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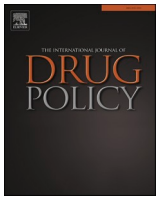

Research Paper

Measuring drug policy evolution: A cross-country analysis*

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ABSTRACT

Drug policies significantly impact public health and criminal justice outcomes, yet quantitative tools for systematically comparing approaches across jurisdictions remain limited. This paper uses a state-of-the-art comparative law method – leximetrics – to construct the Illicit Drugs Policy Indexes (IDPI), a valuable resource for assessing the evolution of drug policies over time within a specific country as well as across countries. The IDPI consists of a set of indexes corresponding to multiple dimensions of drug policy, including laws around consumption, possession and traffic. These indexes examine illicit drug laws and policies across seven countries: Australia, Canada, France, Italy, Netherlands, Portugal and the United Kingdom, over a timeframe of twenty years from 1996 to 2016. Our results identify significant turning points in the evolution of laws regarding drugs, often indicating a shift towards less criminal-oriented approaches. Moreover, the paper identifies the countries which progressed more in that direction, over time. The underlying IDPI methodology provides policymakers and researchers with a standardized framework for evidence-based drug policy evaluation and reform, adaptable across jurisdictions.

Introduction

The global landscape of illicit drug policy has undergone a profound transformation in recent decades. As countries grapple with the complex interplay between public health and law enforcement, a critical question emerges: how can we systematically measure and compare drug policies across jurisdictions and time?

While Portugal's decriminalization in 2001 and recent cannabis reforms in countries like Germany mark significant and obvious shifts, researchers and policymakers have lacked robust quantitative tools to evaluate these evolving approaches. Over the past few decades, for instance, many countries continued to implement drug policies based on the criminalization of illicit drug possession for personal use. However, a growing number of countries have adopted alternative policies, in particular regarding cannabis. These alternative policies are based on decriminalization, diversion and depenalization (Colson & Bergeron, 2017; Stevens et al., 2022) or, in the case of cannabis, on legalization for non-medical use by the adult population. For example, Portugal decriminalized all drug use (up to a specific threshold) in 2001; Uruguay legalized adult-use of cannabis in 2013; and several US states have been legalizing cannabis use by adults (and, in some cases, psilocybin). More recently, Malta (in 2021), Luxembourg (in 2023) and Germany (in 2024) also approved new legislation on adult-use of cannabis, allowing home cultivation and possession for personal use within specific thresholds (UNODC, 2024).

The variety of illicit drugs policies adopted internationally and their embeddedness in changing institutional environments clearly represents a research challenge: how may we compare illicit drugs policies implemented by different countries? And, within a country, how may we compare the evolution of illicit drugs policy over time?

This – mainly methodological – paper addresses this gap by developing indexes of drug policy-related laws using a state-of-the-art comparative law technique – leximetrics – that relies on a systematic quantitative methodology which 'turns the law into numbers' and, therefore, allows intertemporal and international comparison of legal change (Cooter & Ginsburg, 2003; Siems, 2011; Buchanan et al., 2014;

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Table 1
Identification and explanation of the core dimensions.

Dimension	ID	Description
Consumption	1	Refers to the direct consumption/use of illicit/ controlled drugs.
Consumption cannabis	1C	Refers to the direct consumption/use of cannabis in any form.
Possession	2	Refers to possession for personal consumption of illicit drugs.
Possession cannabis	2C	Refers to possession for personal consumption of cannabis.
Traffic	3	Refers to the global illicit trade involving the cultivation, manufacture, distribution and sale of substances which are subject to drug prohibition laws. Includes importation and exportation. "Import" and "export" mean in their respective connotations the physical transfer of drugs into or out of a national territory.
Traffic cannabis	3C	Refers to the same description as ID 3, but restricted to cannabis
Cultivation	31	Refers to cultivation of opium poppy, coca bush
Cultivation cannabis	31C	Refers to cultivation of cannabis plant - Cannabis sativa L.
Production	32	Refers to the act of manufacture, manipulation or obtainment of narcotic drugs, psychotropic substances of drug precursors, from natural organisms out of the plants that produce them (such as opium and coca leaf), either by way of collecting or by way of extracting or by the way of transforming through physical of chemical products.
Production cannabis	32C	Refers to the act of obtaining, manufacturing or manipulating cannabis plant or resin.
Distribution	33	Domestic supply or attempt to supply illicit/ controlled drugs.
Distribution cannabis	33C	Domestic supply or attempt to supply cannabis.

Notes: The authors elaborated on the descriptions of the concepts in Table 1, as they are not normalized across countries. We developed these descriptions considering information collected from different national laws and reports produced by the EUDA (European Union Drugs Agency) and UNODC (United Nations Office on Drugs and Crime). The description of the "traffic" dimension follows UNODC's definition of drug trafficking, regards the overall picture of the illicit drugs supply chain, and is one of the research topics of the organization (https://www.unodc.org/unodc/en/data-and-analysis/research-on-drug-trafficking.html).

Table 2
Indexes for cannabis.

Index// Dimension	SubIndexes	Variables
1C - Consumption Cannabis	1C-1. Maximum consequence	1. Non-dependent, 1st time 2. Non-dependent, n time 3. Dependent, 1st time 4. Dependent, n time 5. Occupations/ professions 6. Place
	1C-2. Exemption of sanction	7. Treatment 8. Exemption of sanction
	1C-3. Allowances for therapeutic/medicinal cannabis	9. Allowance for therapeutic/medicinal cannabis
2C - Possession for consumption Cannabis	2C-1. Detention Threshold	10. Quantities 11. Place restrictions 12. Place allowances 13. Recidivism 14. Therapeutic/ medicinal cannabis
	2C-2. Type of Procedure Threshold	15. Quantities 16. Place 17. Recidivism
	2C-3. Maximum Consequence - Small Quantities	18. Non-dependent, 1st time 19. Non-dependent, n time 20. Dependent, 1st time 21. Dependent, n time
	2C-4. Exemption of Sanction	22. Treatment 23. Exemption of sanction
	2C-5. Maximum Consequence - Large Quantities	24. Maximum Penalty - Large Quantities
3C - Traffic Cannabis		
31C - Cultivation Cannabis	31C-1. Detention Threshold	25. Quantities 26. Place allowances 27. Club allowances 28. Recidivism 29. Therapeutic/ medicinal cannabis
	31C-2. Non-individual Cultivation	30. Public Cultivation 31. Private Corporate Cultivation 32. Export Cannabis Plant
	31C-3. Consequence for Individual Cultivation	33. Maximum Penalty - Small Quantities
32C - Production Cannabis	32C-1. Consequence for Production	34. Individual Production 35. Non-Individual Production
33C - Distribution/ Supply Cannabis	33C-1. Detention Threshold	36. THC level 37. Place allowances 38. Therapeutic/ medicinal cannabis
	33C-2. Consequence for Supply	39. Maximum Penalty 40. Recidivism 41. Dependence on drugs 42. Aggravation Penalties 43. Alleviation Penalties 44. Small Quantities

Adams et al., 2017, 2023; Deakin et al., 2023). These indexes focus on the legal provisions regarding production, distribution and use of illicit drugs in seven selected countries – Portugal, France, Italy, Netherlands, United Kingdom, Canada and Australia – over a timeframe of twenty years (1996–2016).[1] These countries were selected based on their diverse drug policies (Colson & Bergeron, 2017) and legal origin (civil-law and common-law).

Understanding the trajectory of illicit drugs policy may be built via a qualitative analysis of 'law in books' – including statutory law, policy guidelines and judicial precedent – using methods such as discourse analysis (Lancaster & Ritter, 2014). However, to compare the stages of evolution of 'law in books', a quantitative method needs to be used.

In empirical research, leximetrics is a relatively recent method that has been used in a number of ways, ranging from simply counting (e.g., counting cases, words, lawyers) to benchmarking of legal rules, measuring the quality of legal rules, or surveying perceptions about the law. It has also been used in various fields: the pioneers were La Porta et al. (1997; 1998) in their studies on law and finance, but the method has also been used in comparative corporate governance, involving cross-country comparison of legal rules regarding investor protection (e.g., Cheffins et al., 2014), as well as shareholder, creditor and worker protection (La Porta et al., 2008; Armour et al., 2009a, 2009b, Lele and Siems, 2007; Adams et al., 2017, 2023); in company law, to assess the update of articles of association after a legal reform (Hardman, 2021); in labour law, to compare the evolution of rules regarding worker protection (e.g., Deakin, 2009; Mitchell et al., 2010; Deakin & Sarkar, 2011; Mahy et al., 2019); and in studies that involve some kind of criminal provisions, such as self-dealing or investor expropriation (meaning that those who control a corporation divert corporate wealth to themselves, without sharing it with other investors) (Djankov et al., 2008); capital market integration (Bremus & Kliatskova, 2020), and housing policies (Kholodilin, 2020). These studies have in common a purpose that also

[1] The time horizon under analysis can easily be extended to a more recent date. The main purpose of this paper is to propose a methodology and illustrate how it could be applied (using the 1996-2016 time horizon).

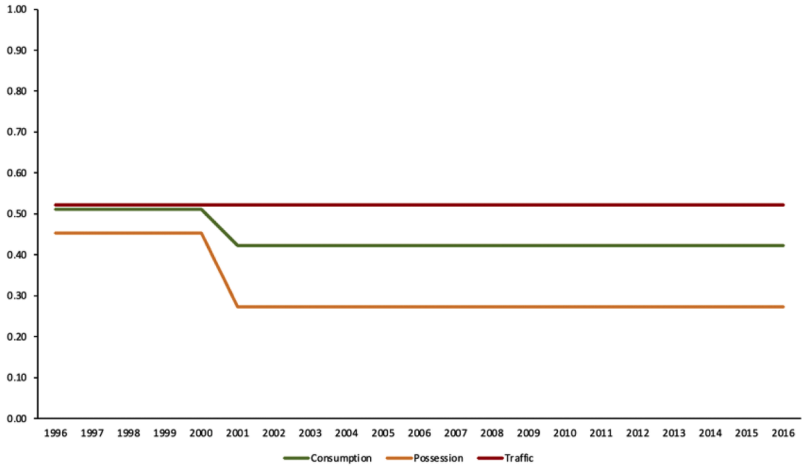

Fig. 1. Consumption, possession and traffic of cannabis in Portugal: 1996–2016.

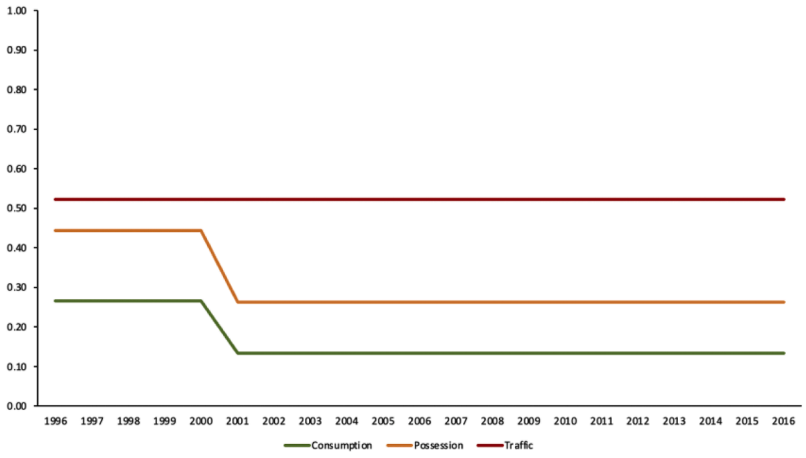

Fig. 2. Consumption, possession and traffic of other drugs in Portugal: 1996–2016.

underlies our paper: the construction of indexes of legal rules that can be quantitatively applied to compare specific policies and evaluate their impacts, hence contributing to policy reform.

The leximetric method provides valuable insights into public policy assessment and change, but it is a demanding method (Elkins & Ginsburg, 2021). The risk of coding errors, the reduction of complexity that it involves, and the interdisciplinary approach it requires justifies the warning of "use, but with care" (Cheffins et al., 2014). Hence, the use of leximetrics – and specifically the construction of indexes – requires attention to legislative timeline validation, development and implementation of coding procedures, and triangulation of sources.

In this paper we extend the use of leximetrics to a new field – illicit drugs policy – and construct the Illicit Drugs Policy Indexes (IDPI), which encompasses separate indexes for three different but interconnected dimensions of illicit drug laws: laws around consumption, possession and traffic, with the latter being further subdivided into laws around cultivation, production and distribution. These indexes focus on laws, court decisions and regulations from public prosecutor's offices, allowing for an analysis of the evolution of drug policy within a country, and for a comparison of drug policies across countries.

The IDPI is distinct from other indexes such as the former UK Drug Harm Index and UNODC Global Illicit Drug Trends, the current New Zealand Drug Harm Index and the Australian Federal Police Drug Harm Index, or the Global Drug Policy Index (GDPI, 2021) recently created by the Harm Reduction Consortium. The goals and methodology are clearly different from ours. For example, the GDPI aims to measure how drug policies align with United Nations recommendations on how to design and implement drug policies in accordance with the principles of health, human rights, and development. It relies extensively on expert consultation and it ranks thirty countries alongside five dimensions of drug policy that are associated with UN recommendations. Notwithstanding the differences, all these indexes highlight the pressing need for policymakers to develop adequate quantitative tools that can 'measure,' in a comparable way, changes in illicit drugs policies, either across countries or over time.

The IDPI is therefore of interest to researchers working in cross-country and cross-time institutional comparison (such as Belackova et al., 2017), as well as to researchers investigating the role of law in constituting drug markets, from a legal institutionalist perspective (Deakin et al., 2017).

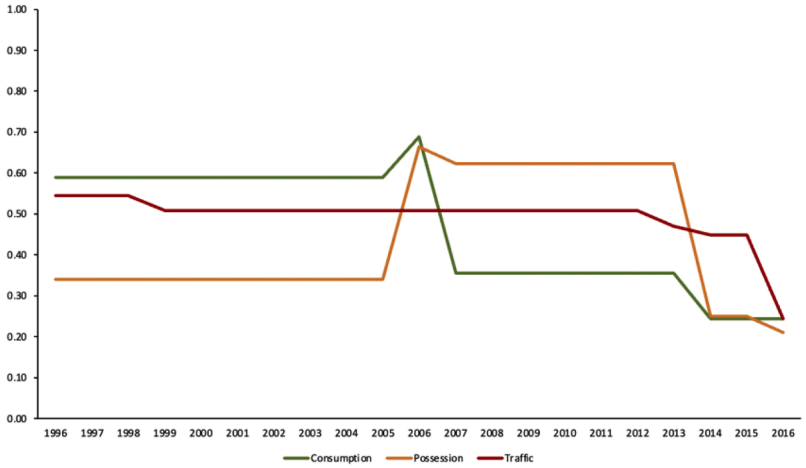

Fig. 3. Consumption, possession and traffic of cannabis in Italy: 1996–2016.

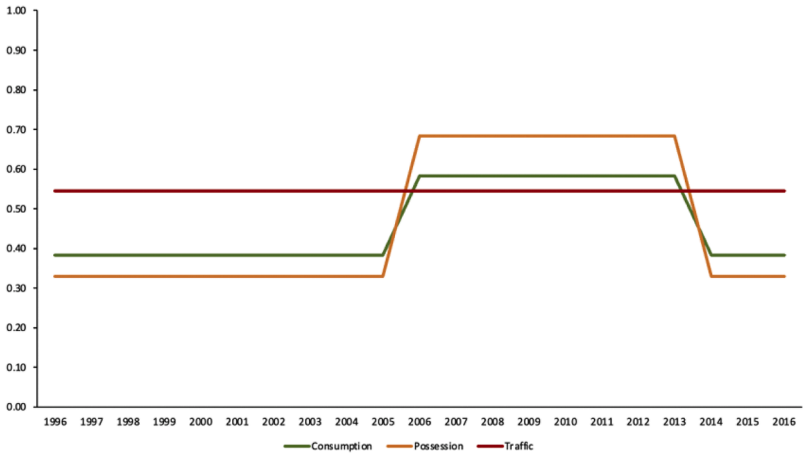

Fig. 4. Consumption, possession and traffic of other drugs in Italy: 1996–2016.

Method

Implementing leximetrics: the construction of illicit drugs policies indexes

The construction of the IDPI builds on work carried out at the Centre for Business Research (CBR) of the University of Cambridge (Adams et al., 2017, 2023; Armour et al., 2009a, 2009b; Deakin et al., 2023). The authors used leximetrics to code legal data for labour laws in 117 countries between 1970 and 2013 – the CBR Labour Regulation Index (CBR-LRI); shareholder protection in 30 countries between 1990 and 2013 (the CBR Extended Shareholder Protection Index), and creditor protection in 30 countries between 1990 and 2013 (the CBR Extended Creditor Protection Index).[2]

When constructing the indexes, a number of measures – identified in the CBR's codebook as safeguards that an index gets as close as possible to representing the real effect of legal rules in any given jurisdiction – were used as a working reference:

Use a wide range of legal information (i.e., sources of rules): positive legal rules, other norms that are de facto binding, and judicial decisions; this allows consideration for relevant cross-national differences in the operation of legal rules; note that the focus is on law in books and not law in action (i.e., not on the actual implementation of the legal rules).

Code for a wide range of values, using an intermediate score between 0 and 1; this allows for increased sensitiveness to legal variation;

(i) Cover a wide range of types of legal rules: mandatory and default;
(ii) Code for legal rules as they have evolved over time, to build a template that is sensitive to possible variations of the law over time.

Moreover, as in the construction of the CBR indexes, we followed the recommendations of index construction indicated in the Handbook on Constructing Composite Indicators prepared jointly by the OECD and the European Commission in 2008. It emphasizes the importance of a theoretical framework that justifies the selection of indicators and the weighting scheme through which they are aggregated into a composite measure or series of measures. It also stresses the need for methodological issues 'to be addressed transparently prior to the construction and use of composite indicators in order to avoid data manipulation and misrepresentation' (OECD, 2008: 15).

The leximetrics process of dataset construction used to create the IDPI follows the same steps used to create the CBR-LRI (Adams et al., 2017; Deakin et al., 2023), which are the following:

1. Identification of a concept which represents the underlying phenomenon of interest;

[2] The CBR Leximetric Datasets are available on the University of Cambridge repository, and one of their distinguishing features is that all legal sources for the data coding are fully described in the relevant codebooks, thereby assisting transparency, external validity and replicability of results. Each dataset (Excel spreadsheet) contains the data and a codebook with the sources of the coding and an explanation of the coding methodology.

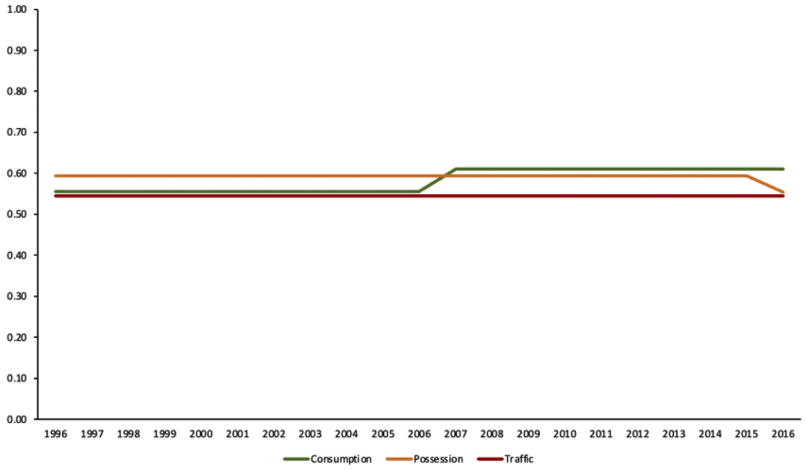

Fig. 5. Consumption, possession and traffic of cannabis in France: 1996–2016.

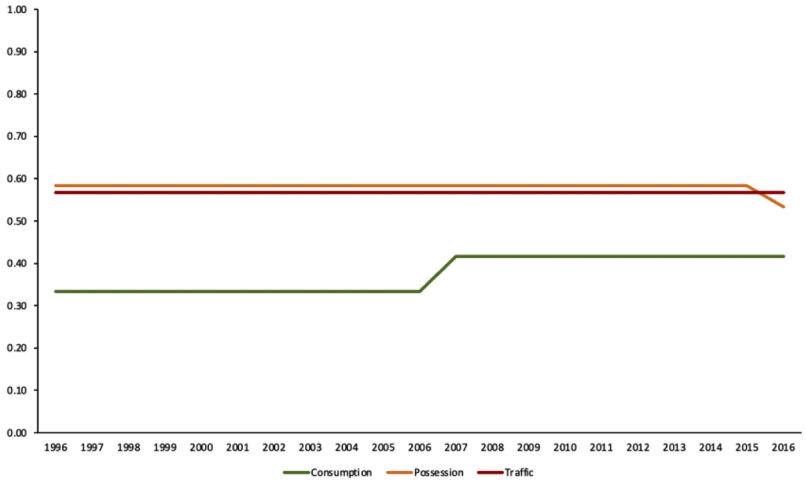

Fig. 6. Consumption, possession and traffic of other drugs in France: 1996–2016.

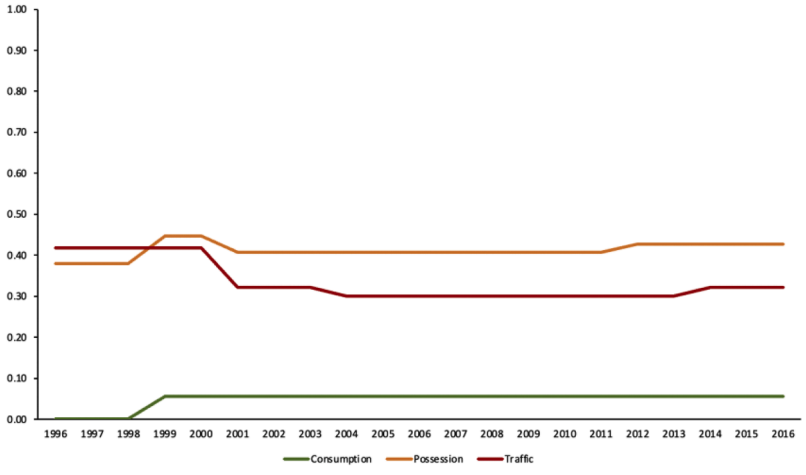

Fig. 7. Consumption, possession and traffic of cannabis in the Netherlands: 1996–2016.

2. Development of a construct which provides a basis for measuring the concept;
3. Identification of indicators or variables that express aspects of the construct in numerical terms;
4. Development of a coding algorithm that sets out a series of steps to be taken in assigning numerical values to the primary source material;
5. Identification of a measurement scale that is embedded in the algorithm;
6. Allocation of weights, where necessary or relevant, to the individual variables or indicators;
7. Aggregation of the individual indicators in an index that provides a composite measure of the underlying phenomenon of interest.

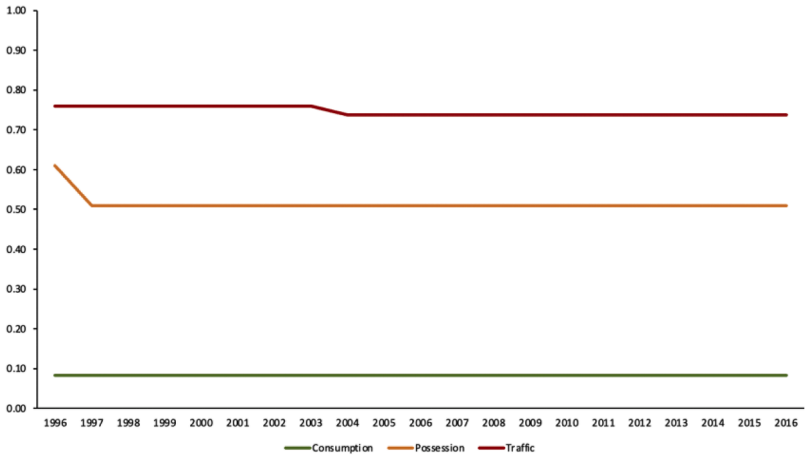

Fig. 8. Consumption, possession and traffic of other drugs in the Netherlands: 1996–2016.

Steps 1 and 2 are similar in nature to the CBR-LRI. The concept that represents the underlying phenomenon of interest is "laws concerned with illicit drugs." The development of a construct that provides a basis for measuring the concept takes into consideration the multidimensionality of illicit drugs policy. Therefore, it encompasses the laws around the following dimensions: consumption, possession and traffic, with the latter being further subdivided into cultivation, production and distribution. Nonetheless, each subdimension may be considered separately and, indeed, disaggregated for coding purposes.

Steps 3 to 5 regard the coding methodology. In step 3, to better identify the indicators that express aspects of the construct in numerical terms, we add two further steps:

a. Construction of a timeline that identifies the provisions of law, relevant court decisions, and regulations in each country for each variable[3];
b. Validation of the timeline by legal experts of each country, who may suggest additional legal landmarks.

Steps 6 and 7 regard the statistical properties of the dataset. In step 6, similarly to the CBR-LRI, we assign equal weights to the indicators. In step 7, we aggregate the individual indicators in sub-indexes, which were then aggregated in three indexes (also using a common weighting scheme). Differently from the CBR-LRI, instead of a single index, due to the multidimensionality of the concept, we have multiple indexes as referred above.

Period coded

The period under analysis is from 1996 to 2016.,[4][5]

Choice of indicators

The selection of indicators originated in the three main core dimensions within the illicit drug laws phenomenon of interest: production, distribution, and consumption (Ritter, 2006, 2009; Babor et al., 2010; Strang et al., 2012).

After collecting the initial legal information for most countries and to better capture differences between countries, we expanded the analysis in the following way: we considered laws around possession in addition to laws around consumption; and we distinguished between the laws around cultivation, production and distribution including them in a more general 'traffic' dimension. Throughout the paper, we refer to "laws around consumption" as "consumption," "laws around possession" as "possession," and "laws around cultivation, production and distribution" as "traffic," for readability.

We identified, therefore, three dimensions of illicit drugs policy coded in the IDPI, producing six indexes and subindexes:[6]

(1) Consumption;
(2) Possession;
(3) Traffic, which is subdivided in
    3.1. cultivation;
    3.2. production; and
    3.3. distribution.

Regarding the type of drugs, we separated cannabis from other drugs. Internationally, there are specific policies for cannabis and, as mentioned above, this is where differences in policy were expected. For example, cultivation of cannabis for own consumption, or production of cannabis for medical use, can have different legal regulations within and across countries.

As we can observe in Table 1, we assign an ID number to each core dimension; the letter C is added to ID numbers that identify laws related to cannabis specifically.

We have in total twelve indexes (with corresponding ID numbers): six referring to cannabis; and six referring to other drugs (drugs that, besides cannabis, are included in schedule I of the 1961 and 1971 UN Conventions, namely heroin and cocaine, which are plant-based narcotics, and MDMA/ecstasy, which is a psychotropic, synthetic drug).

In the context of international drug control and in conformity with the 1961 Single Convention on Narcotic Drugs, except where otherwise expressly indicated or where the context otherwise requires, the following definitions apply:

a) "Drug" means any of the substances in Schedules I and II, whether natural or synthetic.

[3] Timelines can be provided upon request.

[4] This timeframe is associated with the underlying research project's timeframe ("Illicit drug policies and social outcomes", funded by ERANID): the research project proposed to look back at the past 20 years (1996-2016); it was approved for funding in 2017; and it was then developed between 2017-2020.

[5] In many countries, relevant legislative milestones occurred prior to 1996, some of which are still in force. Therefore, for the development of the legislative timelines, the initial date differs across countries depending on the date of the main legislative landmark prior to 1996.

[6] Money laundering was initially considered as a possible (additional) dimension, but it was soon dropped from the analysis because money laundering rules do not treat illicit drug markets' revenue separately from revenues from other illicit markets (e.g., firearms trafficking).

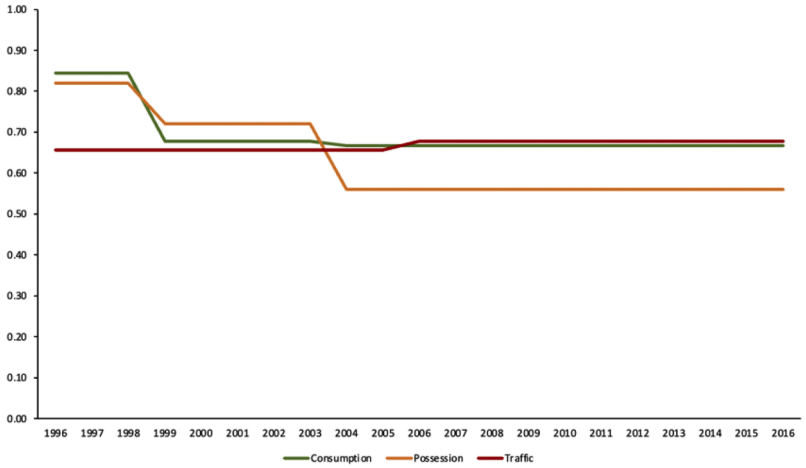

Fig. 9. Consumption, possession and traffic of cannabis in the United Kingdom: 1996–2016.

b) "Schedule I", "Schedule II", "Schedule III" and "Schedule IV" mean the correspondingly numbered list of drugs or preparations annexed to the 1961 Single Convention on Narcotic Drugs. https://www.unodc.org/pdf/convention_1961_en.pdf
c) "Cannabis" means the flowering or fruiting tops of the cannabis plant (excluding the seeds and leaves when not accompanied by the tops) from which the resin has not been extracted, by whatever name they may be designated; "Cannabis plant" means any plant of the genus Cannabis; "Cannabis resin" means the separated resin, whether crude or purified, obtained from the cannabis plant.
d) "Coca bush" means the plant of any species of the genus Erythroxylon; "Coca leaf" means the leaf of the coca bush except a leaf from which all ecgonine, cocaine and any other ecgonine alkaloids have been removed.
e) "Production" means the separation of opium, coca leaves, cannabis and cannabis resin from the plants from which they are obtained.
f) "Manufacture" means all processes, other than production, by which drugs may be obtained and includes refining as well as the transformation of drugs into other drugs.
g) "Preparation" means a mixture, solid or liquid, containing a drug.

Construction and validation of legislative timelines

To better identify the indicators that express aspects of the construct in numerical terms, we built legislative timelines, which encompass a list of key policy events and legal changes that have occurred in each country from 1996 to 2016.

The timelines take into consideration statutory law, coded in the year of its publication, and case law, coded in the year in which judgments are reported. They also consider elements that are deemed as functional equivalents to law: superior court and constitutional court decisions, coded in the year of their reporting, and policy guidelines and regulations issued by administrative entities, coded in the year of their publication.[7]

The sources for collecting the legal information to build the timelines were mainly the official countries' national law databases ;[8] we also consulted the annual Country's Drug Reports published by EUDA (European Union Drugs Agency – former EMCDDA) since 2000 for the European countries in the analysis. These reports present an overview of the drug phenomenon in each country, covering drug supply, use and public health problems, as well as drug policy and responses. The data reported is provided to the EUDA by the national focal points. Other sources of information were the EMCDDA Legal Database on Drugs; the ILO's NATLEX database; and various secondary scientific sources, such as Colson & Bergeron (2017) and EMCDDA (2022). Wherever possible, texts were consulted in their original language (that was the case for texts in English, French, Italian and Portuguese); we also consulted texts translated by the EMCDDA, particularly in the case of the Netherlands.

We identified the provisions covering the core dimensions identified in Table 1: consumption; possession; and traffic. For the overall dimension of traffic, we identified the provisions that cover cultivation, production and distribution of illicit drugs, at an industrial/agricultural level, and at home for own consumption.

In each country, national experts on drug policy, were asked to validate the legislative timeline document prepared by the authors. The experts, identified with advice from the EUDA specialists,[9] were asked to add any legal event missing from the timeline regarding each of the dimensions of Table 1, and to validate the document if they considered that all the key legal events were captured. Their contribution was, essentially, a legal fact-checking exercise specific to each country. Therefore, the experts did not participate in the coding methodology (see Supplementary Material A2 for more details on the identification of legal events requested from the experts).

Choice of variables for each core dimension

The choice of variables or individual indicators that express aspects of each core dimension was based on the following questions:

(i) for each core dimension, what variables allow us to classify a country's legal approach to drugs as health-oriented as opposed to criminal-oriented?
(ii) for each core dimension, are these categories different for different types of drugs?

First, when looking into (i), we are fully aware of the politically sensitive nature of the terms we used. However, we are looking into three different dimensions of drug policy, and the coding methodology requires setting 'bounds' to the coding range for each dimension. In

[7] The timelines indicate the year of the event; the dimension(s) (ID number) that such event refers to; and the legislative/policy milestone, which first refers the name of the normative source (law, act, regulation, guideline, etc.), followed by the date of publication, and then describes its relevance as a drug policy landmark in the country in that year.

[8] See https://n-lex.europa.eu/n-lex/index for a summary of the countries' main national law legal sources.

[9] Some of the experts identified by EUDA also participated in the research project "Illicit drug policies and social outcomes", funded by ERANID.

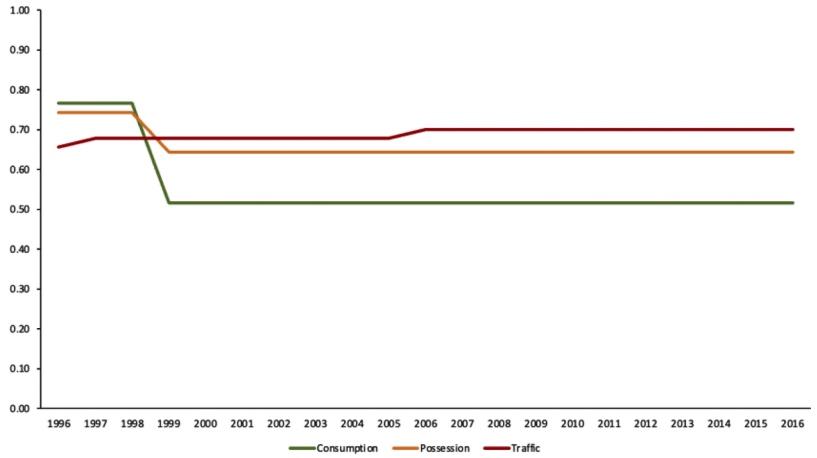

Fig. 10. Consumption, possession and traffic of other drugs in the United Kingdom: 1996–2016.

other words, we need to define what exactly corresponds to the extremes of the coding range for each of the three dimensions. Upon reflection, we concluded that these extremes should be whether a country is health-oriented (i.e., perceiving the individual who uses drugs for own consumption as someone who needs assistance, if that use is problematic) as opposed to criminal-oriented (i.e., perceiving the individual who uses drugs for own consumption as someone who requires punishment).

Considering now (ii): it is natural to expect that the coding methodology differs across illicit drugs. For instance, if the maximum jail time for an individual caught in possession of a small quantity of an illicit drug differs between 'cannabis' and 'other drugs under stricter control' (henceforth 'other drugs'),[10] then we need to adapt the maximum jail time threshold for each type of drug – as they often indeed attract different penalties.

We developed a set of subindexes and variables taking into consideration the database developed by the EUDA on penalties for drug law offenses in Europe.[11] The EUDA collected information on the core offenses of drug use, possession for personal use, and supply-related offenses across countries in Europe. The goal of this database is to examine how penalties vary according to the type or quantity of the drug and the dependence or recidivism of the offender. The questions identified in this database were a starting point for developing our work.[12]

Table 2 describes the dimensions/indexes, subindexes and variables that were considered to arrive at a final score for each dimension. As we can observe, within each dimension, we identified broad categories that would allow us to determine whether a country is health-oriented or criminal-oriented. For each of these categories, we looked at particular variables that reflect the legal diversity across the countries in our sample.

For Consumption of Cannabis (1C), we identified three categories:

1) Maximum consequence foreseen in the law for an individual who is caught consuming (1C-1), which considers a differential legal handling of individuals dependent and non-dependent on drugs (for readability, we refer to a person who is dependent on drugs by 'dependent', and to a person non-dependent on drugs as 'non-dependent'), as well as whether they were caught for the first or for the nth time; this approach is consistent with the EUDA database on penalties, which also considers drug dependence ('addiction', in EUDA's terminology), and includes provisions for first time offenders. Moreover, we looked into particular restrictions associated with the place of consumption (e.g., near schools or hospitals) or with particular professions (e.g., public authorities);
2) Exemption of sanction, which considers whether the law foresees exemption of sanctions under specific circumstances, such as treatment (1C-2); and
3) Allowances for medicinal cannabis, which considers whether the law explicitly foresees a different regulatory regime for therapeutic/medical cannabis (1C-3).

For Possession of Cannabis (2C), we identified five categories:

1) Detention threshold, which considers thresholds in quantities; place restrictions; place allowances (e.g., drug consumption rooms in which users are not prosecuted by using or possessing illicit drugs); recidivism; and allowances for medicinal cannabis;
2) Type of procedure after policy seizure, which accounts for the possibility of administrative procedures, depending on quantity threshold and recidivism, and whether it is affected by seizure in restricted places, such as schools and hospitals;
3) Maximum consequence for small quantities, whose variables are similar to maximum consequence for consumption;
4) Exemption of sanction, also similar to consumption; and
5) Maximum consequence for possession of large quantities.

Traffic of Cannabis (3C) encompasses three subindexes: Cultivation, Production and Distribution. The subindex Cultivation Cannabis (31C) encompasses three categories:

1) Detention threshold, which is similar to possession, with the addition of club allowances;
2) Non-individual cultivation, which encompasses public and private cultivation as well as allowances for exporting; and
3) Consequences for individual cultivation, which reflects the maximum penalty for cultivation of small quantities.

The subindex Production of Cannabis (32C) encompasses two

[10] As previously mentioned, on the one hand, cannabis is the drug which is more frequently object of specific regulation alternative to criminalization; on the other hand, it co-exists in the drug market with other drugs within schedule I of the 1961 and 1971 UN Conventions, which are under stricter control and encompass substances such as cocaine and heroin (narcotic drugs) and MDMA/ecstasy (psychotropic drug).

[11] https://www.euda.europa.eu/publications/topic-overviews/content/drug-law-penalties-at-a-glance_en#section5.

[12] The EUDA's work focuses on EU Member States, Norway and Turkey, but the database includes other jurisdictions such as Algeria, Georgia and Ukraine. Other countries outside the scope of EUDA's database may have stronger maximum penalties, including life in prison and death. For the interested researcher the index requires adaptation for the countries to be analysed.

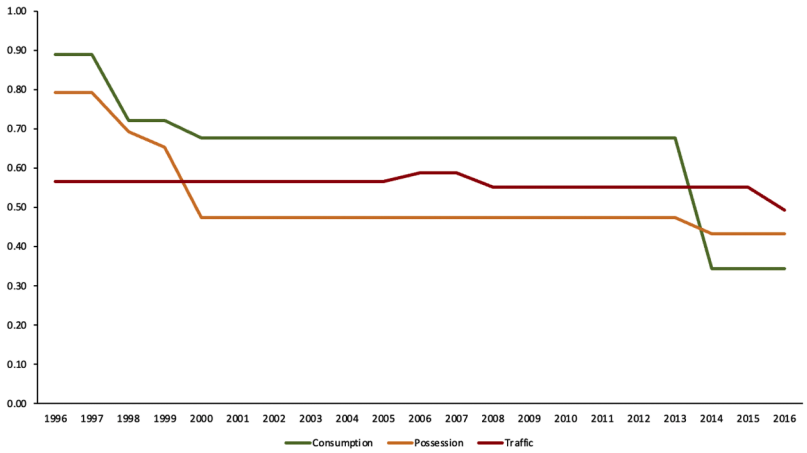

Fig. 11. Consumption, possession and traffic of cannabis in Australia: 1996–2016.

categories:

1) Allowances for individual production;
2) Allowances for non-individual production (e.g., companies or public institutions).

Finally, the subindex Distribution of Cannabis (33C) is divided into three categories:

1) Detention threshold, which considers allowances for: 1) THC levels (i.e., if there is a low THC level under which supply is allowed); place; and therapeutical or medicinal cannabis;
2) Consequences for supply, given police seizure, with regards to maximum penalty; recidivism; dependence on drugs; aggravating and alleviating penalties; and
3) Small quantities, which reflects consideration for the supply of small quantities.

In total, for cannabis we have 44 indicators or variables, divided in 9 for consumption; 15 for possession and 20 for traffic.[13]

The choice of indicators for 'Other Drugs' followed a similar process. Naturally, we did not consider differences in regulatory regimes for therapeutic/medicinal cannabis and, as such, we eliminated variables 9, 14, 29, 36 and 38. This yielded a total of 39 indicators: 8 for consumption; 14 for possession and 17 for traffic. Therefore, the index Consumption of Other Drugs (1O) only contains two categories: the maximum consequence of an individual caught consuming other drugs (1O-1) and whether the law foresees exemptions of sanctions under particular circumstances (1O-2). Accordingly, the indexes Possession of Other Drugs (2O) and Traffic of Other Drugs (3O) also had a reduction of variables in the subindexes Detention Threshold (2O-1, 31O-1 and 33O-1 respectively). Supplementary material A1 presents the coding template by type of drugs.

Algorithms and scales

After identifying the indexes, subindexes and the variables of interest to measure the concept of illicit drugs policy, the next step was to develop a coding algorithm and a measurement scale for each variable, to ensure that the timeline events were coded in a consistent way. For the dimensions Consumption, Possession and Traffic the reference point was the dichotomy most strict (most criminal-oriented) and most lenient (more health-oriented). To this aim, we used two approaches identified in Adams et al. (2017), Deakin et al. (2023) and Botero et al. (2004). The first is a binary code, which consists of using dummy variables to indicate the presence (or absence) of a specific policy feature or situations in which such policy features may be classified at the extremes of the coding range; this approach is taken by Botero et al. (2004) for most variables of the labor regulation index. The second approach was to use graduated scores that express the extent to which a policy feature is more criminal-oriented or health-oriented.

IDPI makes use of both approaches. Whenever possible, we use graduated coding, as it allows for a more fine-grained analysis that is capable of capturing a greater variety of cross-national differences.[14]

As an example of the use of binary code, in the index '1C.Consumption Cannabis', subindex '1C-1.Maximum Consequences', the variable 6 'Place' is coded '1′ if the maximum consequences for consumption are aggravated when consumption takes place in specific places and is coded '0′ otherwise.

As an example of the use of a graduated scale, in the index '1C. Consumption Cannabis', subindex '1C-1.Maximum Consequences', variables 1 to 4 have a 6 points graduated scale: '1′ if the maximum consequence for consumption is arrest for more than 3 months; '0.8′ if the maximum penalty is arrest for 3 months or less; '0.6′ if the maximum penalty is a pecuniary sanction; '0.4′ if the maximum penalty is a non-pecuniary sanction; '0.2′ if the maximum penalty is a warning or a provisional suspension of proceedings and '0′ if consumption is not considered an offense and as such there is no penalty. The same graduated scale is applied to variables 18 to 21.[15]

Other examples of graduated scales are variables 24 (maximum consequence for possession of large quantities) and 39 (maximum penalty for supply): both have a 3 points scale, an upper bound of 10 years and 5 years, respectively, and a lower bound of 1 year, as the

[13] In our opinion, the choice of indicators is sufficiently broad so as to constitute a good measurement proxy of the concept of interest (illicit drug policy). However, and despite the fact that coding is a resource intensive process, more variables could have been included in the analysis.

[14] For the indexes Consumption, Possession and Traffic of Cannabis we have 30 variables coded with a binary code and 14 variables coded with a graduated scale. For the same indexes regarding Other Drugs we coded 25 variables with a binary code and 14 variables with a graduated scale.

[15] The 3-months threshold was chosen because in most countries analyzed by the EUDA, the penalty for cannabis consumption or possession for consumption is less than 3 months. This threshold helps identify more criminal-oriented countries, where the penalty exceeds 3 months. However, this threshold is 1 year in variable 33, as the penalties for individual cultivation of small quantities tend to be higher than 3 months. For Other Drugs this threshold increases to 6 months in variables 1 to 4, and to 1 year in variables 18 to 21, as penalties for these drugs tend to be harsher and there may be significant differences between use and possession.

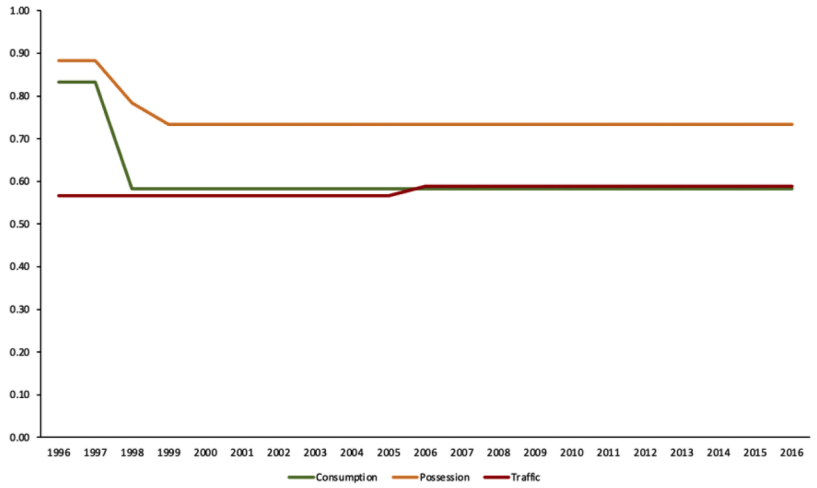

Fig. 12. Consumption, possession and traffic of other drugs in Australia: 1996–2016.

penalties for possession of large quantities and supply tend to be harsher.[16]

Supplementary material A1 describes in detail the policy features considered when coding each variable and its respective value range. These variables were coded for Cannabis and Other Drugs for each country and for each year.

Classification of primary data

The next step in the coding methodology was to assign numerical values to each variable, in line with the timeline events. Therefore, for each country, we attributed numerical values to each variable, according to the measurement scale, for each year from 1996 to 2016. We started by coding the variables in the subindex '1C-1.Maximum consequences', and analyzed the laws/policies identified in the timeline in 1996.[17] We attributed the correspondent value for the time period in which the law was in force, and changed the code if there was an amendment or a relevant event in the timeline.

As an example, for Portugal, variables 1 to 4 were coded with 0.8 from 1996 to 2000. During that period, according to Decree-Law no. 15/1993, the maximum penalty for consumption was imprisonment for up to 3 months, both for non-dependent and dependent consumers, with no penalty alleviation for first-time offenders. These consequences were not aggravated for specific occupations or places, and therefore, the variables 5 and 6 were coded '0.' There was the possibility of treatment as an alternative to penalty if the offender submitted to it voluntarily, and there was also the possibility of exemption of sanction for an occasional consumer. Therefore, variables 7 and 8 were coded '0.' As there were no allowances for medicinal cannabis, variable 9 was coded with the value of '1.' In 2001, Law no.30/2000 entered into force and amended Decree-Law no.15/1993. The value attributed to variable 1 changed to 0.2, as the new law implemented a provisional suspension of proceedings to non-dependent consumers with no prior offences; variable 2 changed to 0.6, as non-dependent consumers should now be sentenced to the payment of a fine in the case of a prior offence and variables 3 and 4 changed to 0.4, as dependent consumers should now be sentenced to non-pecuniary sanctions. There were no more changes to these variables until 2016. Also, variables 5 to 9 did not change from 1996 to 2016. The procedure followed was similar for all variables and for all other countries. Supplementary material A4 contains the resulting dataset.

Weighting and aggregation

As discussed in Adams et al. (2017), from the point of view of the theoretical framework and the leximetrics methodology, the indexes and subindexes have been designed to capture distinct but interlocked aspects of drug policy features, i.e., they have been designed so as not to overlap, thereby avoiding double counting.

The IDPI was constructed in such a way that it is possible to assign different weights to individual subindexes or variables. In particular, the weighting of the subindexes warrants further discussion. As in the CBR-LRI index, we assumed each subindex to have an equal weight, i.e., the index score is the simple average of its subindexes, as each subindex is representative of a relevant and separate issue.[18]

This is the most common weighting scheme, used, for instance, in the construction of other indexes, such as the CBR-LRI index or the OECD Better Life Index.

Notwithstanding, the dataset in supplementary material A4 can be used with different aggregation weights. In our view, researchers should only depart from the common weight assumption if there is a compelling reason to do so. And the available alternative weighting methods range from the simplest – simply attributing different but justifiable weights to each subindex and/or to each variable – to the more complex – e.g., applying Data Envelopment Analysis with the Benefit-of-the-Doubt principle or Multi-criteria Decision Making techniques (Peiró-Palomino & Picazo-Tadeo, 2018). As such, we have considered a simple alternative weighting scheme, based on cost of imprisonment or judicial system, but its effects on results are relatively small and do not materially change the main results obtained. See supplementary material A3 for a comparison of results using alternative weights.

Results: trends and cross-country comparative analysis

Intertemporal results by country [1996–2016]

This section presents the trends over time of illicit drugs policy by country. For each country, we start with a brief description of the most

[16] The variables regarding quantities' thresholds (10, 15 and 25) also have a 3 points scale, taking the value of '1' in the case that any quantity is an offence, the value of '0.5' if there is a quantity threshold and the value of '0' if it is never an offence or when only administrative procedures are applicable (in the case of variable 10).

[17] In most countries, the laws that were in force in 1996 had been approved prior to that date.

[18] Similarly, each subindex score is the simple average of its variables.

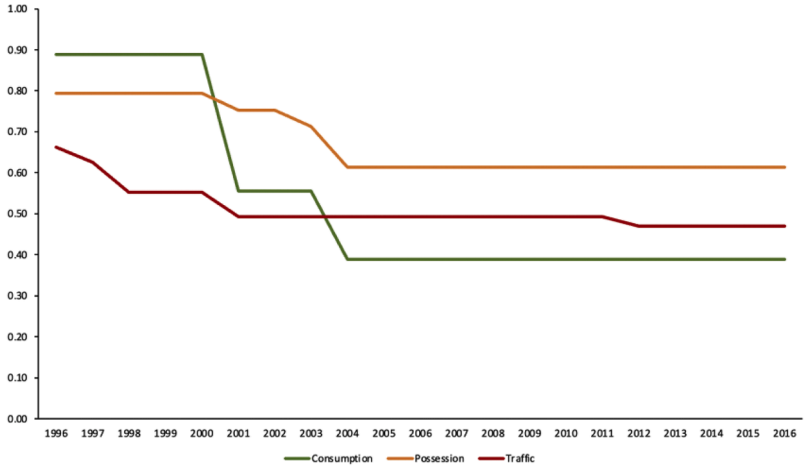

Fig. 13. Consumption, possession and traffic of cannabis in Canada: 1996–2016.

relevant legislative milestones; then we present a comparative analysis of the trajectory of the indexes, starting with the trends in consumption, possession and traffic of cannabis, followed by the trends of the same indexes for other drugs. See supplementary material A1 for the coding template and Appendix A3 for the detailed coding by country and type of drugs.

Portugal

In Portugal, the most relevant drug legislation is Decree-Law no. 15/93, and subsequent amendments. This Decree-Law, which is still in force, instituted the distinction between drug traffic and drug consumption, as it imposed heavy sanctions on traffic, but established lighter sanctions for consumption, which involved the possibilities of dismissal and discharge.

An important milestone of the Portuguese illicit drug policy was the Parliament's majority decision to decriminalize illicit drug possession and consumption, in 2000 (Law no. 30/2000). This decision, which was not restricted to cannabis, but instead covered all illicit drugs, has been presented as a flagship of the Portuguese drug policy, and examined in a number of studies over the last decade (e.g., Greenwald, 2009; Hughes & Stevens, 2010; Gonçalves et al., 2015; Cabral, 2017).

The main Portuguese legal sources for codification of consumption, possession and traffic were those published in 'Diário da República',[19] as well as legal information published in the Portugal Country Drug Reports published by EUDA from 2000 to 2020. The Portuguese national focal point that reports data to EUDA is the Institute on Addictive Behaviors and Dependencies (ICAD) of the Ministry of Health. We also consulted Hughes (2017).

Fig. 1 reports the evolution of three indexes – Consumption (1), Possession (2) and Traffic (3) – of cannabis over the last two decades in Portugal. We can clearly see a change in 2001 from a more criminal-oriented policy to a more health-oriented one.

From 1993 to 2000, the maximum penalty for consumption and possession of small quantities was imprisonment for up to 3 months, both for dependent and non-dependent individuals (Decree-Law no. 15/93). After July 2001, when Law no. 30/2000 entered into force, the maximum consequence for consumption and possession differentiated between non-drug-dependent individuals, who received a provisional suspension of proceedings if they had no prior records, or a monetary fine if it was a repeated offence, and drug-dependent individuals, who were at most sentenced with non-pecuniary penalties. Since 1993, alternatives to a penalty included referral into treatment or the exemption from sanction for occasional consumers. Until 2016, there were no allowances for therapeutical/medicinal cannabis.

Fig. 1 shows how our indexes capture the observed drug policy evolution of consumption and possession of cannabis in Portugal. The value of the index "Consumption Cannabis" (1C) changed from 0.51 between 1993–2000 to 0.42 after 2001 and the value of the index "Possession Cannabis" (2C) changed from 0.45 to 0.27 after 2001.

The year of 2001 – with the associated legislative landmark discussed above– was the only clear-cut turning point affecting these two drug policy dimensions. This legislative landmark did not affect traffic, as the laws around cultivation, production and distribution were not altered since 1993. The index "Traffic Cannabis" takes the value of 0.52 from 1993 to 2016. This score is the average of the scores of the subindexes Cultivation, Production and Distribution. Regarding cultivation, there are no allowances on the detention threshold and the maximum consequence for cultivation of small quantities is imprisonment for less than one year. There are allowances for public and private corporate cultivation and export of cannabis. Regarding production of cannabis, there are no allowances for individual production, but legal permits can be emitted for production of cannabis related products. Regarding distribution of cannabis, the Portuguese drug policy takes a criminal-oriented approach with regard to the detention threshold and consequences for supply, but alleviates the penalties when the quantities involved are small or when individuals are drug-dependent.

Fig. 2 reports a similar evolution of the laws around Consumption (1), Possession (2) and Traffic (3) of other drugs. Portugal scored around 0.27 in Consumption and 0.44 in Possession from 1993 to 2000 decreasing to 0.13 and 0.26, respectively, in 2001. The Traffic index takes the value of 0.52 from 1993 to 2016.

Italy

In Italy, the consolidated Law no. 162/1990, adopted by Presidential Decree no. 309/1990, and subsequently amended, provides the legal framework for consumption, possession, cultivation, production, distribution and trade, import and export of psychoactive substances.

In 1993 there was a referendum, which resulted in the abolition of art. 72 of Law no. 162/90 (the 'manifesto norm'). Possession for personal consumption was decriminalized regardless of quantity and the penalty became an administrative sanction. The difference between 'drugs under stricter control' and 'drugs under less strict control' was abolished in art. 73 of Law no. 162/90. As there was no quantity threshold to determine whether possession was for personal use only, this was to be decided by judges in a court of law.

[19] https://diariodarepublica.pt/dr/home.

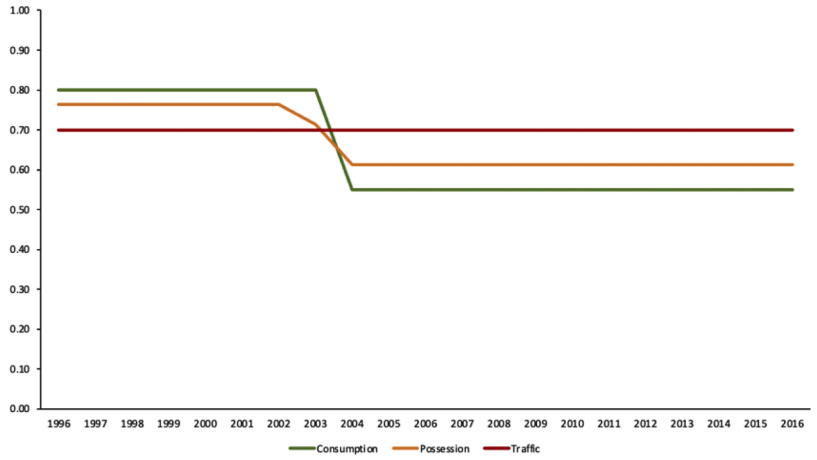

Fig. 14. Consumption, possession and traffic of other drugs in Canada: 1996–2016.

The main Italian legal sources were those published in Normattiva,[20] as well as legal information published in Italy's Country Drug Reports published by EUDA from 2000 to 2020. The Italian national focal point that reports data to EUDA is the Department for Anti-Drug Policies, set up at the Presidency of the Council of Ministers. We also consulted scientific sources, such as Zaami et al. (2018) and Zuffa (2017).

Fig. 3 presents the evolution of the Consumption, Possession and Traffic of cannabis indexes in Italy, where clear turning points may be observed.

In 2006, with the implementation of Law no. 49/2006, also known as law "Fini-Giovanardi", cannabis was upgraded to Schedule I (i.e., drugs under stricter control); art. 73 provided the same criminal penalties for possession, cultivation, production and distribution regardless of the type of drug, and quantities' thresholds were implemented. Penalties were aggravated, even for offences previously considered as less severe.

In 2014, the Italian Constitutional Court declared Law no. 49/2006 unconstitutional, thus effectively reverting to the previous legislation. A distinction was made between less harmful drugs in Schedules II and IV and more harmful drugs in Schedules I and III.

The index score for Possession was 0.34 between 1996 and 2005 and increased to 0.66 in 2006. From 2007 to 2013 the index decreased slightly to 0.62 due to medicinal cannabis allowances and in 2014 the index decreased to 0.25. In 2016 the index decreased to 0.21 due to place allowances, such as cannabis shops. The approval of Law no. 242/2016 dictated that hemp products with low levels of THC, the main psychoactive component in cannabis, should not be considered as intoxicants. The law was originally conceived to encourage the cultivation of the plant for industrial purposes (e.g., fiber for textile use), but it resulted in the emergence of a new 'light cannabis' industry, based on the commercial sale of hemp flowers, resins and oils, but also biscuits, shampoos and a whole range of novelty products.

Regarding Consumption, we can observe the same turning points in 2006 and 2014, as the shifts corresponded to the same legal changes. We can also observe a clear shift in 2007, associated with doctors being allowed to prescribe cannabis-based medicines. Therefore, from 1996 to 2005 the index was 0.6, increasing to 0.7 in 2006. In 2007 the index decreased to 0.36 due to the above mentioned medicinal cannabis allowances and in 2014 it decreased to 0.24.

In what concerns Traffic, the observed changes were mostly due to allowances for distribution of low THC level products in 1999 (index decreases to 0.51), allowances for therapeutic cannabis cultivation in 2013 (index decreases to 0.47) and production and commercial allowances for 'light cannabis' in 2016 (index decreases to 0.24).

Fig. 4 reports the same turning points for Consumption (1) and Possession (2) in what concerns other drugs. Note that the turning points for other drugs are associated with the main drug law changes, as allowances for medicinal cannabis or THC levels are not considered. The consumption and possession indexes were around 0.38 and 0.33 in 1996, respectively, and increased to 0.58 and 0.68 in 2006, respectively. In 2014 the indexes reverted to the previous values (1993–2005) of 0.38 in the case of consumption and of 0.33 in the case of possession. In what regards traffic, there were no changes, with an index of 0.54 between 1996 and 2016.

France

In France, the main legal landmark is Law no. 70–1320, published in 1970. Originally written into the Public Health Code (corresponding, since 2000, to article L3421–1), it established the penalties regarding production, transport, import, export, detention, offer, disposal, acquisition and use of drugs. In 1994 it was integrated into the new Penal Code, which established the penalties regarding drug related offenses, except those related to drug use, which are still sanctioned in the Public Health Code. The French Penal Code does not distinguish between illicit substances; however, judicial authorities may take into consideration the nature and quantity of the substance and any prior criminal records when sentencing penalties. Therapeutic injunction (a court-ordered treatment program) may be applied in substitution or complement to drug use penalties, which are up to 1 year in prison for drug use, and up to five years imprisonment in the case of supply for personal use. Nonetheless, stronger penalties apply if a public authority while on duty commits the offense.

On 17 June 1999, the Ministry of Justice issued a guideline for public prosecutors to reserve prison sentences for extreme cases, and prioritize health alternatives to prosecution, such as court-ordered treatments, among other diversion measures. Since 2007, a drug awareness course may also be proposed by the public prosecutor to a non-dependent offender as an alternative to prosecution or simplified procedure. This course is done at the expense of the offender and may cost up to 450 euros.

The main French legal sources were those published in Légifrance,[21] as well as legal information published in the French Country Drug Reports published by EUDA from 2000 to 2020. The French national focal point that reports data to EUDA is the French Monitoring Centre for

[20] https://www.normattiva.it/.

[21] https://www.legifrance.gouv.fr/.

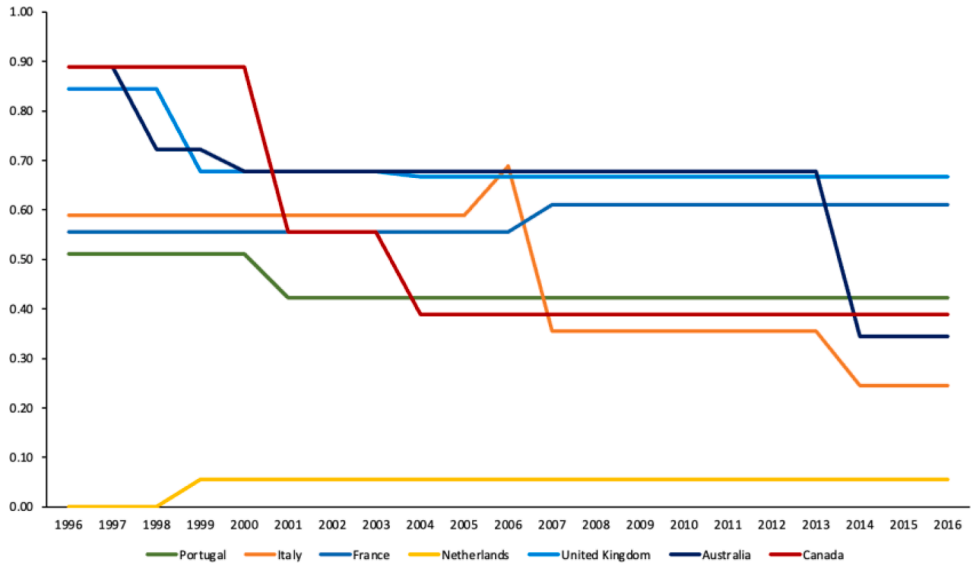

Fig. 15. Consumption of cannabis: 1996–2016.

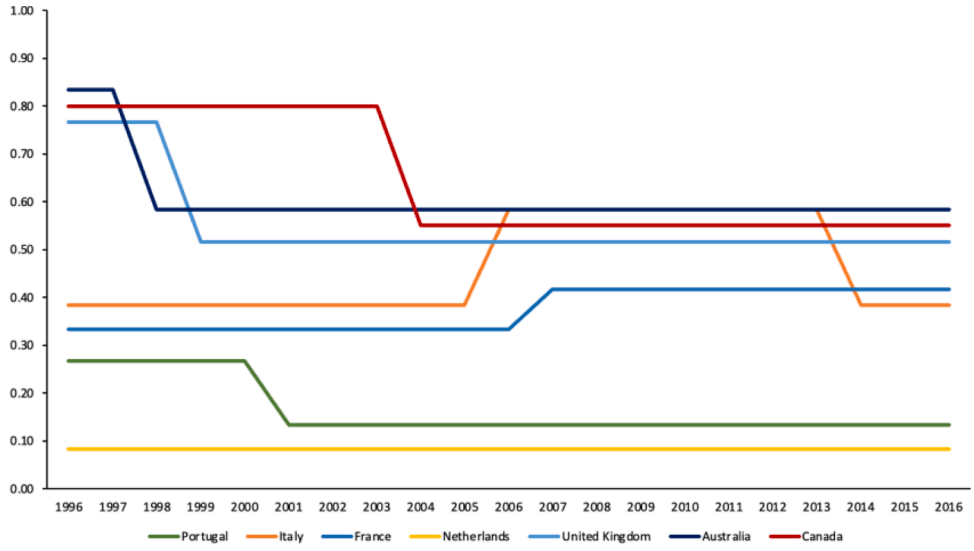

Fig. 16. Consumption of other drugs: 1996–2016.

Drugs and Drug Addiction (Observatoire Français des Drogues et des Tendances Addictives, OFDT). We also consulted Obradovic (2017).

Figs. 5 and 6 show that French laws did not suffer many changes in the period 1996–2016 in terms of consumption, possession, and traffic of cannabis or other drugs. But we can observe a turning point in consumption to a more criminal-oriented policy in 2007, due to an increase in penalties for illicit drug consumption in specific occupations/professions.

The maximum penalty for Consumption or Possession of small quantities of cannabis or other drugs is higher than 3 months and there are no allowances for medicinal cannabis. On the other hand, there is the possibility of exemption of sanction if treatment or community work is recommended.

The Possession index (cannabis or other drugs) is around 0.6 between 1996 and 2015, decreasing to around 0.55 in 2016 due to the establishment of provisions for drug consumption rooms. In 1996 the Consumption index was 0.56 for cannabis and 0.33 for other drugs, increasing in 2007 to 0.61 for cannabis and to 0.42 for other drugs. The index score for Traffic of cannabis is 0.54 and for traffic of other drugs is 0.57, with no changes through the years in analysis.

The Netherlands

The Netherlands Opium Act, which came into force in 1919, rectified in 1928 to introduce cannabis legislation, and fundamentally amended in 1976, is the basis for the current drug legislation. It defines drug possession, trafficking, cultivation, production and importing or exporting as criminal offenses. Nonetheless, the possession and sale of adult-use cannabis is tolerated under Dutch law for amounts that do not exceed 5 g of cannabis or 5 cannabis plants (UNODC, 2024).

The legal sources for the Netherlands were those published in Overheid.nl,[22] as well as legal information published in the Netherlands' Country Drug Reports published by EUDA from 2000 to 2020. The Netherlands national focal point that reports data to EUDA is the National Drug Monitoring and Policy Department of the Trimbos Institute.

[22] https://www.overheid.nl/.

We also consulted Korf (2019) and Grund and Breeksema (2017).

As we can observe in Fig. 7, the Netherlands has had a relatively lenient drug policy in relation to cannabis consumption and possession. In both these dimensions, we observe an increase in the respective index scores in 1999, as the laws associated with consumption in coffee shops[23] were tightened up, and a prohibition was introduced for possession in designated areas. The Damocles article, in 1999, amended the Opium Act by expanding municipal powers regarding coffee shops, and permitting local mayors to close such places if they contravene local coffee shop rules, even if no nuisance is being caused. Therefore, in the Netherlands, drug use by individuals aged 18 or older is not a criminal offense. However, to prevent nuisance, maintain public order, or protect the health of young people, municipal authorities may enact bylaws that prohibit drug use in specific areas, such as schools and public transport. Using drugs like cannabis in these designated areas can result in arrest or payment of a fine. It is the responsibility of local authorities, not the national government, to regulate this. Moreover, until 2000, medicinal cannabis regulation was similar to that of cannabis. As such, the index score for Consumption of cannabis started at "0″ in 1996 and increased to 0.06 from 1999 onwards.

The Possession index increased between 1996 and 2000 (0.38 in 1996–1998 and 0.45 in 1999–2000), as the legislation contemplated quantities' thresholds, place restrictions and place allowances (coffee shops); there was no consideration to recidivism; and allowances for medical cannabis were only regulated in 2001. The maximum consequence for possession of small quantities was a provisional suspension of proceedings: according to prosecutor guidelines, possession of cannabis products up to 5 g would in principle incur a police dismissal, and the offence would remain not prosecuted if it referred to possession for personal use of cannabis products up to 30 g.[24] Moreover, there was exemption of sanctions since at least 1994. In 2001 the Possession index decreased to 0.41 due to specific allowances for medicinal cannabis. In 2012, the Opium Act Directive was revised to leave open the possibility of arresting and prosecuting individuals in possession of less than 5 g of cannabis under certain circumstances, and, as such, the index increased to 0.43. There were no more changes until 2016.

Regarding traffic, there were slight changes, mostly due to allowances for therapeutic cannabis cultivation and exportation in 2001. Since 1 January 2001, the BMC (Office of Medicinal Cannabis) is the government office responsible for the production of cannabis for medical and scientific purposes. The BMC has a monopoly on supplying medicinal cannabis to pharmacies, and on its import and export. The Traffic index was 0.42 from 1996 to 2000, but from 2001 to 2003 the index decreased to 0.32. In 2004, the index decreased further as drug dependence could be considered. In 2014, the preparation or facilitation of cannabis cultivation was criminalised under a new article of the Opium Act. This article was specifically intended as a legal instrument against so-called growshops, as they not only sold seeds to grow marijuana for personal use, but played a crucial role as 'facilitators' in commercial indoor cannabis cultivation, by selling all kinds of equipment for cultivation sites (e.g., hightech lamps). As such, the index increased in 2014 to 0.32.

In what concerns other drugs, we can observe in Fig. 8 that the legal framework was fairly stable in the period 1996–2016. Drug consumption did not constitute a crime; however, there were place restrictions, such as schools, which led to an index score of 0.08 from 1996 to 2016. In 1997, treatment was introduced as an alternative to penalty, decreasing the Possession index from 0.61 in 1996 to 0.51 from 1997 onwards. Regarding Traffic, the index is around 0.75, with a slight decrease in 2004 as drug dependence could be considered.

United kingdom

In the United Kingdom, the Misuse of Drugs Act 1971 regulates the possession, supply and production of psychoactive substances that are considered dangerous or otherwise harmful when misused, and sets maximum criminal penalties for each offence. Although there is no indication of drug use per se constituting a crime, it is unlawful to possess any quantity of a controlled drug, unless the individual is in possession of an authorisation in the form of a license (for example a prescription), or the person can prove unawareness that the substance was a controlled drug. We therefore assume that the legal framework applicable to consumption is the same as the one applied to possession. The Act divides substances into three classes (A, B and C) and sets maximum criminal penalties for illegal production, possession and supply in relation to each class. Cannabis is currently a Class B drug.

The legal sources in the case of the United Kingdom were those published in the legislative database,[25] as well as legal information from Crawford et al. (2017) and the United Kingdom's Country Drug Reports published by EUDA from 2000 to 2019.[26] The United Kingdom's national focal point on drugs is based at Public Health England. We also consulted Macgregor (2017).

As we can observe in Fig. 9, the first turning point for Consumption and Possession of cannabis was in 1999 and is related to the introduction of treatment as an alternative to penalty, decreasing the index score of Consumption and of Possession from 0.8 to 0.68 and to 0.72, respectively.

We can also observe a turning point in possession in 2004, which was related to the introduction of a first-time warning for possession of cannabis, unless there were aggravating factors, such as smoking in public view, decreasing the Consumption index to 0.67 and the Possession index to 0.56. The 2004 modification of the Misuse Act 1971 reclassified Cannabis as a Class C drug. However, the Home Office indicated that despite possession continuing to be defined as an arrestable offence, that consequence should only be exercised in certain circumstances. The ACPO Cannabis Enforcement Guidance 2003 indicated that the strategy was to seize the drug and issue a formal warning, and the arrest would only be used if the formal warning was not appropriate. A police officer could decide to arrest in the following situations: if a person was smoking cannabis in public view or was locally known to be repeatedly handled for possession of cannabis; if a person was in possession of cannabis under circumstances that were causing a locally identified policing problem; or if a person was in possession of cannabis inside or in the vicinity of premises frequented by young persons, e.g., schools, youth clubs, play areas. Up until 2018, medicinal cannabis was not regulated in the UK.

In 2009, cannabis was reclassified as a class B drug and the legal framework became similar to what it was prior to 2004. However, because cannabis warnings were kept, the index score did not change until 2016.

[23] The AHOJ-G criteria (Staatscourant, 1994) – Dutch coffee shop criteria. These were based on the informal house rules pioneered in Amsterdam and adopted by coffee shops around the country. These broadly formulated AHOJ-G criteria were enacted officially only in 1994 and left room for development of local policies by the 'local triangle'.A - No Advertising: no more than (very) low profile signposting of the facilityH - No Hard drugs: these may not be sold or held on the premisesO - No Nuisance (Overlast in Dutch): including traffic and parking, loitering, littering and noiseJ - No sales to under-aged customers (Jeugdigen) and no admittance of under-aged customers to coffee-shops. In 1997 the minimum age was set to 18.G - Transaction size is limited to 'personal use,' defined as 30 Grams per person per coffee shop per day. In 1997 Transaction size was lowered from 30 grams to 5 grams. Introduction of a limited trade stock of coffee shops - The maximum stock allowed is 500 grams per coffee shop.

[24] Opium Act, arts. 2C, 3C, 10(5), Opium Acts Directive, section "Investigation and prosecution".

[25] https://www.legislation.gov.uk/.

[26] From 1 January 2021, the UK ceased to be a member of the Reitox network of national focal points.

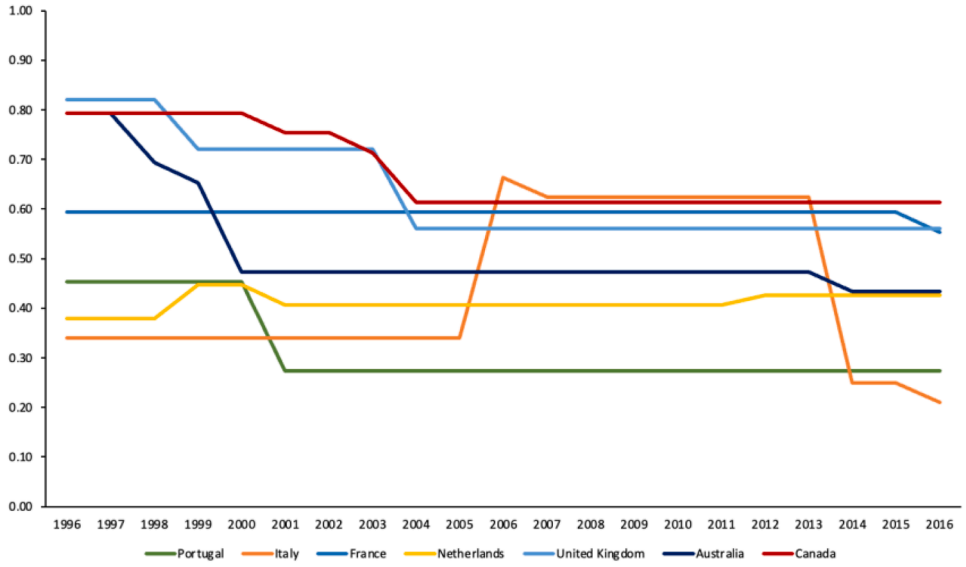

Fig. 17. Possession of cannabis: 1996–2016.

In regard to Traffic, not many changes were observed during the period under analysis. We can observe an increase from 0.66 to 0.68 in 2006, when trafficking near schools was considered an aggravating factor.

Fig. 10 reports a somewhat similar evolution of the Consumption (1), Possession (2) and Traffic (3) dimensions in what concerns other drugs, with a clear turning point in 1999 due to the introduction of treatment as an alternative to penalty. The index score for Consumption was 0.77 in 1996, decreasing to 0.52 in 1999. The index for Possession started at 0.74 in 1996, decreasing to 0.64 in 1999. In contrast to cannabis, no significant changes were observed since then. Regarding Traffic, the index was around 0.66, with slight increases in 1997 due to recidivism and in 2006 due to aggravating penalties if traffic was near schools.

Australia

In Australia, there are national and state laws (the latter within guidelines set at the national level). In this paper, we follow the national laws, whenever they are common to all states, and New South Wales (NSW) laws otherwise. We regard this to be a representative state. Drug policies vary across Australia, especially regarding cannabis. As such, it was necessary to choose one jurisdiction, and NSW is the most populous state. Shanahan and Ritter (2014) followed a similar approach.

The main Australian legal sources were those published in the Federal register of legislation of the Australian government.[27] Whenever the laws are at the state level, the legal sources for codification were those published in Legislation NSW of the NSW government.[28] We also consulted Hughes (2016), which provides a list of key events, policy and legislative changes that have occurred in Australia between 1985 and 2016. The events are listed by jurisdiction, at the federal and state/territory level. Additionally, we consulted Ritter et al. (2011); Shanahan and Ritter (2014); Graycar et al. (1999); NDARC (2017) and UNODC (2008).

In NSW, illicit drugs are regulated by the Drug Misuse and Trafficking Act 1985. It states that a person who has a prohibited drug in his or her possession is guilty of an offence; that a person who administers or attempts to administer a prohibited drug to himself or herself is guilty of an offence; and that the penalty for an offence under this division is a fine of 20 penalty units or imprisonment for a term of 2 years, or both.

We can observe in Fig. 11 that Australia had four main turning points in the direction of a less criminal-oriented drug policy regarding cannabis consumption and possession. The index score for Consumption started at 0.9 in 1996 and decreased to 0.72 in 1998 with the introduction of treatment as an alternative to punishment. The Drug Court Act 1998 introduced drug court diversion – NSW Drug Court (Young and Adult) – with programs that utilize an intensive regime involving drug treatment, case management, supervision and urine testing. In April 1999, the states, territories and Commonwealth agreed to a national commitment to provide diversion for illicit drug users (Council of Australian Governments, 1999). The agreement known as the Council of Australian Government-Illicit Drug Diversion Initiative (COAG-IDDI) was aimed at the diversion of minor drug users via both police and courts (Hughes & Ritter, 2008; Hughes, 2016). This national policy did not affect NSW, as it had already been implemented in that state.

In 2000, the index score decreased to 0.68 with the introduction of the Adult Cannabis Cautioning Scheme, where the police could, in a discretionary manner, let consumers go with caution if possession was of 15 g or less of cannabis and there were no previous convictions for violent offenses, or drug or sexual assault-related offenses. After recidivism, consumers had to attend a compulsory Alcohol and Drug Information Service (ADIS). We can observe another turning point in 2014, which is linked with allowances for therapeutic cannabis, decreasing the index to 0.34.

Possession of cannabis was affected by the same law changes. In 1998 the index decreased from 0.79 (in 1996) to 0.69, with the introduction of court diversion and in 1999 decreased to 0.65 reflecting changes in the law with the introduction of place allowances for possession in injection centers.[29] Drug Summit Legislative Response Act 1999 No 67 exempts from criminal offence users in injecting centers. In 2000 the Possession index decreased to 0.47 and in 2014 it decreased to 0.43 with allowances for therapeutic cannabis.

The Traffic index increased from 0.57 to 0.59 in 2006, reflecting changes related to aggravating penalties: selling, supplying, trafficking, manufacturing or cultivating prohibited drugs around children became a much more serious crime and attracted higher penalties. In 2008, the

[27] https://www.legislation.gov.au/.
[28] https://legislation.nsw.gov.au/.

[29] Although cannabis is not consumed as an injectable substance, the fact that an allowance for injecting centres exists, exempting from sanctions those that possess stricter controlled drugs as well as cannabis, is considered here.

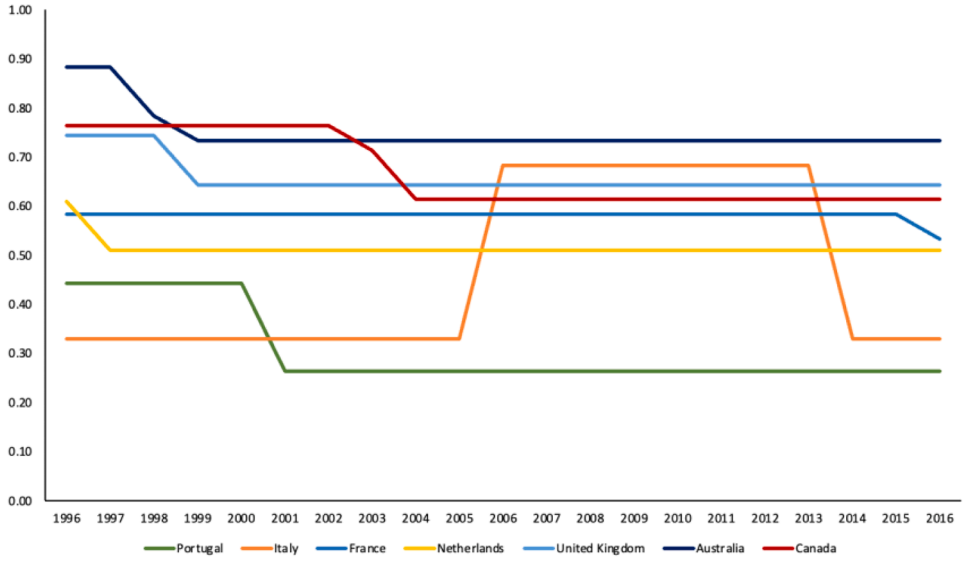

Fig. 18. Possession of other drugs: 1996–2016.

index decreased to 0.55 with the introduction of the Hemp Industry Act 2008, that amended the Drug Misuse and Trafficking Act 1985, authorising and regulating the cultivation and supply of low-THC hemp for commercial production and other legitimate uses. In 2016, the index decreased further to 0.46 due to legislation on medical cannabis. Although there had been allowances for medical cannabis in NSW since 2014, medical cannabis was only regulated nationwide in 2016 by the Narcotic Drugs Amendment Act 2016.

In what concerns other drugs, we can observe in Fig. 12 similar turning points in 1998, when treatment was introduced as an alternative to punishment – NSW Drug Court (Young and Adult) – and in 1999 with place allowances. The Consumption index decreased from 0.83 in 1996 to 0.58 from 1998 onwards, and the Possession index decreased from 0.88 in 1996 to 0.78 in 1998 and to 0.73 in 1999. The Traffic index increased from 0.57 in 1996 to 0.59 in 2006 due to the aggravating penalties of trafficking near children. No further significant changes were implemented since then.

Canada

The Controlled Drugs and Substances Act (CDSA) of 20 June 1996 classifies drugs into eight schedules, I to VIII. There are six common offences under it: possession, trafficking, cultivation, importing or exporting and "prescription shopping" (obtaining multiple prescriptions by visiting several doctors).

In Part I, regarding Offences and Punishment, it states that "Except as authorized under the regulations, no person shall possess a substance included in Schedule I, II or III. Punishment: If the offence is regarding a substance included in Schedule II (such as cannabis and its derivatives) in an amount that does not exceed the amount set out for that substance in Schedule VIII (30g of cannabis and 1g of cannabis resin) the individual is guilty of an offence punishable on summary conviction and liable to a fine not exceeding one thousand dollars or to imprisonment for a term not exceeding six months, or to both". The Controlled Drugs and Substances Act (S.C. 1996, c. 19) does not refer to consumption as a crime. However, in its interpretation (2) it refers to 'anything that contains or has on it a controlled substance and that is used or intended or designed for use: (A) in producing the substance, or (B) in introducing the substance into a human body.' This interpretation suggests that cannabis accessories containing cannabis became controlled and it is a crime of possession for personal use. Therefore, we classified consumption similarly to possession.

The Canadian laws around consumption, possession and traffic are at the national level and the main legal sources were the Canadian Justice Laws Website of the Canadian government.[30] We also consulted the Canadian Centre on Substance Use and Addiction annual report (2016-2017).

As we can observe in Fig. 13, during the period 2001–2004 we can clearly observe a shift in Canada towards a less criminal-oriented drug policy in what concerns consumption and possession of cannabis. The 2001 shift was related with allowances for therapeutic cannabis. The shift in 2003 was related to the approval of drug consumption rooms. The 2004 shift was associated with the introduction of treatment as an alternative to penalty. The index score of cannabis consumption was 0.89 in 1996, decreasing to 0.56 in 2001 and to 0.39 from 2004 to 2016. The index score of cannabis possession was 0.79 in 1996, decreasing to 0.75 in 2001, to 0.71 in 2003 and to 0.61 from 2004 to 2016.

In what concerns traffic, we can observe shifts that were related with permissions for non-individual cultivation, in 1998, and allowances for therapeutic cannabis cultivation, in 2001. In 2012, there was a decrease in the maximum penalty for cultivation of small quantities of cannabis plant. Therefore, the index for traffic was 0.66 in 1996, decreasing to 0.55 in 1998 and to 0.49 in 2001. From 2012 onwards the score was 0.47.

In what concerns other drugs, we can observe in Fig. 14 a key turning point in 2004 towards a less criminal-oriented drug policy for consumption and possession, which was related with the introduction of treatment as an alternative to penalty. The index for possession was 0.76 in 1996, decreasing to 0.71 in 2003 due to the approval of drug consumption rooms and decreased further in 2004 to 0.61. The Traffic index was 0.7 from 1996 to 2016.

Cross-country and cross-time results [1996–2016]

This section presents a cross-country comparative analysis by indexes and type of drugs, comparing the trajectory of illicit drug policy in the seven countries under analysis across time in the period 1996–2016.

[30] https://laws.justice.gc.ca/eng/.

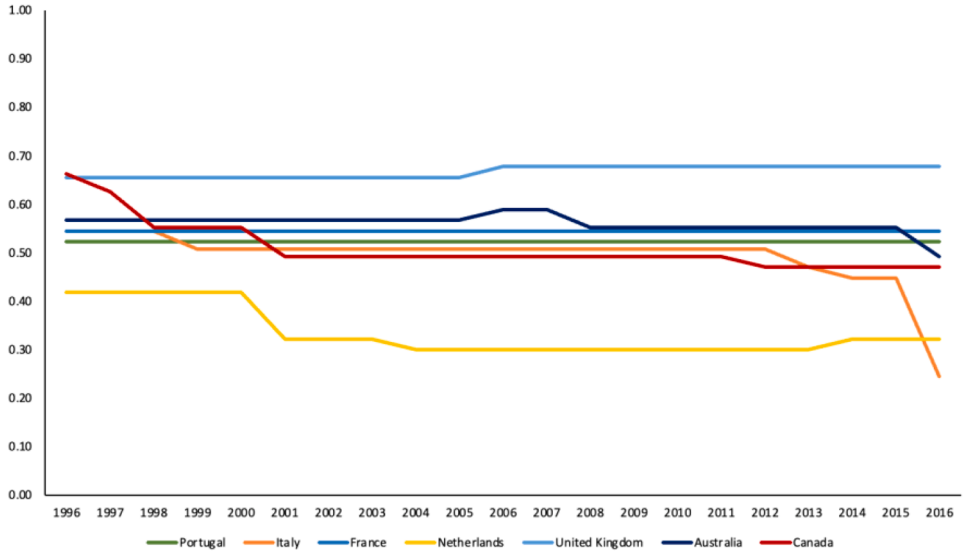

Fig. 19. Traffic of cannabis: 1996–2016.

Consumption

Cannabis

Fig. 15 reports the cross-country legal frameworks in what concerns cannabis consumption and the turning points from more to less criminal oriented policies or vice versa. We can observe that the Commonwealth countries (United Kingdom, Australia and Canada) had the more criminal oriented drug policies in 1996. France, Italy and Portugal were close to one another in 1996, with a 'balanced' (neither very strict or harsh regarding penalties, nor very lenient) drug policy towards drug consumption. At the time, the Netherlands had the less criminal-oriented drug policy.

As reported in the previous section, most countries show (different) turning points over time towards less criminal-oriented drug policies. The observed asymmetric pattern of evolution dictates that the relative position of each country has changed in the period under analysis. As we can observe in Fig. 15, in 2016, the country with stricter, criminal-oriented drug policies was the United Kingdom, followed by France. Portugal and Canada were grouped together slightly below an index score of 0.5, followed by Australia and Italy. In that year, the Netherlands was still the country with a more lenient drug policy towards consumption of cannabis.

Other drugs

Regarding other drugs, we can observe in Fig. 16 that the Commonwealth countries had the strictest drug policies related to consumption during the period under analysis, even though there were several turning points towards a less strict approach. Australia, Canada and United Kingdom had a score around 0.8 in 1996 and decreased it to an index score slight above 0.5 (0.58, 0.55 and 0.52 respectively). France and Italy were grouped together in 1996, with scores around 0.33 and 0.38, respectively. These countries had turning points towards a stricter approach in the years 2006 and 2007. France maintained this course of action, while Italy reversed this approach in 2014. In 2016 their scores were 0.42 and 0.38 respectively.

In the period, Portugal and the Netherlands were the countries with a more lenient approach towards the consumption of other drugs. While there were no changes in the Netherlands, with a score of 0.08 from 1996 to 2016, Portugal started with a score of 0.27 and decreased it to 0.13 in 2001.

Possession

Cannabis

In what concerns possession of cannabis, we can observe in Fig. 17, a broadly similar pattern of evolution of legal frameworks, with most countries displaying shifts towards less criminal-oriented drug policies. Italy is the exception, for which a period of more criminal-oriented policies can be observed between 2006 and 2014, as we noted in the previous section. In 1996 and in 2016, Italy had the lowest score of the seven countries in analysis, but during the stricter period 2006–2014 it had the highest score. France did not make many drug policy changes during the period in analysis, with a score of around 0.6 through the period 1996–2015, slightly decreasing it to 0.55 in 2016. The United Kingdom, Australia and Canada had a score around 0.8 and had different levels of changes through time. In 2016, Australia had the lowest score of the Commonwealth countries, 0.43, and Canada the highest score, 0.61. Portugal was, in 1996, the third more lenient country, with a score of 0.45, and in 2016 it was the second more lenient country, with a score of 0.27 – switching positions with the Netherlands.

Other drugs

Fig. 18 reports a similar pattern of evolution of the legal framework for possession of other drugs, with most countries displaying shifts towards more lenient drug policies. Australia was the country with the highest score in 1996 and in 2016, followed by Canada and the United Kingdom (scores in 1996: 0.88, 0.76 and 0.74; scores in 2016: 0.73, 0.61 and 0.64, respectively). France and the Netherlands presented a similar score in 1996 of around 0.6 and in 2016 of around 0.5, with the important difference that the Netherlands decreased the score in 1997 and France in 2016. Portugal was, in 1996, the country with the second lowest score and the country that presented the highest decrease, being, since 2001, the country with the lowest score of 0.26. In 1996, Italy was the country with the lowest score, 0.33, and presented the only turning point to stricter drug policies between 2006 and 2014, having, from 2014 onwards, the second lowest score regarding possession of other drugs.

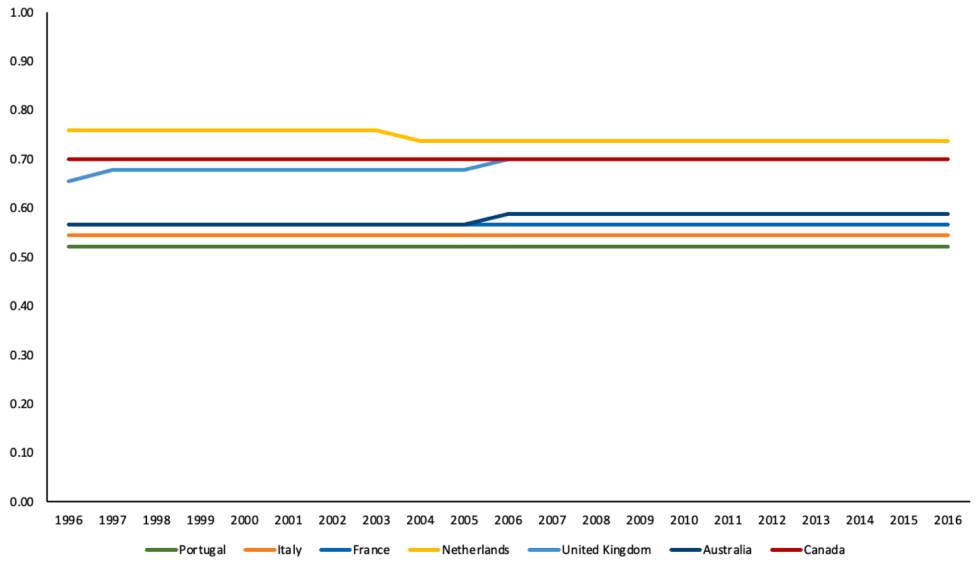

Fig. 20. Traffic of other drugs: 1996–2016.

Traffic

Cannabis

In relation to the traffic of cannabis, we can observe in Fig. 19 that the United Kingdom and Canada were, in 1996, the countries with the strictest approaches. After ten years, in 2016, the United Kingdom was still the country with the highest score for traffic of cannabis, while France, Portugal, Australia and Canada presented scores around 0.5. The Netherlands presented the less strict approach throughout the period in analysis. Until 2012 Italy presented similar scores to most countries, around 0.5, with a clear decreasing shift from 2013 onwards, due to medicinal and "light cannabis" allowances.

Over time, Canada, Italy and the Netherlands displayed the most pronounced shifts from a more to a less strict legal framework.

Other drugs

In relation to other drugs, we can observe in Fig. 20 that the Netherlands was the country with the strictest legal framework for traffic, followed by Canada and the United Kingdom.

Australia slightly increased its score, while France, Italy, and Portugal did not display changes over time, with scores slightly above 0.5. Note that, regarding other drugs, the differences between countries are smaller than for consumption and possession, positioning the countries closer to one another.

Conclusion

More than ten years ago, Alison Ritter claimed that "drug policy analysis whether concerned with monitoring progress over time, comparisons between regions or policy analysis that compares interventions all benefit from a common metric – an Index that quantifies, weighs and combines all the consequences of drug use into a single common metric. […] A transparent, well-documented Index that can be used to broadly compare countries or regions; monitor progress; direct resources; or compare policy options is a valuable step forward" (Ritter, 2009, pp. 478–479).

This paper reports the endeavor of building such a common metric. It describes the methodology involved in the construction of a set of indexes of illicit drugs policy (IDPI), based on the comparative law method leximetrics, which turns the law into numbers. The dataset is the result of the coding of drug laws in seven countries – Australia, Canada, France, Italy, Netherlands, Portugal and the United Kingdom – over the period 1996–2016. It allows for an intertemporal and cross-country quantitative analysis of drug laws and regulations, encompassing three dimensions regarding the laws around consumption, possession and traffic – with the latter including cultivation, production and distribution - for cannabis as well as for other strictly controlled drugs, such as cocaine, heroin and MDMA/ecstasy.

The indexes provide quantitative data on drug laws adopted by the seven countries and capture policy changes. We present trends of drug policies by country, showing the evolution of the three dimensions during the period 1996–2016 by type of drugs, as well as cross-country comparative analyses on the evolution of the seven countries for each of these dimensions.

We identify various turning points in each of the various drug laws dimensions over time. Typically (but not always), these turning points are in the direction of a less strict approach towards drug policy. Comparisons across countries show that these shifts were not uniform: some countries took larger steps than others in that direction, thus changing their relative position for each dimension of drug policy.

Strengths, limitations and avenues for future research

The development of the IDPI serves as an instrument to understand, in a quantitative way, how different countries evolved over time in each dimension of drug policy. In future research, the IDPI can be used to understand the extent to which such changes in drug laws result in tangible changes on social outcomes. In that case, care must be taken because there is a complex and not necessarily linear relationship between drug laws and observed behavior and, indeed, the causality may actually be reversed, with observed behavior affecting laws and policies, as suggested by Reinarman et al. (2004).[31] Moreover, as the coding template is constructed to account for the diversity of drug laws and policies of various countries, it can be adapted so as to encompass more countries.

It is important to stress that the leximetrics methodology deals solely with 'law in books'. However, drug policy is a complex field where 'law in action' may often be more relevant than 'law in books'. Analysing 'law in action' may require an altogether different methodology, possibly of a bottom-up nature and extensively involving experts, with on-the-ground experience with drug policy implementation. Such an

[31] We thank a referee for this observation.

approach would be extremely valuable and would complement the approach we have followed.

Moreover, we are fully aware that many of the methodological choices we have made are necessarily subjective – including the 'coding bounds' (criminal-oriented vs. health-oriented) – we have defined. As such, different researchers may arrive at different conclusions when applying this or other quantitative methods to 'measuring drug laws'. This can be seen as a limitation. But we believe this to be an important step towards quantitative measurement of drug laws and hope that our paper contributes to this line of research.

When looking at these dimensions of illicit drugs laws within a country, we are implicitly assuming a coherence that may not actually exist. Indeed, different national bureaucracies may be at the origin or in charge of implementing different features of drug laws.

Another limitation is that we have restricted our timeframe under analysis to 1996–2016, as well as to the seven countries analyzed. The main goal of this paper was methodological: to develop a leximetrics approach that could be used for measuring and comparing drug laws. Naturally, many relevant changes have occurred in the countries under analysis after 2016, and our leximetrics methodology is inevitably associated with the particular countries analyzed. Clearly, extending our timeframe to a more recent year and/or including other countries is a desirable and relevant effort that we wish to pursue in future research – and invite others to do so as well.

CRediT authorship contribution statement

Ricardo Gonçalves: Writing – review & editing, Supervision, Methodology, Investigation, Data curation. **Ana Lourenço:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Helia Marreiros:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

There is no conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.drugpo.2025.104750.

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