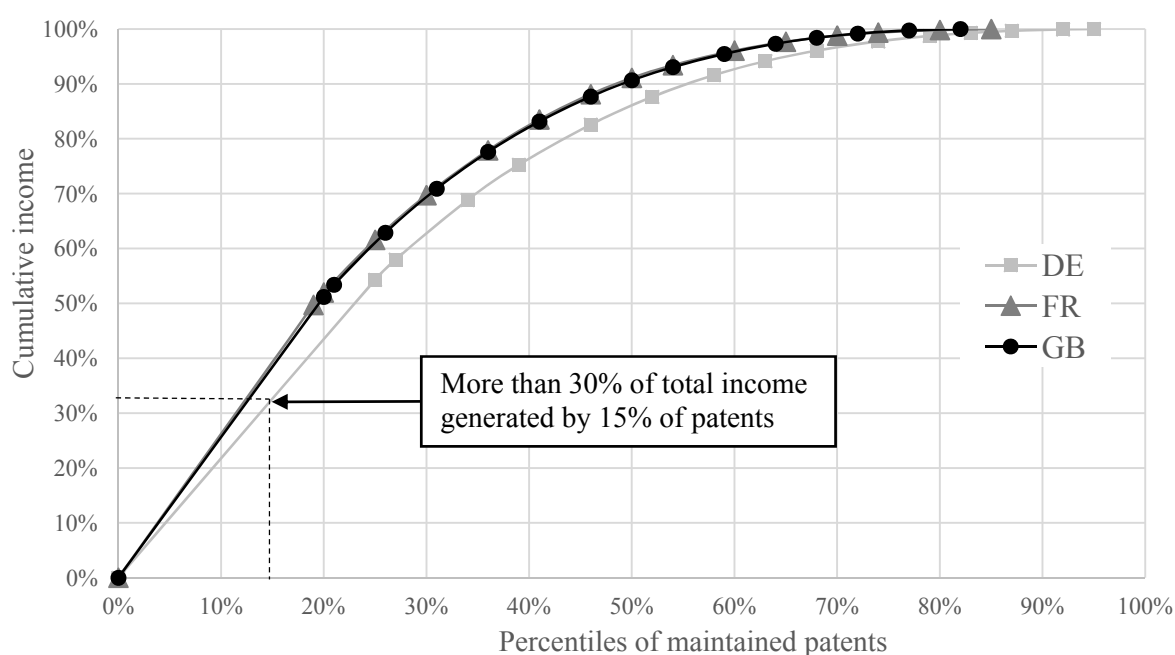
Note: The cumulative income is the sum of annual renewal fees income generated by patents. Each annual renewal fees income is to the product of the maintenance rate of patent and the official annual fee corresponding to each age of the patents.

4.3 UP BREAK-EVEN ANALYSIS

Based on the EP income within the new system ($\widehat{VEP}$), we evaluate the UP income per patent that ensures the break-even of patent offices (see the last column of Table 3):

$$BE_{UP} = \frac{VEP - SH_{EP} * \widehat{VEP}}{SH_{UP}} \tag{6}$$

Table 3: $\widehat{VEP}$ and break-even UP

European patent		Unitary patent	
$\widehat{VEP}$	SH_{EP}	SH_{UP}	BE_{UP}
€ 10 416	100%	0%	
€ 8 124	90%	10%	€ 31 039
€ 5 833	80%	20%	€ 28 747
€ 3 854	70%	30%	€ 25 727
€ 2 500	60%	40%	€ 22 290
€ 1 458	50%	50%	€ 19 373
€ 833	40%	60%	€ 16 804
€ 417	30%	70%	€ 14 701
€ 208	20%	80%	€ 12 968
€ 104	10%	90%	€ 11 561
	0%	100%	€ 10 416

Note: The $\widehat{VEP}$ are computed by considering the distribution of EP renewal fees income in Germany according to the percentiles of maintained patents (see Figure 5).

Assuming that 20 percent of granted patents at the EPO would opt for the UP, the results presented in Table 3 should be read as follows (the shaded cells):

- an average remaining EP would generate about €6000 (ie less than 60 percent of the current average EP income, VEP) ;
- an average UP should generate at least €28,747 to ensure that patent offices will not be worse off with the new system (Table 2 shows that this amount would be achieved with fees of UP(400).

Assuming that 80 percent of granted patents at the EPO would opt for the UP, the results presented in Table 3 would then be read as follows (cf. the shaded cells):

- an average remaining EP would generate about €200;
- an average UP should generate at least €13,000 to ensure that patent offices will not be worse off with the new system (Table 2 shows that this amount would already be achieved with fees of UP(100).

4.4 SIMULATED TOTAL RENEWAL FEES INCOME

Given the estimations of the UP income ($\widehat{VUP}$ in Table 2) and the EP income ($\widehat{VEP}$ in Table 3), simulations based on equation (4) measure the total renewal fees income generated by an average patent granted at the EPO. Table 4 and Figure 6 show the sensitivity of these simulations to different UP fees schedules. The first row (share of EP equal to 100 percent and share of UP equal to 0 percent) corresponds to the current situation. The interpretations of these simulation results are twofold. First, the higher the level of UP fees, the higher the total renewal fee income per average patent granted at the EPO, independently from the share of UP. In other words there is a natural temptation to set high renewal fees. Second, with low UP renewal fees there is a U-shaped relationship between the share of UP and the total renewal fee income per average patent. This is due to the substitution effect between the two types of patent. With higher renewal fees (from UP(400) onwards), the higher the share of UP the higher the total renewal fee income. The total renewal fee income collected by patent

offices could actually be lower than the income in the current situation if the unitary patent system is not attractive enough (ie low share of UP) and has low renewal fees.

At first glance these simulation results strengthen the argument for high UP renewal fees, so that they generate more income than under the current situation. However, very high fees would lead to a low use of the new unitary patent. Such situation would most probably not meet the expectations of EU member states which have asked for a structural improvement in the European patent system[8].

Table 4: Simulated total renewal fees income per average patent (€)

SH_{EP}	SH_{UP}	UP(100)	UP(200)	UP(300)	UP(400)	UP(500)	UP(1000)	UP(1500)	UP(2000)
100%	0%	10416	10416	10416	10416	10416	10416	10416	10416
90%	10%	*9027*	*9552*	*9787*	*10276*	10588	12348	14287	16304
80%	20%	*8047*	*9062*	*9494*	*10357*	10899	14031	17541	21216
70%	30%	*7694*	*9165*	*9757*	10878	11568	15684	20398	25371
60%	40%	*8063*	*9955*	10668	11932	12688	17401	22950	28863
50%	50%	*8810*	11088	11884	13176	13916	18838	24854	31347
40%	60%	*9882*	12512	13353	14557	15199	19943	26058	32772
30%	70%	11093	14039	14887	15889	16351	20528	26375	32950
20%	80%	12378	15607	16425	17108	17308	20531	25742	31819
10%	90%	13667	17143	17892	18142	17998	19878	24085	29306
0%	100%	14927	18615	19259	17865	17041	17721	21060	25229

Note: the cells which are in bold and italic correspond to cases which are worse than the current situation (VEP, €10416).

Figure 6: Simulated total renewal fees income per average patent
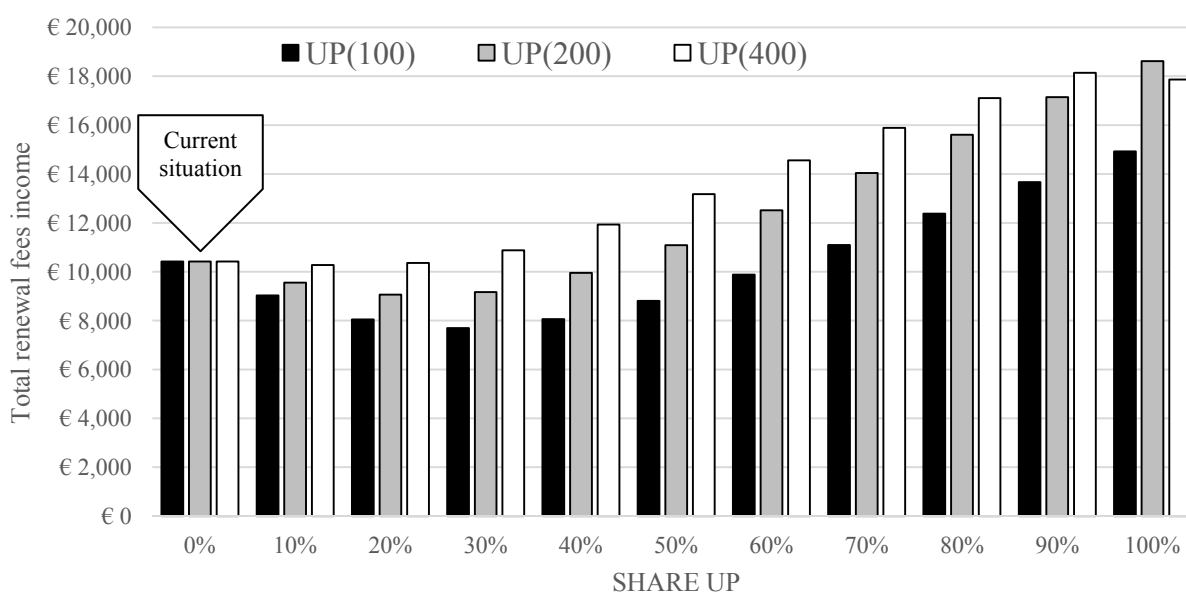
Note: The bars related to a share UP equal to 0 percent correspond to the current situation (VEP). See Table 4 for more fees schedules.

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[8] See, for instance, the press release of the Council of the European Union about the creation of unitary patent protection (17 December 2012).

5   The fate of National Patent Offices

While previous sections analyse the total income generated by an average patent, this section focuses on the budgetary consequences for each national patent office (NPO) and for the EPO. Although the total income within the unitary patent system could be higher than the current situation, the impact for NPOs could be negative, depending on how the total income is shared amongst them. This question is actually a key aspect of the negotiations related to the forthcoming Unitary Patent renewal fees.

5.1   Total renewal fee income for each NPO

Since EP and UP will coexist within the European patent system, the sources of income for each NPO and for the EPO will be twofold. First, regarding European patents, the current situation will continue to prevail. Each NPO keeps half of the renewal fees paid for maintaining EP enforced in their jurisdiction, the other half being retroceded to the EPO. Second, for the maintenance of UP, there will be centralised collection of renewal fees performed by the EPO, which will subsequently retrocede half of these fees to NPOs. The bone of contention is logically related to the distribution key used by the EPO to allocate the UP renewal fee income amongst NPOs. Several distribution keys can be considered (according to GDP, to population, or to former share of EP renewal fees income)[9]. For the present simulation, we have opted for the GDP distribution key, as it is the most legitimate and easy to implement (fast growing countries will benefit more). In other words, the share of UP renewal fees that will be distributed by the EPO back to the NPOs is related to their GDP size. A more complex distribution key has been created by NPOs' representatives: the 2008 politically negotiated distribution key (European Council, 2008). It is compared with the GDP distribution key in Appendix Table A.2.

The total renewal fees income for each country i – with a distribution key D_i^{UP} for the UP income – is computed along equation (7):

$$Total\ fees\ income_i = \left[\frac{\sum_{t=6}^{20} \widehat{\pi_i}\left(1 - \widehat{\delta_{it}}\right)F_{it}}{2}\right] * SH_{EP} + \left[D_i^{UP} * \frac{\sum_{t=6}^{20}\left(1 - \widehat{\delta_t^{UP}}\right)F_t^{UP}}{2}\right] * SH_{UP} \quad (7)$$

Table 5: Total renewal fees income per average patent for Germany (€)

SH_{EP}	SH_{UP}	UP(100)	UP(200)	UP(300)	UP(400)	UP(500)	UP(1000)	UP(1500)	UP(2000)
100%	0%	2760	2760	2760	2760	2760	2760	2760	2760
90%	10%	*2163*	*2231*	*2262*	*2327*	*2368*	*2599*	2853	3118
80%	20%	*1680*	*1814*	*1870*	*1984*	*2055*	*2466*	2927	3410
70%	30%	*1371*	*1564*	*1642*	*1789*	*1880*	*2421*	3040	3693
60%	40%	*1260*	*1508*	*1602*	*1768*	*1867*	*2486*	3215	3992
50%	50%	*1255*	*1554*	*1658*	*1828*	*1925*	*2572*	3362	4215
40%	60%	*1343*	*1688*	*1798*	*1957*	*2041*	*2664*	3467	4349
30%	70%	*1474*	*1861*	*1972*	*2104*	*2164*	*2713*	3481	4345
20%	80%	*1632*	*2056*	*2163*	*2253*	*2279*	*2702*	3387	4185
10%	90%	*1797*	*2253*	*2352*	*2384*	*2366*	*2612*	3165	3851
0%	100%	*1961*	*2445*	*2530*	*2347*	*2238*	*2328*	2766	3314

Note: the cells which are in bold and italic correspond to cases which are worse than the current situation.

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[9] For a discussion on the choice of an appropriate distribution key between NPO, see Danguy and van Pottelsberghe (2011a).

Table 5 shows the simulations for Germany (see Section 5.3 for the EPO and all NPOs). The German patent office would have a significant drop in its revenues because of the implementation of the UP, because Germany currently benefits from a leading position within the European patent system (ie being the largest country within the European Union, which secures higher validation rates and maintenance rate; see Danguy and van Pottelsberghe, 2011a). Indeed, Germany represents more than half of the current EP renewal fee income (see Appendix Table A.2 for the 25 member states included in the UP system). The extent to which the German patent office total income with the UP system is lower than their current 'EP' income (€2760 per average patent granted at the EPO) also depends on the level of UP fees and the share of UP in total EPO granted patents. Table 5 clearly indicates that if the German patent office wants to keep a similar stream of revenues from the European patents, it would opt for very high UP renewal fees, with yearly increases of €1,500. This is true with 10 percent to 90 percent of EPO-granted patents opting for the UP.

5.2 BREAK-EVEN ANALYSIS FOR GERMANY

While there are intense political negotiations concerning the UP fees schedule and the distribution key, an alternative approach is rarely coined by policy makers. Instead of focusing exclusively on UP renewal fees, negotiators could also consider a change in EP renewal fees (national renewal fees used for the maintenance of the EP and national patents). At the level of NPOs, the potential losses due to the creation of UP could actually be compensated for through two channels:

(1) increasing the EP income by increasing the national renewal fees;
(2) increasing the UP income by:
- increasing the UP renewal fees (see the right columns in Table 5 for Germany);
- increasing the number of patents opting for UP thanks to a better attractiveness of the European patent system.

These alternatives are investigated in this section for Germany (see Section 5.3 for results concerning all NPOs).

Table 6 presents the increase in EP fees that would allow a stable revenue stream to be maintained for the German patent office. Since the increase in fees concerns only EP, we observe that the lower the share of EP, the higher the required increase in EP fees in order to compensate similar losses in total income. For instance, with UP(100), the increase in EP fees corresponds to a multiplier of 1.3 if only 10 percent of the patents opt for the UP route, and to 121 if 80 percent of the patents opt for the UP route. In other words, Germany has a financial incentive to argue for very high UP renewal fees, and to reduce the use of the UP route.

Table 6: Required EP renewal fee multiplier in order to secure break-even in Germany

SH $_{EP}$	SH $_{UP}$	UP(100)	UP(200)	UP(300)	UP(400)	UP(500)	UP(1000)	UP(1500)	UP(2000)
100%	0%								
90%	10%	1.36	1.32	1.30	1.26	1.24	1.10		
80%	20%	2.03	1.90	1.85	1.74	1.67	1.28		
70%	30%	3.29	2.97	2.84	2.60	2.45	1.56		
60%	40%	5.44	4.71	4.43	3.94	3.64	1.81		
50%	50%	10.17	8.34	7.71	6.67	6.08	2.14		
40%	60%	19.88	15.28	13.80	11.70	10.57	2.27		
30%	70%	46.68	32.93	28.97	24.30	22.14	2.65		
20%	80%	121.23	76.04	64.59	55.02	52.22	7.11		
10%	90%	411.55	216.92	174.95	160.93	169.00	63.72		
0%	100%								

Note: The blank cells correspond to cases for which patent offices will be better off than the current situation.

An alternative solution would be to have more patents granted by the EPO. The increase in EPO granted patents (compared to the case with 60,000 granted patents at the EPO) that would allow for a stable revenue stream in

Germany is displayed in Table 7. For instance, with UP(100), and if the share of UP is equal to 10 percent of total patents granted by the EPO, one would need 1.3 times more patents granted in order to maintain Germany's revenue stream.

Table 7: Required multiplier for total EPO granted patents in order to secure break-even in Germany

SH $_{EP}$	SH $_{UP}$	UP(100)	UP(200)	UP(300)	UP(400)	UP(500)	UP(1000)	UP(1500)	UP(2000)
100%	0%								
90%	10%	1.27	1.18	1.15	1.11	1.09	1.02		
80%	20%	1.49	1.33	1.28	1.21	1.17	1.05		
70%	30%	1.63	1.42	1.36	1.27	1.23	1.06		
60%	40%	1.70	1.45	1.38	1.29	1.24	1.05		
50%	50%	1.71	1.44	1.38	1.28	1.24	1.04		
40%	60%	1.68	1.40	1.34	1.26	1.22	1.02		
30%	70%	1.62	1.34	1.28	1.22	1.20	1.01		
20%	80%	1.56	1.28	1.22	1.18	1.17	1.02		
10%	90%	1.48	1.20	1.16	1.14	1.15	1.05		
0%	100%	1.41	1.13	1.09	1.18	1.23	1.19		

Note: The blank cells correspond to cases for which patent offices will be better off than the current situation.

5.3 BREAK-EVEN ANALYSIS FOR ALL PATENT OFFICES

Table 8 presents the simulation results for the EPO and the 25 NPOs of the unitary patent system, with the UP(200) renewal fees schedule and the GDP distribution key (see Appendix Table A.3 for the simulations with the politically agreed distribution key). The results show that only a handful of NPOs could be negatively impacted by the creation of the unitary patent system. Except for the German case, the budgetary losses for these patent offices are very low and correspond to cases with relatively low shares of UPs.

The first part of Table 8 shows that with a renewal fee of UP(200) the EPO would have a slight reduction of its revenue stream if less than 50 percent of the EPO-granted patents would opt for the UP. In order to secure a permanent break-even, the EP renewal fees should be subject to a multiplier of maximum 1.55 (or a 55 percent increase). Or, if the EP renewal fees are not subject to any change, the number of patents granted should increase by maximum 6 percent (multiplier of 1.06).

Table 8: EPO and all NPO simulations with UP(200) and a 'GDP' DISTRIBUTION KEY

Total renewal fees income per average patent for patent offices with UP(200) (€)

SH$_{EP}$	SH$_{UP}$	EPO	DE	FR	GB	NL	SE	BE	AT	PL	DK	IE	FI	CZ	PT	HU	GR	LU	RO	SK	SI	BG	CY	EE	LT	LV	MT
100%	0%	5208	2760	814	747	284	100	55	111	22	48	33	51	25	27	37	22	10	13	11	8	10	5	6	4	4	0
90%	10%	*4776*	*2231*	*787*	753	*264*	110	78	*110*	54	59	44	56	32	37	*36*	35	11	21	16	9	11	5	*6*	6	5	1
80%	20%	*4531*	*1814*	*787*	783	*255*	123	101	113	86	70	55	62	39	47	37	49	12	28	20	11	11	6	*6*	8	5	1
70%	30%	*4583*	*1564*	833	854	*262*	141	127	122	118	84	67	71	48	59	40	64	14	36	25	13	12	7	6	9	6	2
60%	40%	*4978*	*1508*	930	971	287	165	155	138	150	101	81	83	58	72	45	79	16	45	31	15	14	8	7	11	7	3
50%	50%	5544	*1554*	1053	1110	321	192	184	157	182	118	96	96	68	85	51	94	19	54	36	18	16	9	7	14	8	3
40%	60%	6256	*1688*	1197	1267	363	220	214	179	213	136	111	110	79	99	58	110	22	62	42	20	18	10	8	16	9	4
30%	70%	7019	*1861*	1347	1430	408	249	243	202	243	155	126	124	89	112	65	125	25	71	48	23	20	11	9	18	10	4
20%	80%	7803	*2056*	1499	1592	454	278	271	225	271	173	141	139	100	125	73	139	28	79	54	26	23	13	11	20	11	5
10%	90%	8571	*2253*	1648	1750	499	306	298	247	298	190	155	152	110	138	80	153	30	87	59	28	25	14	12	22	13	5
0%	100%	9308	*2445*	1789	1901	542	332	324	269	324	206	168	165	119	150	87	167	33	95	64	30	27	15	13	24	14	5

Required EP renewal fee multiplier in order to secure break-even

SH$_{EP}$	SH$_{UP}$	EPO	DE	FR	GB	NL	SE	BE	AT	PL	DK	IE	FI	CZ	PT	HU	GR	LU	RO	SK	SI	BG	CY	EE	LT	LV	MT
100%	0%																										
90%	10%	1.14	1.32	1.06		1.11			1.01							1.02								1.06			
80%	20%	1.34	1.90	1.09		1.27																		1.09			
70%	30%	1.55	2.97			1.35																					
60%	40%	1.36	4.71																								
50%	50%		8.34																								
40%	60%		15.28																								
30%	70%		32.93																								
20%	80%		76.04																								
10%	90%		216.92																								
0%	100%																										

Required multiplier for total EPO granted patents in order to secure break-even

SH$_{EP}$	SH$_{UP}$	EPO	DE	FR	GB	NL	SE	BE	AT	PL	DK	IE	FI	CZ	PT	HU	GR	LU	RO	SK	SI	BG	CY	EE	LT	LV	MT
100%	0%																										
90%	10%	1.04	1.18	1.01		1.03			1.002							1.01								1.01			
80%	20%	1.06	1.33	1.01		1.04																		1.01			
70%	30%	1.06	1.42			1.04																					
60%	40%	1.02	1.45																								
50%	50%		1.44																								
40%	60%		1.40																								
30%	70%		1.34																								
20%	80%		1.28																								
10%	90%		1.20																								
0%	100%		1.13																								

Note: The bold and italic cells correspond to cases which are worse than the current situation. The blank cells correspond to cases which are better off than the current situation.

6   SUMMARY AND POLICY IMPLICATIONS

The main research question addressed in this paper is to assess whether the forthcoming European patent landscape, composed of two parallel systems (the new UP and the 'classical' EP), would lead to similar 'renewal fee revenues' for both the EPO and NPOs. This question has been addressed by Danguy and van Pottelsberghe (2011a) for the scenario of a total switch from the current EP system towards the UP system, showing that under such extreme circumstances most patent offices should be better off (with the exception of Germany). However, as the EP and the UP will coexist, simulations must take stock of the substitution effect between the two systems: if the most valuable EP (which are likely to be protected in a large number of countries) switch towards the UP system, then one could expect smaller revenue streams.

The paper starts with a description of the various options for the UP renewal fee schedule, a particularly sensitive issue for the stakeholders of the system. The debate between member states is related to the number of cumulated renewal fees taken to define the forthcoming UP renewal fees. Some countries would opt for the sum of 8 (or more) national renewal fees (defined as UP(8) in this paper), while others would prefer the equivalent of four countries (UP(4)). An alternative and simpler scheme suggested in this paper is to start with a €600 renewal fee for the first year of enforcement and then add each year a fixed amount. The smallest would be €100 added each year (or UP(100)) and the highest would be to add each year €2,000 (defined as UP(2000)). Our preferred renewal fee schedule is UP(200), because it is relatively low and is close to UP(4). Four countries is what the industry is ready to pay, as the patents granted 15 years ago by the EPO are currently being enforced in 4 countries.

The simulations presented in this paper lead to the following conclusions. First, a total switch towards the UP system will always generate much higher aggregate revenues for the whole patent system and for all NPOs, except Germany and a few other NPOs. Second, taking into account the substitution effect leads to smaller aggregate revenues, following a U-shaped relationship with respect to the percentage use of UP (for instance, with relatively low renewal fees, the aggregate fee income would be higher than with the current system only if more than 40 percent of the patents granted by the EPO would opt for the UP). Higher renewal fees would mitigate this effect, and actually secure higher aggregate revenues than in the past. Third, there are large discrepancies between patent offices, whereby smaller countries should gain more than in the past and larger countries, especially Germany, would have smaller renewal fee income. Extremely high UP renewal fees would mitigate this effect and secure that all countries earn more than with the current system.

In a nutshell, the simulations help to understand the most likely positions of several stakeholders. Smaller countries would opt for smaller renewal fees (say, UP(100) or UP(200)); the EPO would opt for medium level renewal fees (ie UP(400) or UP(500)), whereas Germany would opt for very high fees (probably UP(1500) or more). In other words, one could imagine that the political negotiations would converge towards a situation slightly above the EPO preferences, more than UP(500), as it would reduce the losses for Germany and drastically reduce the risks for the EPO.

But this approach would be ill-founded, because it falls short of taking into account what innovators need. After all, the renewal fee revenues of NPOs should be a secondary or tertiary element, not the primary one. This is however not the case; negotiations essentially consider the UP renewal fee structure, and whether the new bimodal system would generate enough resources for the sustainability of NPOs.

An alternative approach might be more efficient, and show a real political will to transform the UP into an attractive patenting route for applicants. Instead of leveraging the UP renewal fees schedule, policymakers should rather leverage national renewal fee schedules, also used for the EP. This would allow countries to adopt a local policy towards patent systems. For UP patents a low renewal fee structure should be set (maximum

UP(200)), and each national patent office should then leverage the EP renewal fees, increasing them to secure at the same time higher revenue streams and make the UP more attractive than the EP.

The main office that might still see a significant drop in its renewal fee income is the German Patent Office, which has historically benefited from its 'largest economy' status in Europe and hence generates higher than expected validation and maintenance rates, or an undeserved share of renewal fee income. In order to secure its revenue stream, with UP(200) and a 40 percent use of the UP, Germany should multiply its EP renewal fees by 4.5, which is probably too high. An alternative route to mitigate the potential losses is to have more patent applications at the EPO, which is likely to be the case if low UP renewal fees are set. Germany might be the only country to lose what it was probably not supposed to earn in the first place.

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APPENDIX TABLES

Table A. 1: Renewal fees at the European national patent offices (€)

Patent office	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
DE	130	180	240	290	350	470	620	760	910	1060	1230	1410	1590	1760	1940
FR	72	92	130	170	210	250	290	330	380	430	490	550	620	690	760
GB	112	137	161	186	211	236	261	310	360	435	509	571	633	695	745
NL	185	220	280	340	400	500	600	700	800	900	1000	1100	1200	1300	1400
SE	342	194	237	269	301	334	366	409	441	474	506	538	581	614	646
BE	85	100	125	145	150	195	220	250	290	330	370	410	455	500	545
AT	104	208	313	417	522	626	731	835	940	1044	1148	1253	1357	1566	1775
PL	112	99	112	137	161	186	199	224	236	261	286	311	335	360	385
DK	329	215	242	276	309	343	376	410	444	484	524	565	605	645	686
IE	134	150	176	194	220	242	265	285	311	335	356	382	408	438	468
FI	545	245	290	320	360	425	485	540	600	650	700	750	800	850	900
CZ	155	73	73	109	146	219	292	364	437	510	583	656	729	802	875
PT	129	103	154	308	360	360	411	463	514	565	565	668	668	720	720
HU	562	479	479	479	479	479	479	496	496	496	496	514	514	531	531
GR	440	100	115	140	190	240	300	400	500	600	700	800	900	1000	1100
LU	66	82	99	115	131	148	165	180	198	213	230	246	262	281	300
RO	300	220	240	260	280	300	320	340	370	400	500	500	500	500	500
SK	232	133	149	166	199	232	266	299	332	365	398	465	531	597	664
SI	150	60	70	80	110	154	200	234	274	310	390	510	654	870	1100
BG	173	128	154	206	257	308	360	411	462	514	565	617	668	771	874
CY	200	120	140	160	180	200	240	280	320	360	420	480	540	600	660
EE	160	134	153	179	205	243	281	320	358	403	447	492	537	582	626
LT	188	165	188	212	235	294	294	294	294	294	353	353	353	353	353
LV	189	171	213	256	320	320	320	320	320	320	427	427	427	427	427
MT	105	82	93	105	116	128	140	151	163	175	186	198	210	221	233

Notes: The validations fees are included in the renewal fees for year 6.

Source: EPO statistics available on http://www.epo.org/law-practice/legal-texts/html/natlaw/en/vi/index.htm

Table A. 2: Distribution keys across the national patent offices (%)

Patent office	EP	Unitary patent	
		GDP	policy proposal
DE	52.99%	26.27%	30.94%
FR	15.64%	19.22%	12.94%
GB	14.33%	20.42%	11.53%
NL	5.45%	5.82%	8.71%
SE	1.91%	3.57%	4.12%
BE	1.06%	3.48%	3.18%
AT	2.13%	2.89%	6.71%
PL	0.42%	3.48%	1.88%
DK	0.93%	2.21%	3.06%
IE	0.64%	1.81%	1.65%
FI	0.98%	1.78%	1.65%
CZ	0.48%	1.28%	0.94%
PT	0.51%	1.61%	2.00%
HU	0.71%	0.93%	1.06%
GR	0.42%	1.79%	1.76%
LU	0.19%	0.35%	0.59%
RO	0.25%	1.02%	1.41%
SK	0.21%	0.69%	0.82%
SI	0.16%	0.33%	0.47%
BG	0.20%	0.29%	0.94%
CY	0.10%	0.16%	0.71%
EE	0.11%	0.14%	0.82%
LT	0.08%	0.26%	0.82%
LV	0.08%	0.15%	0.71%
MT	0.01%	0.06%	0.59%

Note: The column entitled 'EP' corresponds to the current distribution of EP renewal fees income (computed as in equation (1) with most-up-to-date information about validation and maintenance of EP); the GDP distribution key is based on the GDP series provided in the World development indicators 2012; and the policy proposal is a rescaling (due to the absence of Spain and Italy in the current simulations) of the proposition made by the European Council (2008).

Table A. 3: EPO and all NPO simulations with UP(200) and 'POLICY PROPOSAL' DISTRIBUTION KEY

Total renewal fees income per average patent for patent offices with UP(200) (€)

SH EP	SH UP	EPO	DE	FR	GB	NL	SE	BE	AT	PL	DK	IE	FI	CZ	PT	HU	GR	LU	RO	SK	SI	BG	CY	EE	LT	LV	MT
100%	0%	5208	2760	814	747	284	100	55	111	22	48	33	51	25	27	37	22	10	13	11	8	10	5	6	4	4	0
90%	10%	*4776*	*2284*	*717*	*653*	297	116	74	153	36	68	42	54	28	41	38	35	14	25	17	11	18	11	13	12	11	7
80%	20%	*4531*	*1916*	*649*	*588*	318	135	95	197	51	89	51	59	32	56	40	49	17	37	23	14	25	18	21	20	17	13
70%	30%	*4583*	*1715*	*629*	*566*	355	159	117	246	67	111	62	66	37	72	44	63	22	49	30	17	33	24	28	28	24	19
60%	40%	*4978*	*1705*	*664*	*595*	409	188	142	299	83	136	74	77	43	88	50	78	26	62	36	21	41	31	36	35	30	25
50%	50%	5544	*1796*	*727*	*649*	471	220	168	355	99	162	88	89	51	105	57	93	31	74	43	25	49	37	43	43	37	30
40%	60%	6256	*1972*	*814*	*726*	539	254	195	412	115	188	101	102	58	123	66	108	36	86	51	29	58	43	50	50	43	36
30%	70%	7019	*2186*	910	811	609	288	222	468	131	213	115	115	66	139	74	123	41	98	57	33	66	49	57	57	49	41
20%	80%	7803	*2419*	1010	900	679	321	247	522	147	238	128	128	73	156	83	137	46	110	64	37	73	55	64	64	55	46
10%	90%	8571	*2653*	1109	988	746	353	272	575	161	262	141	141	81	171	91	151	50	121	71	40	81	60	71	71	60	50
0%	100%	9308	2880	1205	1073	810	383	296	624	175	285	153	153	88	186	99	164	55	131	77	44	88	66	77	77	66	55

Required EP renewal fee multiplier in order to secure break-even

SH EP	SH UP	EPO	DE	FR	GB	NL	SE	BE	AT	PL	DK	IE	FI	CZ	PT	HU	GR	LU	RO	SK	SI	BG	CY	EE	LT	LV	MT
100%	0%																										
90%	10%	1.14	1.29	1.20	1.21																						
80%	20%	1.34	1.80	1.53	1.56																						
70%	30%	1.55	2.72	2.03	2.10																						
60%	40%	1.36	4.12	2.50	2.66																						
50%	50%		6.87	2.80	3.19																						
40%	60%		11.49	1.01	2.01																						
30%	70%		21.39																								
20%	80%		37.30																								
10%	90%		46.36																								
0%	100%																										

Required multiplier for total EPO granted patents in order to secure break-even

SH EP	SH UP	EPO	DE	FR	GB	NL	SE	BE	AT	PL	DK	IE	FI	CZ	PT	HU	GR	LU	RO	SK	SI	BG	CY	EE	LT	LV	MT
100%	0%																										
90%	10%	1.04	1.14	1.07	1.07																						
80%	20%	1.06	1.25	1.12	1.13																						
70%	30%	1.06	1.31	1.13	1.15																						
60%	40%	1.02	1.32	1.11	1.12																						
50%	50%		1.30	1.06	1.08																						
40%	60%		1.25	1.00	1.02																						
30%	70%		1.19																								
20%	80%		1.11																								
10%	90%		1.04																								
0%	100%																										

Note: The bold and italic cells correspond to cases which are worse than the current situation. The blank cells correspond to cases which are better off than the current situation.