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Two decades of forest-related legislation changes in European countries analysed from a property rights perspective

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ABSTRACT

In the last two decades, attention on forests and ownership rights has increased in different domains of international policy, particularly in relation to achieving the global sustainable development goals. This paper looks at the changes in forest-specific legislation applicable to regular productive forests, across 28 European

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Property rights
PRIF
Private ownership

countries. We compare the legal framework applicable in the mid-1990s with that applicable in 2015, using the Property Rights Index in Forestry (PRIF) to measure changes across time and space. The paper shows that forest owners in most western European countries already had high decision-making power in the mid-1990s, following deregulation trends from the 1980s; and for the next two decades, distribution of rights remained largely stable. For these countries, the content and direction of changes indicate that the main pressure on forest-focused legislation comes from environmental discourses (e.g. biodiversity and climate change policies). In contrast, former socialist countries in the mid-1990s gave lower decision-making powers to forest owners than in any of the Western Europe countries; over the next 20 years these show remarkable changes in management, exclusion and withdrawal rights. As a result of these changes, there is no longer a clear line between western and former socialist countries with respect to the national governance systems used to address private forest ownership. Nevertheless, with the exception of Baltic countries which have moved towards the western forest governance system, most of the former socialist countries still maintain a state-centred approach in private forest management. Overall, most of the changes we identified in the last two decades across Europe were recorded in the categories of management rights and exclusion rights. These changes reflect the general trend in European forest policies to expand and reinforce the landowners' individual rights, while preserving minimal rights for other categories of forest users; and to promote the use of financial instruments when targeting policy goals related to the environmental discourse.

1. Introduction

Over the last two decades, the emerging political agendas of biodiversity conservation, climate change and bio-economy has increased political attention on sustainable forest management (Winkel, 2017). During the same period, European forest policy was challenged by forest ownership changes, which are the result of the changes in lifestyle, attitudes and behaviours of forest owners, the forest land restitution in Eastern Europe, the support for afforestation, and the incidence of new forms of ownership (Weiss et al., 2019a). As a result, a complex system of political, social and scientific interactions from inside and outside of the forest sector is increasingly influencing forest policies (Klapwijk et al., 2018). This is reflected in country specific governance frameworks, with different combinations of mandatory or voluntary, public or private policy instruments (Nichiforel and Hujala, 2019; Pülzl et al., 2013).

Considering that more than 60% of European forests are privately owned (UNECE/FAO, 2019), property rights arrangements are critical institutions defining the relations between the private forest owners (PFO), forest managers, resource users and forest authorities (Siry et al., 2015). Property rights refer to particular actions authorised by specific operational rules (Schlager and Ostrom, 1992). The "de jure" property rights are guaranteed and implemented by the state. They are reflected in national or regional regulatory frameworks defining what a forest owner may or may not do in relation to her/his forest. While some property rights are defined directly in the text of laws, some other „operational rules" with impact on the exercise of the property rights are defined at the level of different other regulative acts, such as Ministerial resolutions or administrative decisions/guidelines. In the European context, the forest-focused regulations impacting on the de jure distribution of PFOs rights include forest codes, forest acts, forest-related acts, technical prescriptions, and operational guidelines (Pülzl et al., 2013).

Even though the form of forest ownership (Schmithüsen and Hirsch, 2010) and the relevance of property rights in forest management (Glück, 2002) are given high importance in the literature, there is little analytically derived empirical knowledge on the differences in property rights across countries and how these differences evolved over time (Weiss et al., 2019b). To address this issue, Nichiforel et al. (2018) developed the Property Rights Index in Forestry (PRIF) as an analytical tool to measure property rights distribution among private forest owners across Europe. The PRIF provides a structured overview of the power of decision-making that forest owners have across a variety of national or regional legal contexts. The PRIF index makes possible the characterisation of "de jure" property rights, in a specific jurisdiction at a certain point in time (Nichiforel et al., 2018). This paper adds to this emerging research agenda by documenting and analysing the trends of change in the PRIF across Europe. This is achieved by comparing the legal provisions that applied in the mid-1990s with those that applied in the year 2015. This allows the systematic identification of the property rights changes in a time frame of two decades and provides a sound method to highlight and discuss the geographical patterns of changes.

The design of the institutional framework that governs the forest production system is subject to changes and influences by stakeholders. The actors in the forest production system are guided by the "rules of the game" (North, 1990), which are created in time and space by the interaction between "rule makers" and "rule takers" (Möllering, 2007). This means that the actors of the system can expend different efforts in order to modify or preserve the structure of the property rights according to their interest (Nichiforel and Schanz, 2011). This is reflected in examples such as lobbying policy makers and legislators by PFOs in some former socialist countries with a view to increasing their management and withdrawal rights (Bouriaud et al., 2013) or the political efforts made by PFOs in some western countries to defend the current structure of rights against demands for forest conservation (McCauley, 2008). Thus, property rights arrangements are created, maintained or redistributed as an outcome of the interactions between stakeholders who resist or propose changes that benefit themselves, as well as law makers, who receive political benefits from making rules (Ostrom and Hess, 2008; Sikor et al., 2017). The property rights allocation pertaining to forest ownership is therefore part of a continuous socio-political negotiation process, involving the PFOs and other stakeholders under the specific authority structure of the state (Vatn, 2001).

The diversity of pressures and challenges faced by the forest sector may require institutional adaptation in order to direct PFOs' management towards desired policy outcomes. However, stable property rights are an important prerequisite for enhancing entrepreneurship in the forest sector (Bouriaud et al., 2011), to increase the adaptive capacity required to respond to natural disturbances (Coleman, 2011) and to implement successful payment schemes designed to promote forest conservation (Larson et al., 2013). Thus, there is a dilemma of governance with respect to the role of the state in assigning property rights. On one hand, the state can use its authority to assure the stability of the property rights system and thus maintain a firm institutional environment. On the other hand, the state can also exercise its authority to revise the content of the property rights so as to comply with international norms, initiatives and agreements or to create opportunities to enhance the social welfare and resolve social conflicts.

For example, in Western European countries, changes seem to comprise at least two opposing trends. First, the de-regulatory discourse during the 1980s challenged the efficiency of the existing top-down regulation system and resulted in a liberalisation trend in forest legislation promoting self-regulation and voluntary policy instruments (Arts et al., 2010; Pülzl et al., 2014). Since the early 1990s, this led to an

increased role of Corporate Social Responsibility in the forest sector (Toppinen et al., 2012) and of various voluntary certification systems, standards, and guidelines operating at different points across the supply chain to address the sustainability of biomass utilization (Stupak et al., 2011). Second, the implementation of environmental/nature conservation legislation such as the European Natura 2000 policy resulted in increasing restrictions (Sotirov et al., 2017; Weiss et al., 2019a) which have been frequently questioned by PFO associations who opposed the changes in property rights (Alphandéry and Fortier, 2001; Primmer et al., 2014). At the same time, following the fall of the socialist bloc during the 1990s, significant changes to forest legislation were made in the former socialist European countries (Weiland, 2010). Developments in those countries, however, are not homogeneous (Bouriaud and Schmithüsen, 2005). For example, this is illustrated by the difference in the manner in which the process of forest restitution in the Czech Republic and the Slovak Republic was carried out despite their common background: i.e. the two states that for a long time formed a single state (Jarský et al., 2018). The changes in the forest ownership structure in former socialist countries were associated with different patterns of changes in regulation of private forest management (Bouriaud et al., 2013).

In general, the changes in the European legal framework in forest sector have been studied by the research community (e.g. Winkel and Sotirov, 2016). However, the use of PRIF for comparative legal assessments provides a homogenous and unitary methodology for the quantitative analysis of legal changes. By comparing the PRIF and its components at two points in time we are able to identify how the changes in the forest-specific legislation influenced the distribution of the property rights, and which are the spatio-temporal differences among European jurisdictions.

The next section introduces the methods used for the calculation of the PRIF at two points in time. In the results section, we first give an overview on the relevant legislative changes (covering the period 1990–2015), followed by the analysis of their impact on the property rights (comparing the changes of the PRIF between mid-1990s and 2015). Finally, the results are discussed and the concluding section highlights the key points of this assessment.

2. Methods

The cross-country analysis of the identification of property rights changes uses the PRIF methodology as presented in Nichiforel et al. (2018). The PRIF is based on 37 indicators (Table A1-appendix A) grouped into five property rights categories associated with forest production: access, withdrawal, management, exclusion and alienation (Schlager and Ostrom, 1992). The indicators were designed to assess the rigour of the legal framework and the scope for freedom of decision-making attributed to forest owners. Thus, the indicators are assessed based on the rule of law (*de jure* situation) and do not consider perceptions regarding their practical implementation (de facto situation).

The study was conducted by use of a questionnaire sent to national experts in forest policy who had participated in the COST Action FP 1201 FACESMAP or were selected based on their scientific contribution in the field of forest policy analysis. Data collection took place in 2015–2017 and consisted of two main parts.

Firstly, the national experts were asked to document the legislative changes in the period between 1990 and 2015. The calculation of PRIF and the identification of property rights changes focuses on "regular productive forests". Thus, legal provisions referring to forests in protected areas (e.g. Natura 2000 sites) or forests that are subject to plant health or quarantine measures, are not included in the analysis. All of the other forest-relevant legislative policy areas that can impact a PFOs' scope of decision making were considered. After an initial exploration of policy tools affecting the five property rights categories, three types of legal acts emerged: 1. Forest laws (sometimes named Forest Codes, Forest Acts), 2. Hunting laws and 3. Land use laws (Fig. 1). We documented the changes that affect forest owners which occurred to these legal acts in the period 1990–2015 for each country. The legal changes were classified either as major changes (a law revision representing a change that affected the constitutional level of rules) or as minor changes (an amendment to the law affecting mostly the operational-level of rules). The sequence of these changes provided the legal background that is used to assess the indicators which are in turn used to identify the changes to property rights.

Secondly, the questionnaire asked for an expert assessment of the 37 indicators based on the rules of law applicable to private forests at two distinct points in time:

- The "mid-1990s legislation" refers to the legislation applicable in the period 1993–1999, which was chosen as a reference, because the former socialist countries in Europe underwent important institutional changes during this time. Almost all of the countries included in the analysis have as a reference point the end of 1999, with the exception of Slovenia (reference year 1993), Czech Republic (reference year 1996), Poland (reference year 1997) and Estonia (reference year 1998).
- The "current legislation" refers to the status of applicable legislation on the 1st of October 2015, as detailed in the data collection protocol.

The assessment of the indicators was based on the qualitative questionnaire that was distributed to the experts, with each question representing an individual indicator. The role of the national experts was to identify the legal provisions applicable for each indicator in their jurisdiction, for each of the two points in time. Three situations were identified in relation to changes to the laws and the changes to PRIF indicators:

- the changes to the legal acts resulted in changes to the indicators; in this case, a description and interpretation of the situation in both timeframes was provided to gauge the alterations to the restrictions imposed on PFO.
- an indicator had more than one change in the time frame from mid-1990s to 2015; in such cases all the changes are discussed, but only the legal provisions corresponding to the two points in time are used for the PRIF calculation.
- the changes in the legal acts did not result in changes to the indicators; thus, the legal changes did not impact on PRIF calculation.

The methodological foundation of PRIF (Nichiforel et al., 2018) presents the steps used for data processing, data weighting and the aggregation of indicators in the calculation of PRIF (Appendix A2). According to the PRIF methodology, each indicator contained a set of predefined alternatives (i.e. the alternatives identified for each indicator based on the legal stipulations found across the analysed jurisdictions). The identification of the predefined alternatives was carried out on the basis of the legal texts in the "current" 2015 legislation. This set of alternatives proved to be applicable also for the "mid 1990s legislation", which allowed the calculation of PRIF, in the two time frames, using the same initial methodology. The alternatives were sorted out and weighted, in a double blind expert based process, to quantify the degree of freedom in decision making. The scale for assessing the rigour of the law for the alternatives identified for each indicator ranged from 0 – meaning "the right is fully restricted" to 100 meaning "no legal restrictions are imposed", with intermediary values being possible. The scale is designed so as to approach the property rights from the perspective of PFOs. Thus, a change to an indicator that brings more restrictions to PFO freedoms results in a decrease in the value assigned for that indicator.

All indicators were considered to be equally weighted in the index to allow for comparisons between jurisdictions with different forest policy and regulatory landscapes. Thus, the PRIF is calculated as the

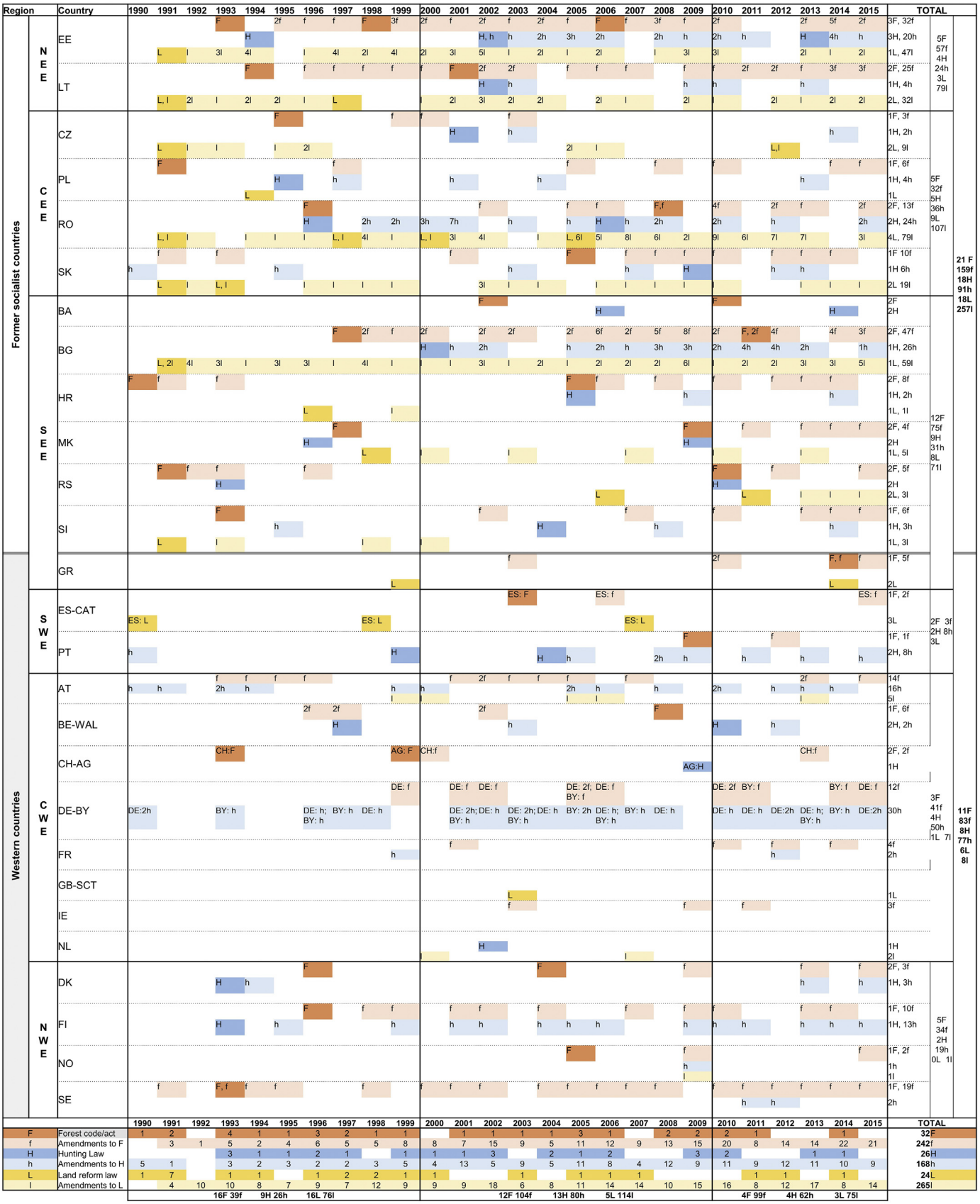

Fig. 1. Timeline evolution of changes occurring in the forest-related legal acts. Enactment year of a new Forest Act/Forest Code is identified with „F"(dark orange), for a new Hunting Law with „H"(dark blue) and for a new Land Use Act with „L"(intense yellow). Amendments to these laws, that represent changes to the content of the law, are identified with equivalent small letter: „f"(soft orange), "h"(light blue) and „l"(light yellow)". The numbers before the letters represent the quantification of the number of changes in a specific year and for the total per country and groups of countries. (Source: compiled by the authors). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

mean of the values for each indicator for the set of 37 indicators. The value of the index can range from 0 – when full restrictions apply for all the indicators to 100 – when owners have a full degree of freedom for all the indicators. For example, the assessment of the legislation applicable in 2015 resulted in PRIF ranging from 38.4 in North Macedonia to 84.7 in the Netherlands, implying considerably greater freedom for the forest owner in the Netherlands (Nichiforel et al., 2018).

We have analysed the property rights changes on a European scale comparison based on the data provided by 28 countries (abbreviations of the jurisdictions are identified using the ISO 3166). In five countries the legal framework was analysed considering the jurisdiction at the regional level: Wallonia – Belgium (BE-WAL), Bavaria – Germany (DE-BY), Aargau – Switzerland (CH-AG), Scotland – United Kingdom (GB-SCT) and Catalonia – Spain (ES-CAT). For Austria, the hunting legislation was analysed at the level of Styria. In terms of geographical distribution, the countries analysed cover all the regions identified by the Forest Europe (2015) group of countries (Fig. 1): North-Europe (NE), Central-West Europe (CWE), Central-East Europe (CEE), South West Europe (SWE) and South East Europe (SEE). Among the countries analysed, 13 of them have a former socialist political background while 15 are categorised as having a "western" political background. In the display of the results, the North-Europe is divided between "western societies" Nordic countries (NWE) and former socialist societies in the Baltic states (NEE).

3. Forest relevant legislative changes

3.1. Changes to forest-related legislation

In a timeframe of 26 years (1990–2015), the legal acts regulating forest management were adapted in the majority of the countries analysed (Fig. 1). In the decade 1990–1999, 16 new forest acts entered into force, 11 of which were issued in former socialist countries. The years where most of changes occurred in this decade are 1993 (four new acts) and 1996 (three new acts). In the next decade (2000–2009) 12 new forest acts entered into force out of which seven in former socialist countries and five in western countries. The last six years of the analysis included four new acts, all of them elaborated in former socialist countries.

We generally can distinguish between three patterns:

i) countries who kept to a minimum the number of changes to forest-related legislation and thus no new forest act was legally endorsed in the period analysed: Austria (AT), France (FR), Greece (GR), Germany (DE), Ireland (IE), Netherlands (NL) and the United Kingdom (GB);
ii) countries that legislated only one new forest act in the time span analysed: Belgium (BE), Czech Republic (CZ), Finland (FI), Norway (NO), Poland (PL), Portugal (PT), Slovenia (SI), Slovakia (SK), Spain (ES), Switzerland (CH) and Sweden (SE);
iii) countries that legislated at least two new forest acts between 1990 and 2015: Bosnia-Herzegovina (BA), Bulgaria (BG), Croatia (HR), Denmark (DK), Estonia (EE), Hungary (HU), Lithuania (LT), North Macedonia (MK), Romania (RO) and Serbia (RS).

The first group of countries, characterised by limited changes in the forest-related legislation, are mainly from CWE. In the Netherlands, the Forestry Act (originating from 1961) has not changed for decades and in the period analysed only minor administrative changes occurred. A similar situation is found in the UK (Scotland) were no amendments affecting property rights have been made to the Forest Act. In Ireland, several minor amendments were made to the 1946 Forestry Act, which were not really of concern to PFOs, except a change from 2001 involving indicators regarding forest lands selling and what price the owner can get. In Austria, despite the fact that the Forest Act (originating from 1975) was amended 13 times, only the 2002 amendment had an impact on PFOs property rights. For German Federal Law (originating from 1975) and Bavarian Forest Law (originating from 1974) only in 2005 did some provisions of Germany's nature protection regulations have an impact on the PRIF. In France, there was a significant revision to the French forest code (originating from 1827) in 2001 (introduction of the notion of multi-functionality), but no real impact to PFO's rights occurred. In 2010 alone, an important amendment was added to the forest code that influenced the matter of requirements for forest management plans (FMP). Additional to the CWE group of countries, in Greece two legal acts from 2014 amended the Forestry Law from 1979, validating and supplementing a series of scattered legislative provisions in respect of the definition of forests and utilization of forest lands.

In the second group of countries, that legislated one new forest act in the timeframe analysed, both the geographical distribution and the former socio-political background is diverse. In Portugal, the Forest Code from 1996 defined the basis for the national forest policy. A legal change with impact in PRIF occurred in 2009 with a Law-decree which approved forest management and forest intervention plans foreseen in the Forest Code of 1996. In Spain, the autonomous communities received the right to rule on natural resource management during the 1980s (including forests and hunting). The Spanish Forest Act of 2003 put in place a common framework for all regional laws. Catalonia introduced pioneering forest legislation in 1988, and the subsequent new Spanish Forest Act (2003) and its amendments (2006, 2015) which apply to whole of Spain were already implemented in Catalonia. Consequently, while the forest law formally changed in Spain, it had no impact in changing PFOs property rights in Catalonia though it had in other Spanish regions. In Switzerland, a Federal Act on Forests entered into force in 1993 setting out the principles to be implemented by cantonal forest legislation. For the Aargau canton, a new Forest Law entered into force in 1999 and was amended in 2013 but the changes had no impact on the indicators used for this assessment. In Belgium, the Forest Code (originating from 1854), has been replaced in 2008 with a new Forest Code applicable in the Walloon region. Additionally, a specific law regarding the protection of forests belonging to PFOs has been in force in Belgium since 2008, impacting on the management rights of PFOs.

Among the Nordic countries, the Norwegian Forest Act (originally enacted in 1932) was replaced in 2005 with a new Forestry Act but kept the similar level of PFOs rights. On the contrary, in the analysed period Sweden and Finland had important changes with respect to the legal acts regulating the activity of PFOs. In Sweden, a major change occurred in 1993, with the introduction of the "freedom with responsibility" principle in the text of the Forest Act but since then, the amendments made to the law had no impact on PFOs rights. In 1996, Finland introduced a major update to the Forest Act, by introducing biodiversity protection explicitly in regulatory statutes. However, a noteworthy change took place in 2014 when a major update to the forest legislation bestowed more freedom upon forest owners with relation to decision making in forest management.

Poland (1991), Slovenia (1993), Czech Republic (1996) and Slovakia (2005) are the former socialist countries that legislated for only one new forest law designed to cope with the new challenges of the transition from a centrally-planed to a market economy. In Poland, no change occurred to the forest ownership patterns after the change from the socialist system, thus fewer rules were introduced envisaging PFOs. Czech Republic and Slovakia included, in their revisions of the Forest Code, specific regulations for the newly established private forests.

The third group of countries, characterised by at least two new Forest Acts in the period analysed, is represented mostly by the former socialist countries, thus illustrating the process of institutional adaptation in these countries, needed to assure the transition to a market economy. In general, the former socialist countries adopted one new forest act at the beginning of the transition period and the second after a number of years (e.g. Serbia in 1991 and 2010, Croatia in 1990 and 2005, Lithuania in 1994 and 2003, Romania in 1996 and 2008,

Hungary in 1996 and 2013, Bulgaria in 1997 and 2011, North Macedonia in 1997 and 2009). In these countries, the laws issued in the beginning of the transition period are the reference point for the analysis of the "mid-1990s" legislation. Estonia records the highest number of changes to its forest laws, with three versions of the Forest law being issued in 1993, 1998 and 2006. In the Estonian case, the analysis for the "mid-1990s" period refers to the legislation applicable in 1993–1998, while the "current legislation" is the outcome of changes to the forest law from 2006. The legal changes in former socialist countries resulted in changes for all of the five property rights categories. The patterns of changes are not homogeneous (as detailed in Section 4). Denmark with two new Forest Acts (in 1996 and 2004) was the only western country in this group. However, for forests outside nature protection areas, legal changes recorded in Denmark did not result in a major impact on the ability of a PFO to exercise their private property rights.

3.2. Changes to hunting legislation

Changes to the hunting laws were in general less frequent when compared to forest-focused legislation i.e. in 18 out of 28 countries included in the analysis hunting laws were enforced from 1990 to 2015 (Fig. 1). Similar differences were observed between western and former socialist countries as in the case of legislation that focuses on forests. Most of the western countries had only amendments to the existing hunting laws. For example, there was no change to hunting legislation affecting landowner's decisions in Catalonia since 1970. On the contrary, in Austria, patterns of changes to the hunting legislation are diverse at the regional level, some regions having issued new hunting laws while others only made amendments to existing laws. In France, a very important amendment occurred in 1999 and was confirmed by the European Court of Human Rights. According to this amendment, a PFO can prohibit access to hunters for ethical reasons. A decision of the same court lead to a similar amendment to German Hunting Law. In the Netherlands, the Hunting Law (originally from 1954), became part of the Flora and Fauna Act in 2002 (i.e. no specific hunting law since 2002); yet, the hunting rights remained with the forest owners, but stricter rules were observed. In Portugal, the 1999 Law regulated hunting practices but had no impact on PFOs rights.

All the former socialist countries, except Romania and Estonia, have issued one new hunting law in the period analysed. Romania passed two hunting laws, one in 1996 and one in 2006. Estonia passed three new hunting laws (1994, 2002, 2013) and numerous amendments to regulate hunting activities.

3.3. Land reform laws

Land reform laws constitute major legal changes especially in the context of former socialist countries. These laws are highly relevant to our analysis because they significantly impacted the ownership patterns.

Former socialist countries had different approaches to forest land restitution (i.e. giving nationalised forest lands to owners) (Table A3 –appendix A). In Poland, the land reform took place in 1994, but the forest land was not returned to the previous forest owners. Many of the former socialist countries dealt with forest land restitution by means of a single land reform act, usually enforced shortly after the collapse of the socialist regime (in 1991 in Bulgaria, Czech Republic, Lithuania, Estonia, Slovenia) even though many amendments were added over

Property Rights Categories:		Acc-ess	Withdrawal rights for											Management rights for forest														Exclusion rights for							Alienation rights for					Sum of changes	
			timber						NWFPs					land use			planning						operations					public			NWFPs use				land		timber				
Region	Country	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16	I17	I18	I19	I20	I21	I22	I23	I24	I25	I26	I27	I28	I29	I30	I31	I32	I33	I34	I35	I36	I37	↗	↘
Former Socialist	NEE	EE	↗	↗				↗				↗			↗		↗	↗	↗	↗				↗	↗			↗			↗							13	0
		LT	↗	↗				↗						↗		↗	↗	↗		↗					↗					↗	↗	↗	↘					12	1
	CEE	CZ	↗														↗	↗	↗	↗			↗	↗		↗								↗					9	0
		HU		↗				↗							↘																							2	1
		PL															↗	↗																					2	0
		RO	↗										↗	↗			↗		↗				↗	↗			↗	↗	↗	↗	↗	↗							13	0
		SK																	↗	↗												↗						3	0
	SEE	BA	↘					↘	↗						↗	↗														↘								3	3
		BG															↘																					0	1
		HR	↘			↗	↗								↗	↗			↗	↗				↗		↗	↘		↗	↗	↗							11	2
		MK	↘														↗									↗								↘				2	2
		RS						↗												↗			↗	↗			↘		↗					↘				5	2
		SI							↘		↘					↘												↘		↗						↗	↗	↗	4	4
Western		GR																																					0	0
	SWE	ES-CAT																																					0	0
		PT															↘									↗													1	1
	CWE	AT												↗									↗																2	0
		BE-WAL															↘	↘								↘													0	3
		CH- AG																																					0	0
		DE-BY		↘															↘							↘						↗							1	3
		FR													↘		↘															↗		↘					1	3
		GB-SCT																									↘		↘										0	2
		IE													↘												↘	↘						↗	↗				2	3
		NL		↘																																			0	1
	NWE	DK											↘		↗																									1	1
		FI		↗															↗					↗	↗														4	0
		NO																																					0	0
		SE																																					0	0
Changes	↘		3	2					1			1			1	3	4	1	1						2	4	1	2	1			4							33
	↗			5	3	1	1		4	1			1	3	3	4	6	4	6	6			4	5	2	6	1	2	3	3	4	6	2	1	1	1	1	91	
	Total		3	7	3	1	1	0	5	2	0	1	1	2	3	4	7	10	5	7	6	0	0	4	5	2	8	5	3	5	4	4	6	0	6	1	1	1	1	124	
			3	23											61													27							10					

Fig. 2. Changes in property rights assessed according to the legislation applicable in 2015 compared with mid-1990s ("blue arrows pointing upward" indicate that the change to the indicator was in the direction of increased freedom for decision making for the PFO in 2015 compared with mid-1990s, while "red arrows pointing downward"means that the change in the indicator was more restrictive for PFO in 2015 compared with mid-1990s) (Source: compiled by authors based on empirical data). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

time. In Croatia, the Law on restitution and compensation of property nationalised by the socialist state was passed in 1996 and this law also allowed PFOs to claim ownership. Until the year 2002, the law was restricted only to Croatian citizens (preventing others from making claims). Slovakia promptly issued two new laws, one in 1991 and one in 1993. In Serbia, the restitution process officially started in 2006 with the Law on the restitution of property to churches and religious communities and this was followed in 2011 with a law regulating property restitution to physical persons. In Romania, land reform took place gradually and was implemented by three different land reform laws that returned a maximum of 1 ha back to PFOs (in 1991), 10 ha (in 2000) and then (in 2005) the entire area owned prior to nationalisation.

Land law reforms in western countries, with an influence on PFOs property rights, are rare. In the Netherlands, amendments to the Estates Act (1928) in 2002 brought changes to the ownership requirement: the estate has to remain in the possession of the owner for at least 25 years, otherwise the owner must pay taxes. In Scotland, the 2003 land reform law clarified that access for pedestrian recreation in private forests could not be restricted. On the other hand, in Greece, many changes occurred, resulting in a clarification of property ownership and forest cadastre. The forest cadastre legislation tries to clarify the situation relating to forests which have either been long considered non-forest and had to be definitively declassified as forests or have been managed as forests and had to be designated as forests. For example, since 2012 in Greece it is considered for public interest reasons, that the forestry areas cleared before the year 2007 for farming purposes without the competent forestry authority's permission, can remain in use for agricultural or horticultural cultivation and exploitation.

4. Property rights changes

4.1. Changes to the content of property rights

The property rights distribution in regular commercial forests was influenced to different degrees by the legislative changes occurring in the last two decades. Of the 37 indicators analysed in 28 countries, we identified 124 situations were changes occurred (Fig. 2), which represented 12% of the overall combination of countries and indicators analysed.

The changes represented a liberalisation of PFO's rights in 91 cases (73%), while in 33 cases (27%) the changes meant more restrictions to the PFOs' rights. Most of the changes to indicators occurred in the former socialist countries (95 changes, representing 76% of the total changes). With regard to the property rights categories, most of the changes occurred to those indicators characterising management rights with 61 changes identified for the 13 indicators, meaning an average of 4.7 changes per indicator. The next category is exclusion rights with 27 changes for seven indicators (average 3.9), access rights with three changes per indicator (average 3), and withdrawal rights with 23 changes for 11 indicators (average 2.1). The category least influenced by legislative changes is alienation rights with only 10 changes recorded for five indicators (average 2).

Changes to access rights were assessed by one indicator (i1), which identified whether the forest owners' access to their own forest lands was restricted to some extent. Temporary restrictions were introduced in the legislation concerning access in areas contaminated by mines (Bosnia-Herzegovina, Croatia) or affected by forest fires (North Macedonia). Thus, in these three countries the level of restriction increased in the 2015 legislation compared with the mid-1990s.

Changes to withdrawal rights for timber were identified in 11 countries consisting of 17 changes for the six indicators used. In five countries the freedom for decision making regarding the amount of timber to be harvested (i2) increased. In Estonia, Lithuania, Czech Republic and Romania, the 1990s legislation required that all private forests had to be covered by FMP, which specified the amount of timber to be harvested. Currently, in Estonia and Lithuania, the amount of timber to be harvested is decided based on inventory data while in Romania and Czech Republic, small scale owners can harvest a certain volume of timber without a FMP. In Finland, the 2014 Forest Act revision discontinued the minimum requirements for mean diameter and age in final felling thus bestowing more freedom upon owners to decide the amount of timber to be harvested. On the contrary, the withdrawal rights for timber became slightly restricted in two countries. In the Netherlands, since 2002, it is not allowed to do any regular forest management activities (including harvesting) in the bird breeding season in deciduous and mixed forests. In Bavaria, since 2005, harvesting rights limitations may come from the enactment into the forest law of the recommendation that clear cuts should be avoided.

With respect to the approval for timber harvests (i3), there were changes in three countries in which the right to harvest had become less regulated. In Hungary, any type of harvest was previously based on a licence from the authorities, while now if the harvest is assigned in the FMP, the forest manager needs only inform the authority, who has 30 days to issue restrictions. In Estonia and Lithuania, during the 1990s, permission was required for all cuttings. According to 2015 legislation, exceptions applied for up to 20 solid m^3 of wood per estate per year in Estonia and for different types of cuttings in Lithuania (e.g. cuttings of young stands, selective sanitary cuttings or in cases of natural disasters of forests and harvesting solid timber up to 3 m^3/ha per year for personal consumption). The authority issuing the permit changed in many former socialist countries (e.g. Croatia, North Macedonia and Romania) reflected in the fact that before, the state forest company issued permits, whereas in accordance with the 2015 legislation an advisory service can issue the permits. For some countries, this was reflected in a decreased level of bureaucracy required to issue harvesting permits (i7), changes to this indicator being recorded for Estonia, Lithuania, Hungary and Serbia, while for Bosnia and Herzegovina the level of bureaucracy increased.

Changes to withdrawal rights for non-wood forest products (NWFPs) are assessed using five indicators, but changes to these indicators were identified in only five countries. Regarding the PFO's right to pick up mushrooms from their forests (i8), changes are recorded in two countries. In Bosnia-Herzegovina, the owners are currently allowed to harvest up to 1 kg of mushrooms per day, while previously this was only allowed if specified in the forest management plans. In Slovenia, the 1998 decree on the protection of wild fungi states that a maximum limit of 2 kg per person per day of mushrooms can be collected, without differentiating whether the picker is the owner or a visitor. In Portugal, there were no regulations for the collection of mushrooms until 2009 when the law limited the collection of mushrooms for personal consumption to 5 kg per day per person. Nevertheless, the section covering mushroom picking was repealed in 2012 and consequently the current legal situation returned to the one existing before 2009. The 2003 Spanish Forest Act clarified that the owner of wild/spontaneous forest fruits is the landowner; yet, this has had a very limited impact in Catalonia, given that there are no specific regional regulations on the matter.

There are no recorded changes in the hunting rights in the period analysed with the exception of Slovenia and Estonia. In Slovenia, the ownership of game (i10) has legally changed, the hunting regulation from 2004 stating that the game belongs to the state and not to the hunting associations as was previously the legal case. Since the new Estonian hunting act of 2013, owners have more freedom to decide on the hunting quota (i11), but only for the small game. With respect to the right to use forests for grazing (i12), the 2015 version of the Danish forest act brought a slight limitation to this right as it currently specifically states that a maximum of 10% of the area of a forest property can be grazed. On the contrary, the changes to the Romanian forest code from 2008 set conditions to permit grazing take place in private forests, while previously this was totally forbidden.

Changes to management rights regarding the forest land use are recorded in 11 countries. In three of these countries, the right of the

PFO to change the forest land use (i13) has been liberalised, in the sense that previously a land use change was possible only if deemed to be in the public interest, while in the 2015 legislation, the change is possible also if it is solely in the interest of the owners, subject to authority approval (Austria) or for limited areas and subject to compensation (Lithuania and Romania). The obligation to assure the reforestation of forest lands after final cutting (i14) was less arduous on PFOs in three countries as the state supported fully or partially the cost of reforestation (Estonia, Bosnia-Herzegovina, Croatia). In Hungary, the situation was the opposite: previously there was a forest fund where forest managers paid and received support on behalf of the owner at the time of reforestation, while currently there is no payment and no support for reforestation. In seven countries, the indicator referring to the need to assure forest regeneration after natural catastrophes has changed (i15). In three countries, the owners have currently more financial means available to support the reforestation, either from national funds (Croatia, Bosnia-Herzegovina) or European Union (EU) subsidies (Lithuania). The implementation of windthrow insurance in Denmark and France lead to divergent assessments on the impact to the changes to PFO's rights. In Denmark, the national windthrow scheme implemented in 2000 created the possibility for the PFO to access public reforestation support conditional on having signed the insurance prior to the event. This insurance was also introduced in France in 2015, but this is assessed as a reduction in PFOs rights since during the 1990s, a PFO had access to public reconstitution grants after a catastrophic windthrow without the need for windthrow insurance. Similar slight reduction in PFOs rights for this indicator are noticed in Ireland and Slovenia, where previously, reforestation was systematically supported through a special state fund while currently this can be supported by way of an application for EU and national funds (Slovenia) or by why of national forest reconstitution grants (Ireland).

Changes to rights regarding forest management planning occurred in 15 countries and generally represent an increase in the freedom of decision making for the PFO (in 22 out of 28 cases). In seven out of the 13 former socialist countries the need to have a FMP (i16), which applied to all types of forests during the 1990s, was changed to take account of the forest size. Thus, the obligation to have an FMP only exists for forests above 10 ha (Poland and Romania), or above 50 ha (Czech Republic). In Estonia only forest inventory data are needed and only for forests above 2 ha. In Lithuania, FMPs were previously obligatory for PFOs if they intended to do a final felling, while today it is the same, but FMPs are not required for private holdings of less than 3 ha and for final felling of grey alder, aspen and other low value stands. In North Macedonia, since 2013 changes were made with respect to the size of forest areas which must include various types of planning documents; previously FMPs were required for forests larger than 100 ha and simplified FMPs for areas less than 100 ha. Nowadays, PFOs with more than 30 ha need an FMP, owners with 10 to 30 ha need a simplified FMP and owners with less than 10 ha have to adhere to simplified rules for forest management. On the contrary, in Bulgaria, there was a reverse trend following liberalisation. From 1997 to 2011 in forests below 2 ha, there was no need for an FMP. Currently, all Bulgarian forests must have an FMP. For properties less than 2 ha the FMP is formulated in conjunction with the neighbouring state enterprise FMPs and it is paid for by the state. In three western countries restrictions were added with respect to the need of FMPs. In France, before 2010, an FMP was compulsory for every forest owner who owned at least 25 ha in one land parcel. Since 2010, FMP has been compulsory if the PFO owns 25 ha in total (taking into accounts all the parcels she owns larger than 4 ha). In Wallonia, since 2008 the public authority has the right to oppose any type of excessive harvesting if it is deemed that such harvesting is contrary to the public interest, as defined in the law. While before 2008, the forest law had limits in terms of the size of clear cuts and no FMP or similar was required, today an FMP is required for spatially contiguous clear cuts larger than 3 ha in deciduous stands and 5 ha in conifer stands. In Portugal, with the approval in 2005 of the Zone of Forest Intervention legislation, all PFOs covered by the approved and established zones have to jointly prepare a FMP and cooperate in the management of the forests.

Options to include the PFO's management objectives into the planning procedure (i18) have increased in five former socialist countries, where during the 1990s their interests were generally not considered. In Croatia, Slovakia and Romania the changes are mainly formal as the owners can express their interest in the course of the planning procedure, without having the capacity to influence the decisions. In the Czech Republic and Estonia, PFOs can currently choose management goals within some technical limitations. In the western context, one important change occurred in Finland, where in 2014 uneven-aged (continuous cover) forest management formally became a legally viable option as a forest management regime, meaning owners can choose repeated selective cuttings and upper-crown harvestings as a forest management option. Higher restrictions were introduced in the Bavarian Forest Law of 2005, which specifically states that clear cuts should be avoided, while previously only vague provisions were given in the law regarding “sustainable” and “professional” management.

Finally, in many of the former socialist countries, the right to design an FMP (i19) does not belong anymore to the state, and owners can now contract authorised experts (Czech Republic, Croatia, Estonia, Lithuania, Serbia and Slovakia).

Changes to rights regarding the implementation of forest operations were measured by four indicators, which recorded changes in 12 countries. The requirement for the administration of private forests (i22) has become less restrictive in four countries. In Austria, an amendment from 2002 requires all forest holdings between 1000 and 3600 ha to hire a forester and above 3600 ha an academic, while previously the limits were 500 and 1800 ha. In Czech Republic, Romania and Serbia during the 1990s, the administration of private forests was imposed by the authorities, but in accordance with the 2015 legislation, PFOs may hire out the administration of the forest to private entities. In North Macedonia, since 2011 private licencing bodies were responsible for performing administrative services for PFOs, but amendments made to the law in 2014 restored the situation to what it was before 2011, with officials from the state forest enterprise now being in charge of these administrative services. With respect to the right to decide which trees are to be harvested (i23), in many of the former socialist countries, in mid 1990s, the state forest district representatives selected and measured the trees and calculated the volume of the forest to be harvested in private forests. In the Czech Republic, Croatia, Romania and Serbia there is a slight liberalisation of this requirement, since according to the 2015 legislation the owner can hire a private licensed forester for this operation. In Estonia and Latvia, the owners were granted the right to select trees for harvesting from the mid-1990s. On the contrary, in North Macedonia the PFO has this service provided only by the public forest enterprise thus no change is recorded compared to mid-1990s. Regarding the possibility to decide on the rotation length (i24) changes occurred in two countries. In Estonia, the owner can currently decide it based on general technical provisions provided (i.e. minimum imposed age) whereas previously this was determined by the forest management planner. In Finland, the Forest Act revision of 2014 removed the average diameter and age requirements for final felling, and explicitly enabled selective cuttings and the possibility that a PFO can decide the rotation length with no constraints, thus there is neither regulation nor supervision regarding final felling site's maturity as there was previously. Regarding the selection of species to be used for reforestation (i25), six situations arose as a result of the evolving trends. In Portugal, the 2013 “Law of the Eucalyptus” simplified the bureaucratic requirements for the establishment of eucalyptus plantations and gave more freedom to PFOs to plant this tree species. In Estonia, Lithuania and the Czech Republic, forest legislation currently provides for a spectrum of species to be used for afforestation and the owner can decide which species to use, while previously this was integrated into the management planning

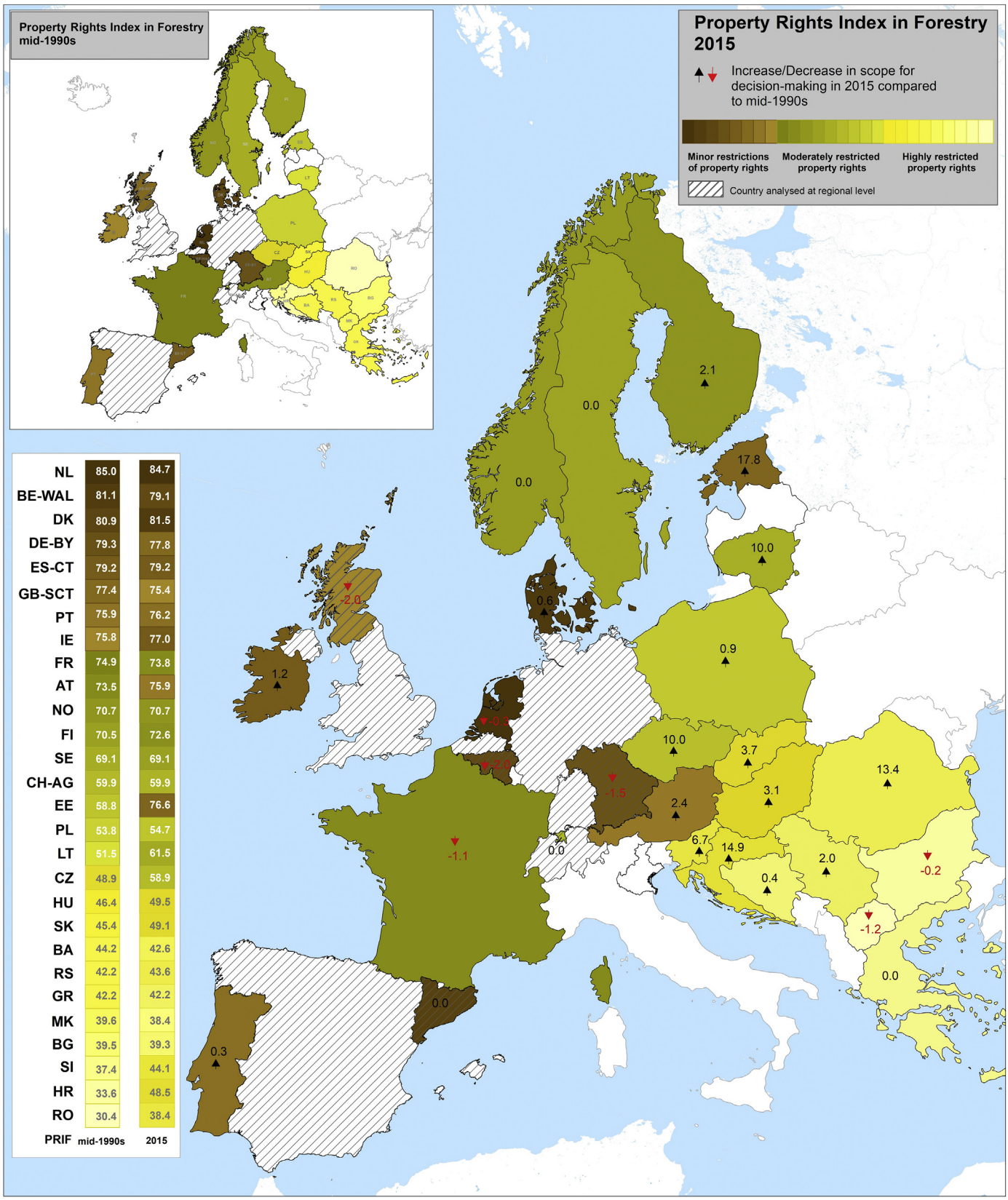

Fig. 3. Geographical distribution of the Property rights index in forestry (PRIF) in mid-1990s and in 2015 with the identification of the changes in the scope of decision making from mid-1990s to 2015 (Source: compiled by the authors).

procedure. Similarly, in Croatia and North Macedonia the owners have greater freedom in deciding on the species to be used. On the other hand, in Wallonia (Belgium), the choice of species has become more restrictive especially with regard to the reforestation of clear cut areas. Furthermore, in Wallonia the PFO must choose species based on an ecological guide for any parcels greater than 0.5 ha. In Bavaria (Germany), an amendment of the national nature protection law in 2002 includes the obligation to use a certain amount of native species in afforestation.

Changes to exclusion rights for public access were assessed by three indicators and resulted in the identification of 13 changes in seven countries. In four countries, the owners have nowadays less rights in restricting public access into their forests for recreational purposes (i26). In Scotland, before the Land Reform Act of 2003 the situation was quite unclear. Traditionally there were no specific regulations restricting public access to forests, but owners often used various means to prevent public access to the land. Currently, the law stipulates that the owner cannot restrict pedestrian public access for recreational purposes. In Ireland, the owner was allowed to restrict access of any private individual onto their forest property, but since 2008, public access for recreation must be provided along the forest road for pedestrians in private forests where government subsidies have been paid for forest road construction. In Croatia, Serbia and Romania there were no regulations during the 1990s for public access into private forests. According to the 2015 legislation, in Croatia and Serbia the public have access, but visitors are not allowed to extract material benefits from private forests or cause damage to the forests. Only in Romania, starting with 2008, PFOs gained the legal right to exclude the public from accessing private forests. The right to restrict access on forest roads when they cross private forests (i27) is currently within the power of a PFO in Estonia and Romania while previously it was not regulated. For Ireland the same change was recorded as for the previous indicator i.e. public pedestrian access must be provided along the grant aided forest roads. Regarding camping in the forest (i28), rights to camp have been formalised in Scotland, whereas since 2003 the owner cannot refuse responsible and short-term camping on unenclosed land; previously camping was permitted under what was widely perceived as 'common law'. In Slovenia since the introduction of the 2006 Protection of Public Order Act, camping is only allowed in especially designated places. In Croatia, Serbia and Romania the owner can now legally restrict camping whereas beforehand camping was legally unregulated.

Changes to exclusion rights for NWFPs occurred in nine countries for four indicators. The patterns are similar with regard to the PFOs capacity to exclude the public from collecting mushrooms for recreational (i29) and for commercial purposes (i30). In Croatia and Romania, the owners acquired this legal right whereas previously it was unregulated. In Lithuania, the previously accepted "everyperson's right" was modified i.e. the harvesting of mushrooms in private forests closer than 100 m from the owner's household being permitted only with the owner's agreement. In Bosnia-Herzegovina the collection of mushrooms was previously restricted while currently owners must permit the collection of a maximum limit of 1 kg per person per day.

Changes to exclusion rights for hunting on PFO's property (i31) have occurred in six countries. In France, since 1964, PFOs were obliged to grant access to hunters if a collective municipal hunting association existed at a local scale. However, according to the "*Chassagnou*"

			PRC mid-1990s					PRIF mid-1990s			PRC 2015					PRIF 2015			PRIF 2015 - PRIF mid-1990s		
Region		Country	Acc.	Withd.	Mgt.	Excl.	Alien.				Acc.	Withd.	Mgt.	Excl.	Alien.						
Former Socialist	NEE	EE	100	57	39	65	96	58.8	55.1		100	72 ↑	65 ↑	89 ↑	96	76.6 ↑	69.1		17.8	14.0	
		LT	90	56	42	24	96	51.5			90	66 ↑	53 ↑	49 ↑	85 ↓	61.5 ↑			10.0		
	CEE	CZ	90	55	21	51	96	48.9	45.0		90	57 ↑	47 ↑	51	100 ↑	58.9 ↑	51.2		10.0	6.2	
		HU	100	40	21	68	85	46.4			100	55 ↑	18 ↓	68	85	49.5 ↑			3.1		
		PL	100	52	24	72	100	53.8			100	52	27 ↑	72	100	54.7 ↑			0.9		
		RO	80	22	7	39	85	30.4			80	30 ↑	16 ↑	81 ↑	85	43.8 ↑			13.4		
		SK	90	48	18	49	96	45.4		43.8	90	48	24 ↑	58 ↑	96	49.1 ↑		50.0	3.7		6.2
	SEE	BA	100	44	19	44	85	42.2	39.4		90 ↓	44	24 ↑	37 ↓	85	42.6 ↑	42.7		0.4	3.3	
		BG	90	31	25	39	85	39.5			90	31	25 ↓	39	85	39.3 ↓			- 0.2		
		HR	100	25	14	30	96	33.6			90 ↓	41 ↑	33 ↑	49 ↑	96	48.5 ↑			14.9		
		MK	100	36	7	54	100	39.6			90 ↓	36	10 ↑	54	85 ↓	38.4 ↓			- 1.2		
		RS	90	41	20	34	100	42.2			90	43 ↑	29 ↑	35 ↑	85 ↓	43.6 ↑			2.0		
		SI	100	53	35	18	25	37.4			100	46 ↓	33 ↓	24 ↑	85 ↑	44.1 ↑			6.7		
Western		GR	100	27	42	29	85	42.2		73.0	100	27	42	29	85	42.2		73.0	0.0		0.0
	SWE	ES-CAT	90	76	81	76	85	79.2	77.6		90	76	81	76	85	79.2	77.7		0.0	0.1	
		PT	100	67	67	86	100	75.9			100	67	68 ↑	86	100	76.2 ↑			0.3		
	CWE	AT	100	80	64	69	85	73.5	75.9		100	80	71 ↑	69	85	75.9 ↑	75.5		2.4	-0.4	
		BE-WAL	100	77	83	67	100	81.1			100	77	77 ↓	67	100	79.1 ↓			- 2.0		
		CH- AG	100	56	58	36	100	59.9			100	56	58	36	100	59.9			0.0		
		DE-BY	100	75	88	61	88	79.3			100	74 ↓	84 ↓	62 ↑	88	77.8 ↓			- 1.5		
		FR	90	69	63	87	100	74.9			90	69	61 ↓	96 ↑	85 ↓	73.8 ↓			- 1.1		
		GB-SCT	90	78	76	65	96	77.4			90	78	76	54 ↓	96	75.4 ↓			- 2.0		
		IE	100	67	76	91	70	75.8			100	67	72 ↓	84 ↓	100 ↑	77.0 ↑			1.2		
		NL	100	83	79	86	100	85.0			100	82 ↓	79	86	100	84.7 ↓			- 0.3		
	NWE	DK	100	85	73	73	100	80.9	72.8		100	84 ↓	76 ↑	73	100	81.5 ↑	73.4		0.6	0.6	
		FI	100	81	74	34	84	70.5			100	82 ↑	79 ↑	34	84	72.6 ↑			2.1		
		NO	100	76	77	34	88	70.7			100	76	77	34	88	70.7			0.0		
		SE	90	73	73	39	88	69.1			**90**	73	73	39	88	69.1			0.0		
Average (N=28)			**96.1**	**58.3**	**48.8**	**54.2**	**89.8**	**59.4**			**95.0**	**60.3**	**52.7**	**58.2**	**91.1**	**62.3**					

Fig. 4. Calculation of changes in the property rights categories and PRIF between mid-1990s and 2015.

amendment in 1999, a PFO can restrict hunter's access to their forest for ethical reasons (ethical opposition to hunting). In Germany, every private forest land is part of a hunting district. Since 2013, the hunting authority has had the power to prohibit hunting if the PFO refuses hunting on ethical grounds as long as other public interests are not impeded. In Estonia, Lithuania, Romania and Slovakia during the 1990s the owners had to accept hunting activities taking place in their forest subject to compensation. Nowadays, in Estonia and Lithuania the PFOs have the legal right to forbid hunting in their forests but if they do they lose eligibility to apply for compensation if game damages the forest. In Slovakia and Romania nowadays forest owners can form hunting associations if they own, individually or in association, more than half of the area of the hunting ground. In the Czech Republic owners have had this legal right since 1992 so there is no change in the rights corresponding to this indicator.

Changes to alienation rights referring to restrictions on the sale of forest lands (i33 and i34) were identified in six countries. The sale of forest land has become more restrictive in four countries. In France, the changes to the Forest Code from 2012 introduced a pre-emption right in favour of the state or the closest neighbours whereas previously the owner was free to decide whom to sell the forest to. The pre-emption right was also introduced in Lithuania, Serbia and North Macedonia in favour of the "neighbours", whereas beforehand the law did not regulate this during the 1990s. On the contrary, in the Czech Republic there was a liberalisation in the law: previously sales of forests were permitted only to Czech citizens whereas currently there are no restrictions on who can purchase forest land, except in national nature reservations and parks where the state has a pre-emption right. In Ireland, starting 1990 the Government had the right to execute a compulsory purchase of forest land, but this power was repealed in 2001, thus owners are free to decide to whom and at what price to sell their forest land.

Only in Slovenia were changes recorded to the rights of PFOs to decide to whom they choose to sell their timber to (i35), the form of sale (i36) and at the sale price (i37). Slovenia is a country that had an important share of private ownership even in socialist times. Nevertheless, the state had monopoly over the trade of timber from private forests. This situation completely changed in 1993, when the transition to the market economy started and owners got the right to solely decide on the selling methods for timber.

4.2. Pattern of property rights changes between the mid-1990s and 2015

Looking at the distribution of PRIF according to the legislation applicable to the mid-1990s, the map shows a clear difference between the western and the former socialist countries, distinctions which are less evident nowadays (Fig. 3). In the mid-1990s, the western countries (with the exception of Greece) had higher PRIFs than any former socialist country. Furthermore, 10 out of the 13 former socialist countries included in the analysis of the mid-1990's had a highly restrictive legal framework (PRIF < 50) and only Poland, Estonia and Lithuania had a PRIF slightly above 50 (moderately restrictive legal framework).

Comparing the PRIF values computed for the mid-1990s legislation with those calculated for the end of 2015 we can derive the following patterns of changes (Fig. 4):

- there is an overall increase in the PFO's scope for freedom in decision making, the average PRIF value across the 28 analysed countries is 59.4 in mid-1990s compared with 62.3 in 2015;
- for the 15 "western" countries included in the analysis the average PRIF value remained the same (73.0), which confirms the stability of the property rights distribution in most of these countries;
- for the 13 former socialist countries included in the analysis there was a significant increase in the average PRIF from 43.7 in mid-1990s to 50.0 in 2015, which means that the institutional changes in the former socialist countries had an important impact on the distribution of property rights; nevertheless, there were greater differences among them in the approach of rights liberalisation;
- the 2015 legal framework remains highly restrictive for 10 countries, but with a modest increase in the average PRIF values compared to the mid-1990s; Czech Republic moved up into the group of countries with moderate restrictions while Estonia moved up into the group of countries with a high degree of freedom in decision making, having the largest absolute increase in PRIF from 53 degrees of freedom in 1998 to 76.6 in 2015.

Looking at the changes from the perspective of property rights categories (Fig. 4), we see that the average for the 28 countries increased for management and exclusion rights (both, with an increase of 3.9 degrees of freedom in 2015 compared to the mid-1990s), withdrawal rights (with an increase of 2.0 degrees of freedom) and alienation rights

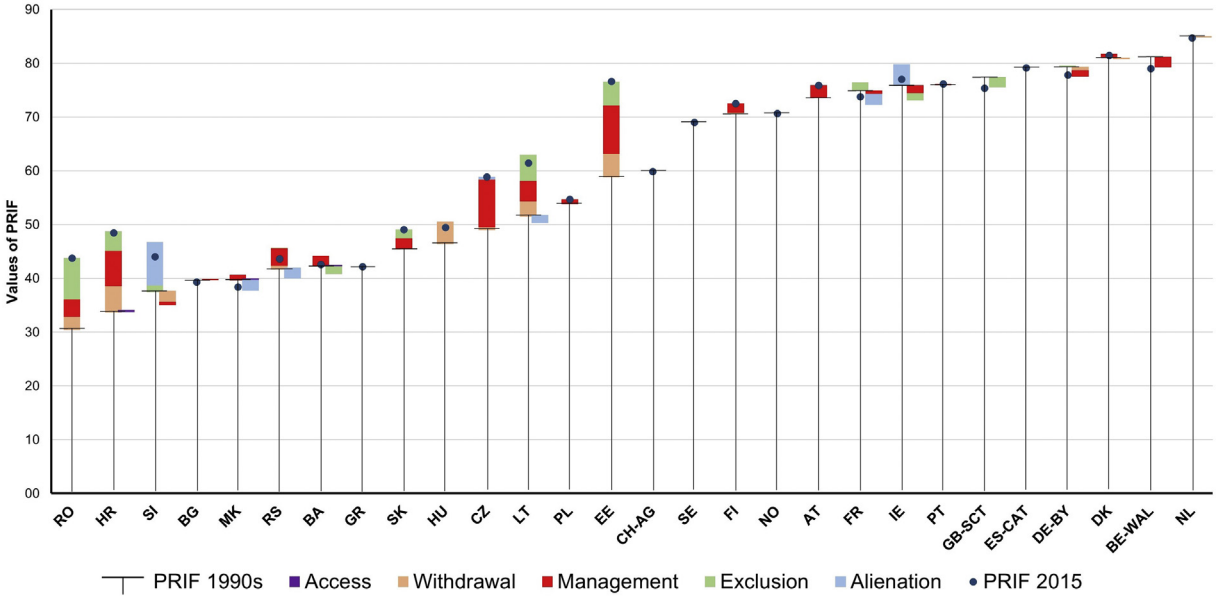

Fig. 5. Changes in absolute values of the five property rights categories in relation to PRIF (mid-1990s and 2015). The values present the contribution of each of the five property rights categories in the PRIF values from 2015 compared to PRIF values from mid-1990s. The countries are presented in the order of the increasing PRIF values from mid-1990s, from left to right along the horizontal axis (Source: compiled by the authors).

(1.3) Access rights had a slight decrease of degrees of freedom (−1.1).

Considering the geographical distribution of jurisdictions (Fig. 4), we observed that overall increases in PRIF were found for the NWE countries, but these increases were modest, while reductions in PRIF occurred mainly for CWE countries, but these changes were also small. Aargau (Switzerland) and Greece are the western jurisdictions that have maintained a restrictive framework in private forest management recording no changes in the distribution of rights. Among the former socialist countries, we saw a clear decrease in the average change from North to South East Europe. NEE countries recorded the highest increased in absolute values of PRIF (14 points). From the CEE region Poland, Hungary and Slovakia had only small increases in PRIF values. Former socialist countries with marginal changes to property rights are mainly from the SEE region, with the exception of Croatia and Slovenia.

At jurisdiction level, we identified differences in the direction of change in the property rights categories in relation to the values of PRIF (Fig. 5). Thus, very few changes occurred for the countries that had high values of PRIF in the 1990s (PRIF > 70). For example, in half of the western countries, with high values of PRIF in the mid-1990s, there were no changes at all (Norway, Sweden, ES-Catalonia) or only minor changes (Netherlands, Portugal, Denmark). In the rest of the countries with high level of PRIF in the 1990s, management rights were slightly liberalised in Austria and Finland, while on the contrary, some management restrictions were imposed in Bavaria and Wallonia. In Ireland the direction of changes to property rights categories was mixed, important changes occurred to the liberalisation of the right to sell forest land, while minor restrictions were imposed on the PFO's ability to prevent public access on grant aided forest roads. In France, besides the recognition of the right to refuse hunting activities, restrictions came from the introduction of pre-emption rights and from the additional requirements for FMPs. In Scotland, only exclusion rights have been restricted in favour of the public. In general, the property rights in the Western countries have largely been stable, regardless of their geographical grouping and are generally characterised by high PRIF values already in existence from the 1990s.

The diversity of changes in property rights categories (Fig. 5) is highly visible for the low to mid-PRIF countries (most of the Eastern Europe groupings) where the patterns of change in property rights categories varied significantly. Important changes occurred in most of the former socialist countries with respect to management rights. The obligation to have an FMP in all private forests previously required in all former socialist jurisdictions, is now applicable in only seven out of the 13 formers socialist countries (Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Serbia, Slovakia and Slovenia) while in the others this obligation depends on the size of the property and/or the forestry works the owner intends to carry out. The changes in the management rights are also reflected in the changes to the withdrawal rights for timber products. Exclusion rights contributed most to the increased PRIF values in Romania, due to the fact that since 2008 forest owners were granted full exclusion rights for public access and the harvesting of NWFPs. Estonia and Lithuania are the only former socialist countries where PFOs were granted the right to forbid hunting activities on their property. Alienation rights decreased in the countries that introduced the pre-emption right for the sale of forest land (North Macedonia, Serbia, France and Lithuania). In Slovenia, the overall increase in PRIF is mainly attributable to the termination of the state monopoly in timber sales from private forests in 1993. The slight reduction in access rights is explained by the fact that temporal access restrictions imposed on forest owners were regulated in some Western Balkans countries that had been involved in military conflicts during the period analysed.

In terms of the relative changes in the PRIF values for 2015 when compared with the mid-1990s (Fig. 6b), major changes are recorded for only six countries, all having a former socialist political background (Croatia, Romania, Estonia, Czech Republic, Lithuania and Slovenia), while the rest of countries had limited changes, below 10%.

Croatia has the highest value of relative changes in the overall PRIF (44%) being the only SEE country in which 11 indicators are liberalised. Nevertheless, the legislative framework remains highly restrictive namely the retention of the obligation to have a FMP in all private forests even though the owner can now contract this service to private entities and can stipulate and influence the management goals (e.g. species selection). The overall level of PRIF also remains highly restricted in Romania and Slovenia despite a relatively high increase in PRIF. In Romania the relative increase in PRIF is mainly due to the changes is exclusion rights. In Slovenia, the changes were mainly related to alienation rights for timber. The current level of PRIF in Slovenia, Croatia and Romania remains below the Baltic country's levels of the mid-1990s, despite their high relative increase in PRIF (Fig. 6a). In the Czech Republic, the changes in the forest code applicable since 1996 resulted in a liberalisation of the management rights indicators, while the regulation of the exclusion rights largely favoured the public. Thus, Czech Republic is currently found in the

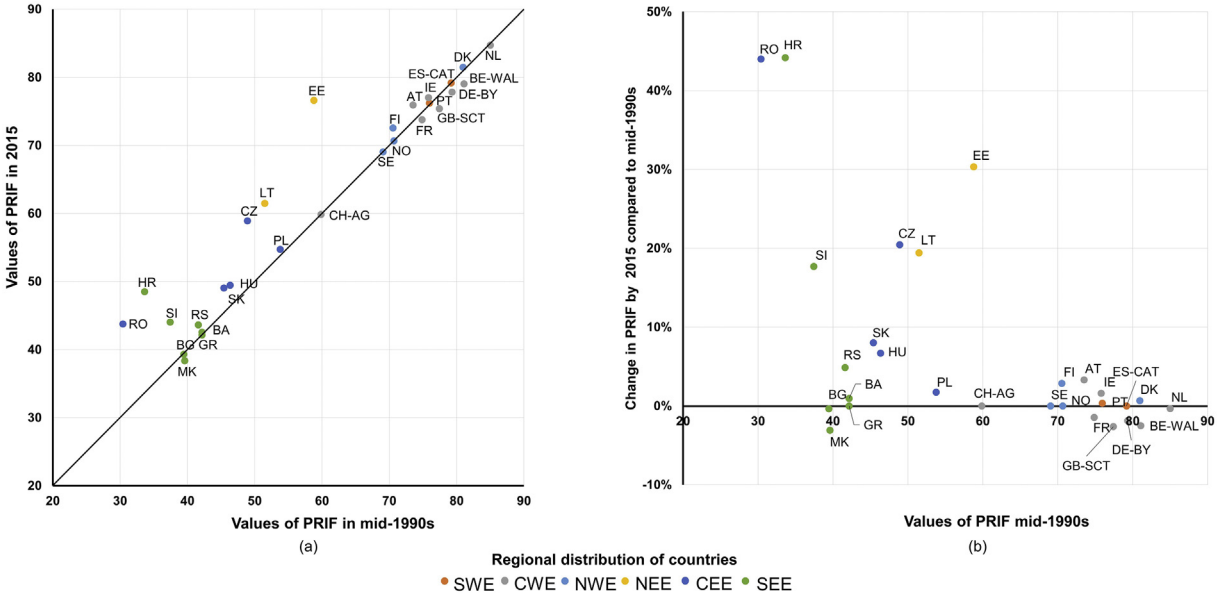

Fig. 6. Plot of PRIF values in mid-1990s and 2015 (a) and the relative changes (b). In figure (a) the line is the "no change line"; countries above the line feature a change towards less regulated property rights. The relative changes between the two time periods are presented in figure (b) (Source: compiled by the authors).

group of countries with moderate restrictions in PFOs rights. In Lithuania, more freedom of decision is granted for withdrawal and management rights but the implementation of the pre-emption right reduces the overall increase in the PRIF value. In Estonia, there has been major trend towards liberalisation with respect to the withdrawal, management and exclusion rights. This results in the highest absolute increase in PRIF of all of the countries analysed (17.8) due to Estonia having the largest number of legal changes documented in the analysed period.

5. Discussion

Our analysis of changes to property rights identified broad patterns in the manner in which European countries have adapted forest-focused legislation to the new policy challenges of the last two decades. The approach provides new insights and allows us to analyse dynamics and responsiveness of forest policy systems over the past decades. Hence it demonstrates the value of the PRIF as a tool for analysing policy change, in addition to the comparative snap-shot analyses previously undertaken (Nichiforel et al., 2018). Its value in this regard is two-fold. First, by analysing the *direction* of legal changes, it enables us to demonstrate geographical patterns in the changing regulatory role of the state with respect to activities of PFOs. Second, by analysing the *content* of the changes in property rights categories we explore the connections with major challenges influencing forest policies in the last two decades. Such political trends and motives that may be driving those changes are e.g. deregulation of forest policy (Arts et al., 2010), environmental discourse (Leipold et al., 2019) and increased influence of EU strategies in national forest policies (Pülzl et al., 2013).

Regarding geographical patterns, our analysis shows a marked distinction in the mid-1990s, between the forest governance approaches applied in western Europe (which gave more freedom of decision making to PFOs), and countries from the former socialist bloc (which had state-centred forest regulatory frameworks). With the exception of Switzerland and Greece, PFOs in the western countries in our study already had high degrees of freedom in management and withdrawal rights, varying mainly in the distribution of exclusion rights. This was because most western countries had already deregulated forest policy during the 1980s (Arts et al., 2010), moving from centralised "command-and-control" approaches to market-based, self-regulatory and voluntary measures (Glück et al., 2005). For example, many of the obligations previously imposed on the PFOs in Sweden in accordance with the Forest Act from 1983 had been withdrawn in 1993 (such as the obligations to clean young forest, to thin it, to clearfell it and to have a FMP).

At the beginning of the 1990s, forest policies in the socialist countries were based on stringent regulatory frameworks, designed to perform in the context of predominantly public ownership and centralised economic systems (Dembner, 1994). These frameworks advocated strong mandatory technical norms (Lawrence, 2009; Buliga and Nichiforel, 2019) imposing long rotations, small clear cuts, and annual allowable cuts significantly below the mean annual increment (Brukas et al., 2001; Cashore et al., 2006). Current forest governance approaches in former socialist countries are very diverse. Some countries still base their forest policy system on strong regulations (most of the SEE), while others (such as the Baltic countries) have given PFOs freedom of decision making similar to those in CWE. In between these extremes, most CEE countries maintain a strong role for the state in private forest management, although in some cases owners are granted substantial management (Czech Republic) or exclusion rights (Romania).

Private forest governance systems in former socialist countries are particularly related to the approach taken by each country in the forest land restitution (e.g. Avdibegović et al., 2010; Glück et al., 2011; Nonic et al., 2011; Brukas et al., 2013; Teder et al., 2015). For example, in the Baltic countries, radical changes in the share of private ownership (from 0% to more than 40%) were implemented in a single step at the beginning of the 1990s (Table A3-appendix). The number of legislative changes in this region is the highest among the countries analysed (Fig. 1), which may explain the changes in values of a significant number of indicators in the main property rights categories (withdrawal, management and exclusion). These substantial changes give forest owners a larger decision space, and reduce administrative costs while maintaining control mechanisms for management planning and felling (Teder, 2016). Romania is an interesting contrast to the Baltic states. It also had a major shift to private ownership, but implemented over several rounds of legislation, thus the lobby power of PFOs was directed more towards the forest restitution process that lasted for more than 20 years and less on adapting the forest management rules in their interest (Scriban et al., 2019). On the other hand, countries that made minor changes in the share of private ownership, because they maintained some forms of private property during socialist times (e.g. Slovenia, Serbia, Bosnia-Herzegovina, Poland), are characterised by fewer changes in the structure of rights, the state maintaining a central role in private forest governance (Dobšinská et al., 2020).

The general differentiation between regulatory approaches used in European private forestry has to be interpreted in the larger context of policy instruments used to steer implementation of forest policy goals. One factor differentiating regulatory frameworks is the integration of neoliberal principles in forest policy and the shift towards market-based policy instruments (Humphreys, 2009). We have shown that the degree to which changes occurred in property rights between the two time periods depends on the degree of restrictions existing in the mid-1990s: the higher the PRIF value was in the mid-1990s, the more stable property rights were at the end of the next two decades. Where policy assumes that individuals are responsible and that markets are functioning well, changes have usually involved the liberalisation and extension of PFO rights. Where regulation has increased, this is often intended to integrate environmental concerns into forest legislation, and simultaneously introduces financial instruments such as compensation or incentives for adopting aligned sustainable management (Deuffic et al., 2018). The shift towards more individual responsibility and market based approaches may also result in state withdrawal from financial responsibility for aspects that can be covered by market instruments. Our analysis has pointed to some countries where the state no longer covers damages to private forests in the case of natural hazards, but still maintains the obligation to replant. In this case, PFOs have to rely on private market insurance mechanisms, in order to cover the cost of replanting.

The shift from 'Soviet era' rationales for forest management, and adaptation to the EU common markets, manifest in a range of rather diverse policy instruments in former socialist countries. For example, the Baltic countries, Hungary and Slovakia, have successfully used EU financial mechanisms from the Rural Development Program to provide annual payments to compensate private owners for the disadvantages related to Natura 2000 areas (Sarvašová et al., 2019). In contrast, the stringent legal framework applied in Romania hinders the capacity of the government to access EU compensation mechanisms related to Natura 2000 areas as there is little room to add restrictions additional to those already imposed through existing legislation (Drăgoi and Toza, 2019). Croatia has developed a private forest governance system distinct from the rest of the SEE countries. While many indicators have been slightly liberalised giving more freedom of decision making to forest owners, the state maintains the obligation for all private forests to have management plans. The government funds this through a "green tax" imposed on every company operating in Croatia, which provides annual grants to support the activities of PFOs who provide ecosystem services (Krajter Ostoić and Vuletić, 2016).

The deregulation trend has been challenged during the last two decades by increased pressure on forest policies, especially from the environmental discourse (Sergent et al., 2018). The distribution of rights is often debated between two advocacy coalitions: e.g. in

Germany the forestry coalition tries to defend the property rights of the PFOs while the nature protection coalition pushes for legal minimum standards, which reduce owners' freedom of decision (Winkel et al., 2011). Especially in high-PRIF countries, we observe a pressure for more environmental issues to be addressed by owners' decisions even for forests located outside protected areas. For example, at the same time as the 1993 deregulation of the Swedish forest management legislation, environmental concerns were integrated by giving the possibility for authorities to stop clear-felling in areas of specific biodiversity concerns, of up to approximately 5–10% of a stand's value without financial compensation to the land owner. In the Netherlands, since 2002 felling has been banned during the nesting season. Such restrictions are common in Natura 2000 sites across many countries, yet we see in the case of the Netherlands a transfer of this regulation to all type of deciduous and mixed forests irrespective of whether they are inside or outside of Natura 2000 sites. The deregulation trend can even be reversed when proven to bring high environmental risks. For example, in Portugal the 2013 legislation facilitating eucalyptus plantations was recently repealed given the scale of the devastation caused by the forest fires in 2017; a new law has been recently issued, with the objective of limiting the establishment of eucalyptus plantations.

Despite these examples, it is clear from our data that the environmental discourse in the last two decades has had little influence on the PRIF in “regular productive forests”. This suggests that environmental legislation and forest-specific legislation are still disconnected in most of the European countries (Weiss et al., 2017). Since our analysis did not focus on forests located in protected areas (e.g. Natura 2000 network), the restrictions imposed in forests with protected status are not displayed in the current values of PRIF. However, the transposition of European environmental legislation into forest management practice is an ongoing process (Pukall, 2019). This trend can be seen in some countries, where, for example, forest laws have been integrated into nature conservation laws (e.g., Netherlands). New environmental rules combine restrictions (e.g. Natura 2000 standards, limitations of clear-cut areas) and new financial and management opportunities. Management measures, including consideration of close-to-nature forestry and species diversification, may provide some opportunities to explore new forestry models that were not supported up to now by the traditional foresters. Comparative studies across European countries (e.g. Feliciano et al., 2017) suggest the need for more innovative support schemes and advisory services to encourage forest owners to engage with these new models.

On the other hand, our research shows that owners' rights can increase as a consequence of increased social awareness. For example, in France and Germany PFOs now have the right to prevent hunting activities for ethical reasons. For NWE, increases in PRIF are related to increased rights in management and freedom of decision, but these are often motivated by increased environmental concerns. In Finland, deregulation is explicitly aimed at allowing PFOs more freedom in their forest management decisions, implicitly also increasing their responsibility and empowerment to practice more active and multi-faceted forestry. In Denmark, the voluntary windthrow schemes directed towards native species are based on the same market principles as the voluntary grants for enhancing management in Natura 2000 areas (Jacobsen et al., 2013).

Overall, most of the changes we identified across Europe were recorded in the categories of management rights and exclusion rights. This reflects policy maker's concerns to balance between, on the one hand, an individual's responsibility and the imposition of easily achievable forest management requirements, and, on the other hand, forest owners' collective duties and their relations with other users (e.g. hunters, mushroom pickers, recreationist). These concerns are also the result of the increased influence of EU strategies on national forest policies (Pülzl et al., 2013).

Management rights have a central role in most of the European strategies. For example, the EU Biodiversity strategy (EC, 2011) address the forestry measures by encouraging the adoption of FMPs, and the Natura 2000 network also places a high emphasis on management plans (Weiss et al., 2017). While in many former socialist countries the elaboration of a FMP remains an obligation for PFOs, other countries use financial instruments to stimulate PFOs to draw up FMPs. For example, support to small forest holders to formulate FMPs has been programmed in six member states (Austria, Germany, Spain, France, Italy and UK) within the framework of the 2014–2020 EU RDP (Alliance Environment, 2017). At the same time, the “bio-economy” and “bioenergy” turn advocated by forest policy makers over the last decade (Kleinschmit et al., 2014; Pülzl et al., 2014) has put pressure on management rights, in order to increase wood mobilization from sustainable sources (Orazio et al., 2017). For example, in 2010 French forest policymakers decided to slightly adjust the requirements for FMPs through an amendment to the Forest Code, and as a result the number of PFOs obliged to contract an FMP has doubled (CNPF, 2015). In other countries, this issue is addressed by soft policy instruments such as subsidies and advisory services targeting “new”, “absentee” or “passive” forest owners in the direction of wood mobilization (Weiss et al., 2019a), often through multi-faceted support programmes (Lawrence, 2018).

The exclusion rights are often disputed between the forest users, who want free access for recreational activities or for the collection of NWFPs, and the PFOs who may gain entrepreneurial benefits from using the exclusion rights (Nichiforel and Schanz, 2011). For example, in Czech Republic, Romania and Slovakia, as a result of increased exclusion rights attributed to PFOs, the transfer of hunting rights from PFOs to hunting associations has become a growing market. Similar developments may be seen also from the introduction of picking fees and mushroom picking norms favouring PFOs (Górriz-Mifsud et al., 2017). As our analysis has shown, PFOs have received increased legal support to exclude commercial use of mushrooms without their consent. However, the collection of NWFPs is often embedded in the culture of household economy and exclusion rights for NWFPs are difficult to enforce in practice. Thus, the selling and leasing of rights to collect NWPFs are, with few exceptions, seldom practiced in European private forests (Wolfslehner et al., 2019).

This redefinition of rights, in particular forest management and exclusion rights, confirms the proliferation in European forest governance of an approach based on soft laws where policy makers steer forest policies through a new set of policy instruments (Kleinschmit et al., 2014; Sergent et al., 2018). Current efforts in research and policy development have a major focus on financial instruments for environmental regulation in forestry as well as agriculture, thus still respecting a substantial degree of individual PFO discretion. Despite this common deregulation trend, the structure of property rights remains diverse between countries, and our research shows that there is still a long way to go for the European countries to align their forest management regulations towards the vision of a common European forest policy.

6. Conclusions

Our analysis has illustrated how different forest governance approaches exist and develop in different ways at the European level, emphasising the role of the state in the distribution of *de jure* access, withdrawal, management, exclusion and alienation rights between forest owners, forest authorities, and other users.

At the beginning of the 1990s there was a clear distinction in property-rights distribution between the western countries (with a higher freedom of decision making attributed to PFOs) and the former socialist countries entering the transition period. We conclude that there is no longer a clear line between the western countries and former socialist countries with respect to PRIF scores. In the western countries, many of the changes to forest-related laws and their amendments in the last two decades were made at similar level of rights, which means few additional rules or norms were introduced, but legislative acts were tidied up and updated. In contrast, in most of the former socialist

countries, both the number of legal changes and the impact in property rights changes was higher. In countries with high PRIF scores in mid-1990s we sometimes find these declining (mainly in CWE), driven by environmental and forest user concerns; in other cases, environmental concerns are pursued using deregulation or market based instruments, which rely on decision-making of PFOs (e.g. Finland and Denmark). In these latter cases we see PRIF scores continuing at a high level. Across the former socialist countries, we see deregulation in some areas, at various speeds. Nevertheless, most of the former socialist countries, with the exception of Baltic states, still maintain a high level of state coercion on private forest management.

Although we cannot extrapolate our conclusions outside the analysed period, we can still note implications for possible future legal changes. The general deregulation trend begs the question: how far is it possible to liberalise the freedoms of PFOs to make decisions, without negatively affecting the practice of sustainable forest management? The future development of property rights is likely to be accompanied by increasing demands from outside the forestry sector, the endorsement of policies by a complex constellation of stakeholders and – at least in some states, by a focus on decentralization (from the state to regional forest authorities). While it is expected that national forest policy goals will slowly converge to a more uniform distribution of rights across Europe under the pressure of biodiversity and climate change policies, national governance frameworks may pursue shared goals with diverse policy instruments. Such a convergence may mean more management restrictions in the high-level PRIF countries and new policy instruments and more freedom of decision in the field of forest management in the low-level PRIF countries. Potential forest policy instruments may not necessarily focus on the reconfiguration of property rights, particularly not on the material dimension of rights, but rather on the redefinition of fiscal advantages and the financial instruments used to balance the cost/benefits of PFOs, to alleviate unintended economic losses or to promote responsible forest management practices.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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