



Ministerio
de Industria,
Energía y Minería

Dirección Nacional
de la Propiedad Industrial



The economic contribution of IPR intensive industries in Uruguay



Financiado por la Unión Europea



EUIPO

EUROPEAN UNION
INTELLECTUAL PROPERTY OFFICE

The economic contribution of IPR-intensive industries in Uruguay

Industry-level Analysis Report

August 2021

Content

Content.....	2
Project Team.....	5
1. Foreword.....	6
2. About this study.....	8
3. Executive summary (EN)	10
3.1. Main findings	10
3.2. IPR-intensive industries in Uruguay.....	11
3.3. Methodology and data.....	15
4. Resumen Ejecutivo en Castellano.....	17
4.1. Principales hallazgos.....	17
4.2. Industrias intensivas en DPI en Uruguay.....	18
4.3. Metodología y datos.....	22
5. Introduction.....	25

5.1. IP rights and their function in the economy	30
5.1.1. Overview of patents.....	32
5.1.2. Overview of trade marks.....	34
5.1.3. Overview of designs	35
5.1.4. Overview of copyrights	36
5.1.5. Overview of geographical indications	38
5.1.6. Overview of plant variety rights	39
5.2. Summary of all IP rights	40
6. Methodology of the study	44
6.1. Data sources and selection criteria	46
6.1.1. Economic data.....	48
6.2. Data matching for patents, trade marks, designs, and plant variety rights	49
6.3. Definition of absolute and relative intensities	51
6.4. Identification of patent-intensive industries	52
6.4.1. Absolute intensity	52
6.4.2. Relative intensity	54
6.5. Identification of trade mark-intensive industries	54
6.5.1. Absolute intensity	55
6.5.2. Relative intensity	56
6.6. Identification of design-intensive industries.....	56
6.6.1. Absolute intensity	57
6.6.2. Relative intensity	58
6.7. Identification of copyright-intensive industries.....	58
6.8. Identification of geographical indications-intensive industries...	60
6.9. Identification of PVR-intensive industries.....	64
6.9.1. Absolute intensity	64
6.9.2. Relative intensity	65
6.10. Limitations of data and methodology.....	65
7. IPR-intensive industries in Uruguay	67
7.1. Patent-intensive industries	67
7.2. Trade mark-intensive industries.....	68

7.3. Design-intensive industries	69
7.4. Copyright-intensive industries	70
7.5. PVR-intensive industries	73
7.6. All IPR-intensive industries.....	74
8. Contribution of IPR-intensive industries to the Uruguayan economy	77
8.1. Contribution to employment, GDP, trade, and wages.....	77
8.1.1. Employment	77
8.1.2. GDP.....	78
8.1.3. International trade.....	80
8.1.4. Wages	82
8.1.5. The main IPR-intensive industries in Uruguay.....	83
9. Appendix: Patenting by resident status in Uruguay.....	86
10. Appendix: Methodology	94
10.1. Description of approximate string-matching algorithms.....	94
10.2. Assignment of IPR-intensive industries to service categories in international trade in services data.....	95
11. Appendix: Additional results	99
11.1. All IPR-intensive industries in Uruguay	99
11.2. Patent-intensive industries	107
11.3. Trade mark-intensive industries.....	108
11.4. Copyright-intensive industries	112
11.5. PVRs granted by industry	115
12. References	117

Project Team

This study was coordinated by the *IP Key LA Project* and was developed by Analytica Consultora (Reflexión S.R.L.). The project team included Ricardo Delgado (project coordinator), Ezequiel Tacsir, Bernardo Díaz de Astarloa and Rodolfo Barrere.

The research team wants to thank the National Directorate of Intellectual Property of Uruguay, Uruguay's National Library, and the Ministry of Labour and Social Security of Uruguay, which provided fundamental data inputs and assistance. We are grateful for helpful comments from IP Key LA Project, EUIPO and EUIPO on several versions of the Report.

The information and views set out in this Study are those of the author(s) and do not necessarily reflect the official opinion of the European Commission.

The European Commission does not guarantee the accuracy of the data included in this Study Neither the European Commission nor any person acting on the European Commission's behalf may be held responsible for the use which may be made of the information contained therein.

This study prepared by Analytica for the IPKey Latin America Project, Funded by the EU.

1. Foreword

Innovation is widely considered as indispensable for genuine long-term economic development. Entrepreneurship and innovative approaches towards the creation and delivery of goods and services allow for scientific, technological and creative activities to translate into more productive economic ones. Taking a historical perspective, since the Industrial Revolution, much of the rise in living standards are due to innovation.

Creativity is a distinctive human feature, and it is not surprising that innovative processes have always existed, on an individual or small scale, everywhere in the world. Moreover, when immersed in favourable environments, accompanied by adequate regulatory systems, innovation will extend and spread across the economy and benefit companies in different sectors and of various sizes. A sound intellectual property system is a crucial component of such a framework and is vital to realise the full benefits of innovation.

Intellectual property rights (IPRs) give the creator, the inventor, exclusive rights over the use of his/her creation for a certain period rewarding inventiveness, artistry and other forms of intellectual and entrepreneurial talent. They are essential for the economy since IPRs, such as patents, copyright, trade marks, designs, geographical indications and plant varieties, not only protect innovation in the productive processes, converting them into economic assets, but -by doing so- they also allow the commercialisation of products and services which embody creative breakthroughs.

But while IPRs are readily considered to play a fundamental role in the generation of wealth of companies and social welfare, as well as a crucial factor in determining competitiveness and national progress, so grows the importance of measuring its impact on economic indicators such as value added, employment and international trade since this allows to gain understanding and enrichen the discussion on IPRs contribution to the

economy. In other words, it is imperative that the debate on IPRs as a driver for the economy be based on sound evidence.

The European Union has been working with Uruguay for many years on intellectual property issues, supporting initiatives for an improved intellectual property system. The IP Key project and the study it has carried out with DNPI of the Ministry of Industry, Energy and Mining is a clear example of fruitful cooperation. The economic importance of having a sound intellectual property is evident and this study is conclusive: a protective legal framework for intellectual property contributes significantly to competitiveness, benefits the economy and employment, provides better wages and facilitates trade and investment. Like the European Union, Uruguay can help even more by promoting more significant registration and increased protection of intellectual property.

The study is part of a series of studies engaged in the EU and now extended to many countries of the region. It is hoped it will contribute to stimulate the interest of the public about the importance of intellectual property intellectual and favour the economic exchanges of technology and innovative goods and services between the European Union and Uruguay.

Ambassador Karl-Otto König

Head of the European Union Delegation in Uruguay

2. About this study

The objective of this study is to identify industries that use intellectual property rights (IPRs) intensively and to measure their economic contribution in Uruguay. It is designed to maximize comparability with recent efforts by the European Union Intellectual Property Office (EUIPO) and the European Patent Organisation (EPO) to quantify the importance of IPR-intensive industries in the European Union and other Latin American economies.

The study contributes to previous efforts by producing consistent and comparable estimates of IPR-intensive industries in Uruguay and their contribution to overall economic activity and employment. In particular, it is built upon the methodologies and structure of previous studies carried out by EPO and EUIPO (2019) for the EU and EU member states, EUIPO and IMPI (2021) for Mexico, and ongoing studies for Argentina, Chile, and Peru.

Whereas existing evidence about the contributions of innovation outputs to productivity or employment tend to be based on exploiting self-reported data from innovation surveys using econometric models, this study makes extensive use of administrative records about IPR applications. While the study aims to analyse industries that show an intensive use of various types of IPRs and how they contribute to the Uruguayan economy, it cannot be interpreted as a direct causal proof of IPRs leading to economic outcomes.

As in EPO and EUIPO (2019), the unit of analysis in this study is the industry or sector. The IPRs the study focuses on are patents, trade marks, and designs published by the National Directorate of Intellectual Property of Uruguay (DNPI), geographical indications, and plant variety rights registered in the National Registry of Cultivars of Uruguay during the 2014-2019 period. The economic variables considered are value added, employment, wages, exports, and imports for different periods, depending on the economic variable. For

employment, wages, and international trade indicators, data for the 2014-2019 period was used. For value added data, the period considered was 2014-2018.

Rather than making policy recommendations, which are outside the scope of this study, the analysis provides information about the extent and economic importance of IPR use among economic sectors in Uruguay, which could be helpful for policymakers or analysts involved in formulating policies for intellectual property protection.

The remainder of this report is organized as follows. Chapters 3 and 4 provide executive summaries and main findings and results in English and Spanish, respectively. Chapter 5 presents an overview of intellectual property rights, including their importance for economic growth and development and features of the different types of IPRs considered in this study. Chapter 6 presents the methodology used to identify IPR-intensive industries as well as the sources of data. Chapter 7 presents the main results regarding industries that intensively use IPRs, including by type of right. Chapter 8 measures the economic contribution of IPR-intensive industries in terms of employment, value added, international trade, and wages. Appendixes 9 to 11 contain further details about the methodology and complete lists of IPR-intensive industries.

3. Executive summary

3.1. Main findings

- There are 173 IPR-intensive industries in the Uruguayan economy. Approximately one-third of IPR-intensive industries are intensive in more than one IPR.
- IPR-intensive industries accounted for 35.9% of formal employment in Uruguay during the 2014-2019 period. On average, IPR-intensive industries employed 352,999 people directly per year.
- During the same period, IPR-intensive industries contributed with 48.9% of GDP, worth UY\$ 788,726 million. In terms of international trade flows in goods, these industries represented 44% of exports and 53.8% of imports, generating a trade deficit of about US\$ 1,315 million. Trade in services, audio-visual services, personal and cultural services, technical retail, and other business services were the categories with more IPR-intensive industries.
- Wages in all IPR-intensive industries were higher than in other industries, with a wage premium of 34%. Plant-variety rights-intensive industries showed the highest premium, at 200%. This is consistent with the fact that value added per worker is higher in IPR-intensive industries than in other industries.
- A salient feature of IPR filing in Uruguay is that the share of resident applicants is significantly low. Only around 3% of patent applications and 10% of design applications were made by residents in 2014-2019.

3.2. IPR-intensive industries in Uruguay

The IPRs covered in this study are patents, trade marks, designs, copyrights, geographical indications (GI), and plant variety rights (PVR). IPR-intensive industries are defined as those showing an above-average number of filings of IPRs per employee compared with other IPR-using industries.¹ This means that an industry is identified as IPR-intensive in Uruguay if -for at least one of the IP rights under consideration- the number of IPRs per employee exceeds the employment-weighted average of IPRs per employee of all industries making use of that same IP right. IPR-intensive industries in Uruguay are concentrated in manufacturing, retail and wholesale activities, and services sectors, as shown in Chapter 6. Although most IPR-intensive industries in Uruguay use only one IP right intensively, about one third combine two or more IP rights.

The contribution of IPR-intensive industries to two main economic indicators - employment and output - is summarised in Table 5 and Table 2. To minimise the impact of data gaps in the statistics and to avoid attaching undue importance to a particular year, the economic indicators were calculated as an average for the years 2014-2019.

As shown in Table 1, on average, 35.9% of all formal employees in Uruguay were employed in IPR-intensive industries in the 2014-2019 period.

¹ Due to data limitations, we cannot distinguish between IPRs that were applied for and IPRs that were subsequently granted.

Table 1: Direct contribution of IPR-intensive industries to formal employment, 2014-2019

IPR-intensive industries	Employment (direct)	Share of total employment (direct)
Copyright-intensive	65,757	6.7%
Design-intensive	8,022	0.8%
Geographical indication-intensive	1,279	0.1%
Patent-intensive	116,253	11.8%
Plant variety rights-intensive	22,815	2.3%
Trade mark-intensive	268,983	27.4%
All IPR-intensive	352,999	35.9%
Total formal employment in Uruguay	982,948	

Notes: Due to overlapping use of IP rights, the sum of the shares of the individual IPRs exceeds the total share of IPR-intensive industries.

This percentage is comparable to the 29.2% contribution of IPR-intensive industries to employment in the EU for the 2014-2016 period (EPO and EUIPO, 2019). More than 350,000 formal employees worked in IPR-intensive industries in Uruguay per year, on average, in 2014-2019. Trade mark-intensive industries contributed the most to employment, with 27.4% of employees, followed by patent-intensive industries (11.8%) and PVR-intensive industries (2.3%). Design-intensive and GI-intensive industries contributed with less than 1%.

In terms of output, measured by gross domestic product (GDP), IPR-intensive industries generated almost 50% of GDP in Uruguay in the 2014-2019 period (Table 2). This is similar to the contribution of IPR-intensive industries to GDP in the EU for 2014-2016 (44.8%). Trade mark-intensive industries accounted for 43.4%, patent-intensive industries 22.8%, copyright-intensive industries 4.3%, PVR-intensive 2.3%, design-intensive industries 0.6% and GI-intensive industries 0.1%.

Table 2: Contribution of IPR-intensive industries to GDP, 2014-2019 average

IPR-intensive industries	Value-added (UY\$ million)	Share of total GDP
Copyright-intensive	69,668.7	4.3%
Design-intensive	9,604.9	0.6%
Geographical indication-intensive	1,840.3	0.1%
Patent-intensive	368,110.3	22.8%
Plant variety rights-intensive	37,543.0	2.3%
Trade mark-intensive	698,128.1	43.3%
All IPR-intensive	788,726.3	48.9%
Total GDP	1,611,666.9	

Notes: Due to overlapping use of IP rights, the sum of the shares of the individual IPRs exceeds the total share of IPR-intensive industries.

The contributions of IPR-intensive industries to employment and GDP imply that value-added per worker was higher in IPR-intensive industries than in other industries over the period under study. In theory, then, IPR-intensive industries should show a wage premium compared to other non-IPR-intensive industries. Table 3 confirms, IPR-intensive industries paid their employees 34% higher wages than other industries, but 13 percentage points lower than what EPO and EUIPO found for the EU (2019). While the average wage in IPR-intensive industries was UY\$ 39,532, the average salary in non-IPR-intensive industries was UY\$ 29,498. All IPR-intensive industries showed a wage premium. The wage premium was higher in PVR-intensive industries (200%), followed by patent-intensive industries (41%), trade mark-intensive industries (35%), design-intensive industries (31%), GI-intensive industries (25%), and copyright-intensive industries (22%).

Table 3: Average wages in IPR-intensive industries, 2014-2019

IPR-intensive industries	Average wage (UY\$ per month)	Premium (compared to non-IPR-intensive industries)
Copyright-intensive	35,848	22%
Design-intensive	38,565	31%
Geographical indication-intensive	36,936	25%
Patent-intensive	41,492	41%
Plant variety rights-intensive	88,433	200%
Trade mark-intensive	39,881	35%
All IPR-intensive	39,532	34%
Non-IPR-intensive	29,498	
All industries	33,102	

Chapter 7 includes an analysis of the contribution of IPR-intensive industries to international trade in goods and services. As shown in Table 4, during 2014-2019, IPR-intensive industries in Uruguay accounted for 44% and 53.8% of exports and imports of goods, respectively, generating a trade deficit of roughly US\$ 1,315 million. Regarding international trade in services, IPR-intensive industries accounted for 74.6% and 50.7% of exports and imports of services, respectively.

Table 4: International trade in goods in IPR-intensive industries, 2014-2019

IPR-intensive industries	Exports (US\$)	Share of total exports	Imports (US\$)	Share of total imports
Copyright-intensive	23,011,258	0.3%	263,158,917	3.0%
Design-intensive	300,811,165	3.8%	497,469,121	5.6%
Geographical indication-intensive	11,730,206	0.1%	90,927,658	1.0%
Patent-intensive	318,494,755	4.0%	1,245,847,355	14.0%
Plant variety rights-intensive	553,816,871	7.0%	358,451,699	4.0%
Trade mark-intensive	3,189,225,498	40.4%	4,024,562,680	45.2%

All IPR-intensive	3,473,685,710	44.0%	4,788,365,346	53.8%
Total for Uruguay	7,901,689,614		8,895,034,419	

Notes: Due to overlapping use of IP rights, the sum of the shares of the individual IPRs exceeds the total share of IPR-intensive industries.

3.3. Methodology and data

The methodology to identify IPR-intensive industries and estimate their contribution to the Uruguayan economy used in this study follows EPO and EUIPO (2019) as closely as possible to achieve maximum comparability. Its principles are essentially the same: first, determine IPR use across industries and identify those industries that use IPR more intensively; second, use industry-level economic data to characterize IPR-intensive industries in terms of employment, wages, value added (GDP), and international trade; third, compare industry-level aggregates to the overall economy to estimate the weight of IPR-intensive industries in the economy. Chapter 6 includes a detailed description of the methodology and sources of data used in this study.

A wide variety of databases and other data sources were used to determine which industries are IPR-intensive and to assess the contribution of these industries to employment, GDP and other economic indicators. To decide which industries are IPR-intensive, IPR register databases of LATIPAT (by the EPO), the National Directorate of Industrial Property of Uruguay (DNPI), and the National Register of Cultivars (RNC) of Uruguay's National Institute of Seeds (INASE) were matched with a business register constructed combining registers from Uruguay's Social Security Bank (BPS), provided by the Ministry of Labour and Social Security (MTSS), and registers publicly available from Uruguay's National Institute of Statistics (INE). The business register provides information on businesses registered economic activity, which was used to calculate the number of trade marks, designs, patents and PVRs per employee for each industry. Industries with IPRs per employee above an employment-weighted average among industries with IPR were considered to be IPR-intensive.

We used a string-matching algorithm to perform the match between IPR registers and the business register as well as manual revision to improve the fraction of registers that could be matched. Depending on the type of IPR, between 62% and 99% of IPRs filed by Uruguayan residents were matched with information of their owners and assigned to an economic activity.

A relevant feature about IPR applications in Uruguay is that they are predominantly made by foreign residents: only around 3% of patent applications were made by residents in 2014-2019, and only 10% of design applications were made by residents.

This low fraction is not specific to the period under study but a general characteristic of patenting activity in Uruguay. The average fraction of patents filed by residents in the last 20 years in Uruguay is 4.8%, as reported by RICYT². Appendix 9 includes a discussion about the methodological challenges implied by this feature and compares patenting behaviour between residents and non-residents in Uruguay.

² RICYT collects comparable science, technology and innovation indicators, including patent applications and patents granted by the country of residence of the applicant for Latin America and the Caribbean. See www.ricyt.org.

4. Resumen Ejecutivo en Castellano

4.1. Principales hallazgos

- Existen 173 industrias intensivas en derechos de propiedad intelectual (DPI) en Uruguay. Aproximadamente un tercio de las industrias intensivas en DPI son intensivas en más de un DPI.
- Las industrias intensivas en DPI representaron el 35,9% del empleo formal en Uruguay durante el período 2014-2019. En promedio, las industrias intensivas en DPI empleaban directamente a 352.999 personas al año.
- Durante el mismo período, las industrias intensivas en DPI contribuyeron con el 48,9% del PIB, por un valor de UY\$ 788.726 millones. En términos de los flujos comerciales internacionales de bienes, estas industrias representaron el 44% de las exportaciones y el 53,8% de las importaciones, generando un déficit comercial de alrededor de US\$ 1.315 millones. El comercio de servicios, los servicios audiovisuales, los servicios personales y culturales, y otros servicios empresariales fueron las categorías con industrias más intensivas en DPI.
- Los salarios en las industrias intensivas en DPI eran más altos que en otras industrias, con una prima salarial del 34%. Las industrias intensivas en variedades vegetales mostraron la prima más alta, con un 200%. Esto es coherente con el hecho de que el valor agregado por trabajador es mayor en las industrias intensivas en DPI que en el resto de las industrias.
- Una característica saliente de Uruguay es la baja proporción de solicitudes de DPI por parte de solicitantes que son residentes. Solo alrededor del 3% de las solicitudes de patentes y el 10% de las solicitudes de diseños fueron realizadas por residentes en 2014-2019.

4.2. Industrias intensivas en DPI en Uruguay

Este estudio cubre el análisis de una variedad de DPI: patentes, marcas registradas, diseños, derechos de autor, indicaciones geográficas (IG) y derechos de variedades vegetales (PVR). Las industrias intensivas en DPI se definen como aquellas industrias que muestran un número superior a un promedio ponderado de solicitudes de DPI por empleado en comparación con las otras industrias que utilizan DPI³. Esto significa que una industria se identifica como intensiva en DPI en Uruguay si, para al menos uno de los derechos de propiedad intelectual en consideración, el número de DPI por empleado excede el promedio ponderado por empleo de DPI por empleado de todas las industrias que hacen uso de ese mismo derecho de propiedad intelectual. Las industrias intensivas en DPI en Uruguay se concentran en las actividades manufactureras, actividades de comercio minorista y mayorista, y en los sectores de servicios, como se muestra en el Capítulo 7. Aunque la mayoría de las industrias intensivas en DPI en Uruguay usan solo un derecho de propiedad intelectual de manera intensiva, alrededor de un tercio combina dos o más Derechos de propiedad intelectual.

La contribución de las industrias intensivas en DPI a dos indicadores económicos principales, el empleo y la producción, se resume en las Tablas 1 y 2. Para minimizar el impacto de la falta de datos en las estadísticas económicas y evitar otorgar una importancia indebida a un año en particular, los indicadores económicos fueron calculados como el promedio para el período 2014-2019.

³ Debido a las limitaciones de los datos, no podemos distinguir entre los DPI solicitados y los DPI efectivamente concedidos.

Como se muestra en la Tabla 1, en promedio, el 35,9% de todos los empleados formales en Uruguay estaban empleados en industrias intensivas en DPI en el período 2014-2019. Este porcentaje es comparable a la contribución del 29,2% de las industrias intensivas en DPI al empleo en la UE durante el período 2014-2016 (EPO y EUIPO, 2019). Más de 350.000 empleados formales trabajaron en industrias intensivas en DPI en Uruguay por año, en promedio, en 2014-2019. Las industrias intensivas en marcas son las que más contribuyeron al empleo, con el 27,4% de los empleados, seguidas de las industrias intensivas en patentes (11,8%) y las industrias intensivas en PVR (2,3%). Las industrias intensivas en diseño e intensivas en IG contribuyeron con menos del 1%.

Tabla 1: Contribución de las industrias intensivas en DPI al empleo formal, 2014-2019

Industrias intensivas según DPI	Empleo (directo)	Proporción del empleo total (directo)
Intensivo en Derechos de Autor	65.757	6,7%
Intensivo en Diseños	8.022	0,8%
Intensivo en Indicaciones Geográficas	1.279	0,1%
Intensivo en Patentes	116.253	11,8%
Intensivo en Variedades Vegetales	22.815	2,3%
Intensivo en Marcas	268.983	27,4%
Todas las industrias intensivas en DPI	352.999	35,9%
Empleo formal total en Uruguay	982.948	

Nota: Dado el uso simultáneo de un DPI, la suma de las contribuciones individuales de cada derecho excede la contribución total de las industrias intensivas en DPI.

En términos de valor agregado, medido por el producto interno bruto (PIB), las industrias intensivas en DPI generaron casi el 50% del PIB en Uruguay en el período 2014-2019 (Tabla 2). Esto representa una proporción similar a la contribución de las industrias intensivas en DPI al PIB en la UE para el período 2014-2106 (44,8%). Las industrias intensivas en marcas representaron el 43,4%, las industrias intensivas en patentes el 22,8%, las industrias intensivas en derechos de autor el 4,3%, las industrias intensivas en PVR el 2,3%, las industrias intensivas en diseño el 0,6% y las industrias intensivas en IG 0,1%.

Tabla 2: Contribución de las industrias intensivas en DPI al PIB, promedio 2014-2019

Industrias intensivas en DPI	Valor agregado (millones de UY\$)	Proporción del PIB total
Intensivo en Derechos de Autor	69.668,7	4,3%
Intensivo en Diseños	9.604,9	0,6%
Intensivo en Indicaciones Geográficas	1.840,3	0,1%
Intensivo en Patentes	368.110,3	22,8%
Intensivo en Variedades Vegetales	37.543,0	2,3%
Intensivo en Marcas	698.128,1	43,3%
Todas las industrias intensivas en DPI	788.726,3	48,9%
PIB total de Uruguay	1.611.666,9	

Nota: Dado el uso simultáneo de un DPI, la suma de las contribuciones individuales de cada derecho excede la contribución total de las industrias intensivas en DPI.

Las contribuciones de las industrias intensivas en DPI al empleo y al PIB implican que el valor agregado por trabajador fue mayor en las industrias intensivas en DPI que en el resto de las industrias durante el período analizado. Es de esperar, entonces, que las industrias intensivas en DPI deberían mostrar una prima salarial en comparación con otras industrias no intensivas en DPI. De hecho, como muestra la Tabla 3, las industrias intensivas en DPI pagan a sus empleados salarios un 34% más altos que las otras industrias. Esta prima salarial es 13 puntos porcentuales menos que lo que EPO y EUIPO (2019) encontraron para la UE. Mientras que el salario promedio en las industrias intensivas en DPI fue de UY\$ 39.532, el salario promedio en las industrias no intensivas en DPI fue de UY\$ 29.498. Si bien todas las industrias intensivas en DPI mostraron una prima salarial, la prima salarial fue más alta en las industrias intensivas en PVR (200%). Luego se ubica la prima salarial en las industrias intensivas en patentes (41%), las industrias intensivas en marcas comerciales (35%), las industrias intensivas en diseño (31%), las industrias intensivas en IG (25%) e industrias intensivas en derechos de autor (22%).

Tabla 3: Salario promedio en las industrias intensivas en DPI, 2014-2019

Industrias intensivas según DPI	Salario promedio (UY\$ por mes)	Prima (comparada con industrias no intensivas en DPI)
Intensivo en Derechos de Autor	35.848	22%
Intensivo en Diseños	38.565	31%
Intensivo en Indicaciones Geográficas	36.936	25%
Intensivo en Patentes	41.492	41%
Intensivo en Variedades Vegetales	88.433	200%
Intensivo en Marcas	39.881	35%
Todas las industrias intensivas en DPI	39.532	34%
Industrias no intensivas en DPI	29.498	
Todas las industrias	33.102	

Nota: Dado el uso simultáneo de un DPI, la suma de las contribuciones individuales de cada derecho excede la contribución total de las industrias intensivas en DPI.

El Capítulo 77 incluye un análisis de la contribución de las industrias intensivas en DPI al comercio internacional de bienes y servicios. Como se muestra en la Tabla 4, durante 2014-2019, las industrias intensivas en DPI en Uruguay representaron el 44% y el 53,8% de las exportaciones e importaciones de bienes, respectivamente, generando un déficit comercial de aproximadamente US\$ 1.315 millones. En cuanto al comercio internacional de servicios, las industrias intensivas en DPI representaron el 74,6% y el 50,7% de las exportaciones e importaciones de servicios, respectivamente

Tabla 4: Comercio internacional de bienes en industrias intensivas en DPI, 2014-2019

Industrias intensivas según DPI	Exportaciones (US\$)	Proporción del total de exportaciones	Importaciones (US\$)	Proporción del total de importaciones
Derechos de Autor	23.011.258	0,3%	263.158.917	3,0%
Diseños	300.811.165	3,8%	497.469.121	5,6%
Indicaciones Geográficas	11.730.206	0,1%	90.927.658	1,0%
Patentes	318.494.755	4,0%	1.245.847.355	14,0%
Variedades Vegetales	553.816.871	7,0%	358.451.699	4,0%
Marcas	3.189.225.498	40,4%	4.024.562.680	45,2%
Todas las industrias intensivas en DPI	3.473.685.710	44,0%	4.788.365.346	53,8%
Total para Uruguay	7.901.689.614		8.895.034.419	

Nota: Dado el uso simultáneo de un DPI, la suma de las contribuciones individuales de cada derecho excede la contribución total de las industrias intensivas en DPI.

4.3. Metodología y datos

La metodología para identificar industrias intensivas en DPI y estimar su contribución a la economía uruguaya utilizada en este estudio sigue a EPO y EUIPO (2019) lo más fielmente posible para lograr la máxima comparabilidad. Sus principios son esencialmente los mismos: primero, determinar el uso de los DPI en todas las industrias e identificar aquellas industrias que utilizan los DPI de manera más intensiva; en segundo lugar, utilizar datos económicos a

nivel de la industria para caracterizar las industrias intensivas en DPI en términos de empleo, salarios, valor agregado (PIB) y comercio internacional; tercero, comparar los agregados a nivel de industria con la economía en general para estimar el peso de las industrias intensivas en DPI en la economía. El Capítulo 6 incluye una descripción detallada de la metodología y las fuentes de datos utilizadas en este estudio.

A fin de desarrollar el estudio, se utilizó una amplia variedad de bases de datos y otras fuentes de registros administrativos para determinar qué industrias son intensivas en DPI y, en base a esto, estimar su contribución al empleo, el PIB, y otros indicadores económicos. Específicamente, para definir qué industrias son intensivas en DPI, las bases de datos de registros de DPI de LATIPAT, la Dirección Nacional de Propiedad Industrial de Uruguay (DNPI) y el Registro Nacional de Cultivares (RNC) del Instituto Nacional de Semillas de Uruguay (INASE) fueron cotejadas con un registro de empresas construido a partir de registros administrativos del Banco de Previsión Social (BPS) de Uruguay, proporcionado por el Ministerio de Trabajo y Previsión Social (MTSS), y registros de empresas disponible públicamente por parte del Instituto Nacional de Estadística de Uruguay (INE). El registro de empresas brinda información sobre actividad económica registrada por las empresas, la cual se utilizó para calcular el número de marcas, diseños, patentes y PVRs por empleado para cada industria. Las industrias con DPI por empleado con valores por encima del promedio ponderado por empleo entre las industrias con DPI se consideraron intensivas en ese respectivo DPI.

A fin de identificar las empresas en los registros, utilizamos un algoritmo de coincidencia de cadenas de texto para realizar la coincidencia entre los registros de DPI y el registro de empresas, así como un proceso de revisión manual para mejorar la proporción de registros que podrían coincidir. Dependiendo del tipo de DPI, entre el 62% y el 99% de los DPI presentados por residentes uruguayos se cotejaron con información de sus propietarios y fue posible asignarles una actividad económica.

Una característica relevante sobre las aplicaciones de DPI en Uruguay es que son predominantemente realizadas por residentes extranjeros: solo alrededor del 3% de las aplicaciones fue hecho por residentes uruguayos en 2014-2019, y solo el 10% de las aplicaciones de diseños fue a manos de residentes uruguayos.

Esta baja fracción no es específica del período bajo estudio, sino una característica general de la actividad de protección de PI en Uruguay. Por ejemplo, la fracción promedio de patentes presentadas por residentes en los últimos 20 años en Uruguay es de 4,8%, según lo informado por RICYT. El Apéndice 9 incluye una discusión sobre los desafíos metodológicos que supone esta característica y la comparación de la actividad de patentamiento entre residentes y no residentes en Uruguay.

5. Introduction

One central insight from scholarly research is that sustainable economic growth relies on continuous technological progress. The last three centuries have seen a series of innovative breakthroughs in different fields of technology that have profoundly transformed productive activity and spurred the growth of new industries. Available evidence confirms that inventors' and firms' investment in new technologies, new pieces of knowledge and innovation rely on the expected profits that they could appropriate from these investments. At the same time, for technological breakthroughs to spur economic growth, they need to diffuse widely throughout the economy. Firms need to learn how to use new technology, undertake capital investments, reorganize business operations and train workers. Indeed, the arrival of new technologies typically spurs complementary organizational and business model innovations that, in themselves, are responsible for significant productivity gains.

WIPO (2015a) illustrates the importance that IP systems have in both the innovation incentives -by contributing at least partially to R&D appropriation - and in facilitating sharing of knowledge, by encouraging disclosure and providing a flexible tool for innovators to decide which technologies to share, with whom and on what terms.

Despite the potential contribution to economic growth and development, there is a dearth of evidence on the overall contribution of IPR-intensive industries. The evidence based on register data is mainly limited to developed economies, particularly the US and the EU. A 2016 report by the United States Patent and Trademark Office (USPTO), updating results published in 2012, combined USPTO administrative data to identify the industries that most intensively use the protection offered by patents and trade marks and identify the set of industries primarily responsible for both the creation and production of

copyrighted materials.⁴ The report identified 81 industries from among 313 as IPR-intensive. These IPR-intensive industries directly accounted for 27.9 million jobs in 2014, or 18.2% of total employment, while indirect activities associated with these industries provided an additional 17.6 million jobs, for a total of 45.5 million jobs in 2014 (30% of all jobs). IPR-intensive industries accounted for about US\$ 6.6 trillion in value added, or 38.2% of U.S. gross domestic product (GDP), in 2014. The report also provided evidence that IPR-intensive industries pay a wage premium compared to other industries. Average weekly wages for IPR-intensive industries were 46% higher than average weekly wages in other non-IPR-intensive industries. This wage premium more than doubled from 22% in 1990. Finally, merchandise exports of IPR-intensive industries totalled US\$ 842 billion in 2014, accounting for 52% per cent of total U.S. merchandise exports. Additionally, IPR-intensive service-providing industries accounted for approximately 12.3 per cent of total U.S. private services exports in 2012.

Concerning the European Union, EPO and EUIPO have conducted jointly three studies on the topic. The first joint study, carried out in 2013 (EPO and EUIPO, 2013), covered the period 2008-2010, while the update conducted in 2016 (EPO and EUIPO, 2016) considered for its analysis the period 2011-2013. The latest study (EPO and EUIPO, 2019) looks at the period 2014-2016. The latest results show that there are now 353 IPR-intensive industries in the EU economy, compared with the 342 identified in the previous study. Approximately two-thirds of these industries are intensive in more than one IP right. In terms of their contribution, IPR-intensive industries generated 29.2% of all jobs in the EU during 2014-2016. On average, over this period, they employed almost 63 million people in the EU. In addition, another 21 million jobs were generated in industries that supply goods and services to IPR-intensive industries. Considering indirect jobs, the total number of IPR-dependent jobs rises to 83.8 million (38.9%). Over the same period, IPR-intensive industries generated almost 45% of total economic activity (GDP) in the EU, worth € 6.6 trillion.

⁴ GI and PVR were not included in the scope of USPTO (2016).

They also accounted for most of the EU's trade with the rest of the world and generated a trade surplus, thus helping to keep the EU's external trade broadly balanced. With respect to wages, IPR-intensive industries paid significantly higher wages than other industries, with a wage premium of 47%. This is consistent with the fact that value-added per worker is higher in IPR-intensive industries than elsewhere in the economy. A comparison of the results over time reveals that the relative contribution of IPR-intensive industries to the EU economy has increased, even after considering the change in the number of IPR-intensive industries.

So far, most of the empirical evidence about the contribution of innovation outputs to employment and productivity in Latin America has been produced through exploiting self-reported innovation outputs in innovation surveys and in the framework of structural econometric models. A striking exception is IMPI (2021), which presents, based on the EUIPO methodology, an account of the contribution of IP to the Mexican economy in the 2010-2019 period. Besides the recent contribution for Mexico, the evidence is generally based on the model put forward by Crépon, Duguet and Mairesse (1998, hereinafter CDM model) and extensions around it.

The CDM model, which can be traced back to Griliches (1990) path diagram of the knowledge production function (1990), introduces a structural model that explains productivity by innovation output and the latter by research investment, and it suggests a method of correcting for selectivity and endogeneity issues. Due to its relative simplicity and easiness of application, the CDM has become the workhorse in the empirical literature on innovation and productivity and has been applied to micro data of over 40 countries (Lööf, Mairesse and Mohnen, 2017).

Concerning the effects of innovation and employment, available evidence is mainly based on Harrison, Jamandreu, Mairesse and Peters (2014). They aim at disentangling the employment-creating effect versus the displacing effect of

innovation by differentiating between product and process innovation at the firm level. The change in employment is then decomposed into that which is due to increased efficiency in the production of old products (which could be related to process and organizational innovations) and a part due to the introduction of new products (product innovations).

Available evidence on productivity effects of innovation for Chile is well summarized in Crespi and Zuñiga (2012). They performed the first comparative study to examine the determinants of technological innovation and its impact on firm labour productivity in manufacturing firms across Latin American countries (Argentina, Chile, Colombia, Costa Rica, Panama, and Uruguay). The authors used micro-data from innovation surveys. In line with this comparative evidence, Crespi, Vargas and Tacsir (2016) performed a similar exercise for the region by exploiting information from the World Bank's Enterprise Surveys project. These contributions focused on manufacturing exclusively. Crespi, Vargas and Tacsir (2014) analysed the effects on labour productivity in services sectors at the firm level, providing comparative evidence for Chile, Colombia, and Uruguay. At the same time, available evidence on employment effects in Latin America was pushed forward by a project led by the Inter-American Development Bank (IDB) in 2010, jointly coordinated by Gustavo Crespi and Ezequiel Tacsir. This project produced evidence about the effects of process and product innovations in manufacturing for Argentina (De Elegalde, Giuliodori and Stucchi, 2015), Uruguay (Aboal et al., 2011a), Chile (Alvarez et al., 2011, updating Benavente and Lauterbach, 2008) and Costa Rica (Monge-Gonzalez et al., 2011). Crespi, Tacsir and Pereira (2019) and Pereira and Tacsir (2019) updated the comparative exercise of Crespi and Tacsir (2012). Crespi and Zuñiga (2013) combined the HJMP model to assess whether different firm strategies produced different impacts in terms of employment change.

The overall evidence in the first strand of literature is that innovation, particularly in manufacturing, positively affects labour productivity (at the firm level), although providing estimates with a broader range than those observed

for developed countries. For employment, overall, the literature highlights the positive effects of product innovation, even in contexts of relative labour destruction, and little evidence of displacement effects due to process innovation. Although these contributions have highlighted the importance and impacts of innovation by firms, it presents several shortcomings in comparison to the efforts previously reported by USPTO and EU and EUIPO:

- These are based on self-reported measures of innovation, following the Oslo Manual guidelines for data collection on Innovation Surveys;
- It is impossible to disentangle what type of innovation output (whether patents, utility models, copyrights) are behind the effects on better productivity levels and employments changes;
- The evidence is limited to those firms covered by innovation surveys. In particular, studies mainly focus on manufacturing only, or selected services sectors at most;
- It provides evidence on (if any) a set of limited IPRs. Innovation surveys in LAC don't collect information on whether the firm has applied/was granted trade marks, designs, GI, nor PVR.

In the case of Mexico, EUIPO and IMPI (2021) closely follow the methodological approach put forward in previous studies for the EU. The study identified 445 industries that are intensive in IPRs (out of 822 activities), with 44.5% being intensive in more than one intellectual property right. IPR-intensive industries contributed with 17.6 million jobs, representing 33.6% of total employment nationwide and 47.8% of GDP and generated 74.7% of exports.

As in Mexico, for Peru, EUIPO and INDECOPi (2021) applied the same methodology for the 2015-2018 period and identified 74 IPR-intensive industries out of 101 industries. When considering IPRs held by residents only, as in this study, IPR-intensive industries in Peru in this period accounted for 22% of total employment and contributed with 32% of total GDP and 32% of total exports.

5.1. IP rights and their function in the economy⁵

Technological progress requires the development and application of new inventions. At the same time, innovative firms tend to create, combine, and adapt knowledge.

Intellectual property rights are fundamental in providing incentives to innovate. Inventors, artists, scientists and businesses put a lot of time, money, energy and thought into developing their innovations and creations. To encourage them to do that, they need the chance to make a fair return on their investment. That means giving them rights to protect their intellectual property. But at the same time, the intellectual property system needs to balance the rights and interests of different groups: of creators and consumers of businesses and their competitors, of high- and low-income countries. By striking the right balance between the interests of innovators and the wider public interest, the IP system aims to foster an environment in which creativity and innovation can flourish. In a broader sense, Intellectual property (IP) refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce. IP allows innovators, creators or owners to benefit from their work and investment in a creation by giving them control over how their “property” is used.

IP rights have long been recognized within various legal systems both nationally and internationally. IP is an exclusive patrimonial right granted for a certain time, normally used or exploit inventions or innovations in an industrial or commercial way. Examples are a technically new product, an upgrade to a machine or apparatus, an original design to make a novel product or manufacturing process more useful or attractive, as well as commercial indications to distinguish products and services from others of similar kind in

⁵ This section is based on EPO and EUIPO (2019).

the market. Overall, the procedures and requirements for registering and obtaining IP rights are territorial, i.e., established by national laws and providing protection within a particular territory.⁶

IP is also sometimes divided into two main categories: industrial property and copyrights. Industrial property includes patents for inventions, industrial designs and trade marks. Copyrights and related rights cover literary, artistic and scientific works and derived rights performances and broadcasts. Also, some categories do not derive from these more traditional forms of IP. These are the so-called *sui generis* rights or unique IPRs. In the arena of intellectual property (IP) law, they may include forms of protection such as geographical indications or plant variety rights.

The International IP Framework is based on numerous international agreements, the majority of which have been administered by the World Intellectual Property Organisation (WIPO) since its creation. Among these are two of the fundamental conventions which are the genesis of the international IP System: the Paris Convention and the Berne Convention.

The Paris Convention for the Protection of Industrial Property, adopted in 1883, applies to "industrial property" i.e., patents, trade marks, industrial designs, utility models, service marks, and trade names. It also covers geographical indications and the repression of unfair competition, which are today not considered to be industrial property *strictu sensu*. This international agreement was the first major step taken to help creators ensure that their intellectual works were protected in other countries.

The Berne Convention for the Protection of Literary and Artistic Works was adopted in 1886. It deals with the protection of works and the rights of their authors, providing creators such as authors, musicians, poets, painters etc.

⁶ Later, we will focus on describing the basic requirements and duration of IP protection in the case of Uruguay.

with the means to control how their works are used, by whom, and on what terms. It is based on three basic principles and contains a series of provisions determining the minimum protection to be granted, as well as special provisions available to developing countries that want to make use of them.

In 1994, the members of the WTO concluded the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) as an annex to the WTO Agreement. The administration of TRIPS, in particular the monitoring of the operation of the Agreement, is made by the WTO Council for TRIPS (or TRIPS Council). Today, the TRIPS Agreement can be considered a low common denominator as far as the standard of IPR protection is concerned.

EU Member States and most LAC countries are part of WTO and, thus, members of the TRIPS Agreement, the Paris Convention, and the Berne Convention. Membership to the other important conventions which make up the weave defining the international IP system may diverge from country to country, but not substantially. This is sufficient to establish that both blocs, regardless of engaging in special bilateral relations through conventions, do find support on IP regulations which comply to *de minimis* standards.

5.1.1. Overview of patents

Patents have a long history and have evolved jointly with technological progress and the professionalization of invention and research. Nowadays, inventions protected by patents cover are inserted in everyday aspects of our life.

By patenting an invention, the patent owner gets exclusive rights over it, meaning that they can stop anyone from using, making, or selling the invention without permission, to secure that firms and inventors can maximize profits during the protection period. This protection lasts for a limited time stipulated by national laws, generally at 20 years. In return the patent owner has the obligation to disclose full details of the invention in published patent documents

for this protection. Disclosure of the invention adds to the body of public knowledge, enabling further research and invention. Once the period of protection has expired, the invention becomes *off-patent*, meaning anyone is free to make, sell or use it.

An invention can be defined as a product or process that offers a new way of doing something, or a new technical solution to a problem. To qualify for patent protection, three requirements must be met, known as “patentability requirements”. Overall, an invention must be of some practical use and must offer something new which is not part of the existing body of knowledge in the relevant technical field (what lawyers call the “prior art”). The invention must also involve an inventive step, something non-obvious that could not just have been deduced by someone with average knowledge of the technical field. Furthermore, the invention must not fall under non-patentable subject matter. Patents are territorial: protection is granted within a country under national law.

In Uruguay, the office responsible for patent applications and registration is the National Directorate for Industrial Property (DNPI) of the MIEM. Once an application is filed, the DNPI will verify if the formal requirements are met and, after at least 18 months from the filing date, the application will be published in the Industrial Property Bulletin (available in Spanish at DNPI’s webpage) so that third parties can make observations for the following 60 days. The office will then proceed with a substantive examination process, in which the head of the Department will analyse if patentability requirements are met. If the resolution is favourable, the applicant will be required to pay a certification fee. Finally, the patent will be published in the Industrial Property Bulletin (European Commission, 2020a). In Uruguay, legal protection lasts 20 years from the application filing date. Maintenance of these rights is conditional upon payment of annual fees.

Although Uruguay is not a party to the Patent Cooperation Treaty (PCT), and thus requires that foreign residents file an application directly to the DNPI, it

is possible to use the PROSUR Patent Prosecution Highway, which allows users to benefit from an effective reduction in patent pendency, by shortening the examination process. However, at the DNPI, applicants could benefit from the patentability examination of a previous patent application in any of the other member countries of the PPH-PROSUR Agreement (Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay and Peru) once this agreement becomes effective.

5.1.2. Overview of trade marks

A trade mark is a sign capable of distinguishing the goods or services of one enterprise from those of other enterprises. They take many forms and identify a wide array of goods and services. Enterprises spend enormous amounts of time and money developing their brands and trade marks. Legal protection allows the owner of a mark to control who uses it, which means that enterprises can develop and promote their goods and services and protect their reputation from being undermined by counterfeiters. Moreover, consumers can rely on trade marks being genuine.

All sorts of signs may be used as trade marks - words, letters, numbers, symbols, colours, pictures, three-dimensional signs such as shapes and packaging, holograms, sounds, and even tastes and smells. A trade mark must be distinctive and not just a generic description of the product or service. Nor can it be identical (or very similar) to a trade mark already registered or used for that type of product or service. These are basic requirements that a sign needs to comply with to be susceptible to being protected.

Trade marks are not only used to identify the goods and services of a particular enterprise. There are also collective marks, which are owned by an association and can be operated by its members, and certification marks which, for example, show that a product or service complies with certain production standards or quality features.

In Uruguay, trade mark applications should be filled at the DNPI online. The registration of a trade mark is valid for 10 years from the date of grant and can be renewed indefinitely. The right holder must file for renovation and pay a renewal fee every 10 years in order to maintain its validity. As of January 2019, cancellation actions can be filed against a registered trade mark. Registrations of a trade mark can now be cancelled if it has not been used (including interruptions of use) by the owner, a licensee, or any other authorised person within 5 consecutive years following the granting of the trade mark or from the date of its renewal. The cancellation action can be requested after 5 years from the granting of the registration if the trade mark has been interrupted for more than 5 consecutive years. In order to avoid cancellation, the owner of the trade mark must prove its use within a period of 5 years prior to the date of the request for cancellation by a third party (European Commission, 2020a).

5.1.3. Overview of designs

The European Commission (202a) defines an industrial design as an original creation of an ornamental nature, which, when incorporated in or applied to a product, offers a special appearance to it. These characteristics may result from its shape, lines, outline, configuration, colour, texture or material. Industrial designs are applied to a wide variety of industrial products and handmade goods, such as cars, telephones, computers, packaging and containers, technical and medical instruments, watches, jewellery, electrical appliances, textile designs, as well as many other types of goods (WIPO, 2020). Industrial design rights entitle the right holder to control the commercial production, importation and sale of products with the protected design. As with most other forms of IP, owners can exploit design rights themselves, or otherwise license or sell them to others, and can sue in the relevant national court to prevent infringement of their rights. This means that owners have a mechanism to capture the rents originated in their designs, providing incentives to invest in developing them.

To qualify for the protection of an industrial design under most national laws, the design must be new and show a degree of originality, individuality, or singular character, meaning that it is not identical or very similar to any previous design. Moreover, it must be capable of being produced industrially, so unique artworks are not considered designs.

In Uruguay, an application must be filed online. It is worth mentioning that the country admits that a set of functional objects having the same main distinguishing design characteristics to be subject to protection as a group (European Commission, 2020a). In Uruguay, the protection of industrial designs lasts for 10 years from the filing date. It can be renewed for another 5 years at the holder's request.

5.1.4. Overview of copyrights

Copyright, or authors' right, is a legal term used to describe the rights that creators have in their literary, artistic and scientific works (WIPO, 2020). Copyright covers not only books, music, paintings, sculpture and films, but also computer programs, databases, advertisements, maps and technical drawings, among other works. There are also rights related to the copyright of the creators, which protect the interests of those closely associated with copyrighted works, including performers, broadcasters and producers of sound recordings.

Copyright applies to the creative expression of ideas in many different forms - text, still or moving pictures, sound works, three-dimensional shapes such as sculptures and architecture, reference works and collections of data. However, copyright does not generally cover ideas themselves, procedures, methods of operation, or mathematical concepts.

Copyright includes both economic and moral rights. Essentially, economic rights involve the right to control the distribution of a work. In other words, a copyright owner can stop anyone from copying or using a work without permission, including, for example, by translating it, reproducing it, performing it or

broadcasting it. Moral rights rely on the connection between an author and his or her creation and protect the personal and reputational, rather than purely monetary, value of a work to its creator.

A work is protected against infringements from the day it is created, even without formal registration. Nevertheless, registration may be very useful in enforcement actions as a proof of ownership and it also provides evidence of the date of creation and the content of the work itself (e.g., the protected source code).

In Uruguay, registration must be applied for at the Copyrights Office within the National Library in Montevideo (Departamento de Derechos de Autor, Biblioteca Nacional). The procedure is simple and inexpensive (European Commission, 2020a).

Copyright collecting societies are authorised to collectively manage the economic rights with the consent of some right holders. They are approved by the government, through the Copyright Council (CDA) of the Ministry of Education and Culture. They are competent to exercise the rights established by the law on behalf of national and foreign right holders. Some of the best-known collecting societies in Uruguay include Uruguay's Association of Copyright Holders (AGADU), Uruguay's Society of Artists and Performers (SUDEI), Uruguay's Chamber of Phonogram and Video Producers (CUD), National Association of Uruguayan Broadcasters (ANDEBU) and Uruguayan Information Technology Chamber (CUTI).

The exclusive right granted by copyright exists from the moment of the creation and lasts for the life of the author plus 70 years. If the author is unknown or a legal person, this term begins from the first publication of the work (e.g., computer programmes created by a software developer).

5.1.5. Overview of geographical indications

A geographical indication (GI) is a name or sign used on certain products to link them to a specific geographical location or origin (e.g., a town, region or country) (EU and EUIPO, 2013). The use of a GI may act as certification that the product has certain qualities, is made according to traditional methods, or enjoys a reputation due to its geographical origin. The connection with the “land” and strict controls regarding the manufacturing process often lead to vertical integration in the different sectors involved in producing GI goods: starting with the farmer, continuing with the manufacturer, and even wholesale and retail distributors.

GIs have been traditionally used in the agriculture, food, and beverages sector, but may also be established for craftworks which are typical from a region.

In general, there are two main types of GIs:

- **Protected Designation of Origin (PDO):** a product that is produced, processed and prepared in a defined geographical area using recognised know-how. Products owe their characteristics exclusively or essentially to their place of production and the skills of local producers.
- **Protected Geographical Indication (PGI):** a product whose reputation or characteristics are closely linked to production in the geographical area. For PGI agricultural products and foodstuffs, at least one of the stages of production, processing or preparation takes place in the area. For PGI wines, at least 85% of the grapes come from the area.

A difference between GIs and other IP rights is that, while trade marks, designs, patents, and copyright are usually applied for and owned by private entities, most often individual companies, GIs are typically applied for and managed by producer associations in the relevant geographical area. The GI can then be used by all individual producers located in the area and complying with the defined production methods.

In terms of their economic function, GIs share with trade marks the basic function of addressing the information asymmetries between sellers and buyers and assisting consumers in reducing their search costs by certifying the origin and method of manufacture of the product. Consumers are often willing to pay a price premium for GI products, since they convey a certain quality associated with the products, know-how and systems of production of a region.

5.1.6. Overview of plant variety rights

Plant variety rights (PVR), or plant breeder's rights, are an independent *sui generis* form of intellectual property right tailored to protect new plant varieties (Article 27(3)(b) of the TRIPS).⁷

The term "species" is a familiar unit of botanical classification within the plant kingdom. However, within a species there can be a wide range of different types of plant. Farmers and growers need plants with particular characteristics that are adapted to their environment and their cultivation practices. A plant variety represents a more precisely defined group of plants, selected from within a species, with a common set of characteristics. Technically, a plant variety is a plant grouping within a single botanical taxon of the lowest known rank, which can be defined by the expression of the characteristics resulting from a given genotype or combination of genotypes; distinguished from any other plant grouping by the expression of at least one of the said characteristics and considered as a unit concerning its suitability for being propagated unchanged.

The International Convention provides the international legal framework for the protection of plant variety rights for the Protection of New Varieties of Plants is the "UPOV Convention". It provides the basis for members to encourage

⁷ The TRIPS agreement authorizes WTO members to eschew patent protection for plants and plant varieties and adopt instead an "effective *sui generis* system" of protection.

plant breeding by granting breeders of new plant varieties an intellectual property right: the breeder's right. In the case of a variety protected by a breeder's right, the breeder's consent is required to propagate the variety for commercial purposes. The breeder's right is granted by the individual UPOV members.

For a PVR to be granted, it is necessary first. to file an application before a national or regional designated authority. The candidate variety must then fulfil the technical criteria of distinctness, uniformity, and stability (known as the "DUS" criteria). It must also be new and bear a suitable denomination.

The registration with a Plant Variety National Property Register provides the creator protection over new plant varieties. Nonetheless, this sole registration is often not enough to commercialize the plant varieties. In Uruguay, plant varieties must proceed with two additional registrations at INASE (National Seeds Institute). The first one, in the Cultivars Property Register (RPC), grants the property right. The second one, in the National Register of Cultivars (RNC), also administered by INASE, allows for the commercialization of the variety.

A PVR certificate of protection is granted for a fixed period if all due requirements are met. The UPOV 1991 Convention provides for a minimum of 20 years. In Uruguay, it is 25 years for most species and 30 years for vines and trees.

5.2. Summary of all IP rights

The previous sections presented the main characteristics and relevance of the different IP rights.

Table 5 summarizes these features and provides further information concerning the duration of the right under Uruguayan law.

Table 5: Main characteristics of IP rights

IP right	Patents	Designs	Trade marks	Copyrights	Geographical indications	Plant variety rights
Subject matter	Inventions (solutions to technical problems)	Original ornamental and non-functional features of an article or product or parts of it	Distinctive signs that identify certain goods or services and distinguish them from those of other businesses	Artistic, literary, dramatic, musical, photographic and cinematographic works; maps and technical drawings; computer programs and databases	Product originating in a particular geographical location whose quality or reputation is linked to its geographical origin	Plant varieties
Requirements for protection	Novelty; inventive step (non-obviousness); industrial applicability	Novelty; individual character	Distinctiveness	Originality of the work, irrespective of its literary or artistic merit	Technical specifications justifying the special characteristics of the product and their link to the geographical location	Distinctness, uniformity, stability and novelty.
Acquisition of right	Examination by the patent office, followed by grant	For registered designs, examination by the IP office.	For registered trade marks, examination by the IP office.	Automatic upon creation in a tangible form of expression	Examination by the national authority	Examination by examination authority
Conferred rights	Exclusive right to make, use and sell the	Exclusive right to use the design and to prevent any	Exclusive right to use the trade mark in trade	Reproduction, communication, including making the work	Collective right. Exclusive rights to commercialize comparable	Exclusive right to commercialize

	patented invention	third party from using it without the right holder's consent		available to the public, distribution, rental, resale, translation, adaptation, public performance	products and prevent imitation or evocation	the protected plant variety
Duration (according to Uruguayan law)	Legal protection lasts 20 years from the filing date of the application for patents and 10 years for utility models. Maintenance of these rights is conditional upon payment of annual fees. In addition, the law allows for the term of protection for utility models to be extended only once for a five-year period.	The protection of industrial designs lasts for 10 years from the filing date. It can be renewed for another 5 years at the holder's request.	The registration of a trade mark is valid for 10 years from the date of grant and the right holder must file for renovation and pay the fee in order to renovate the registration, that it can be renewed indefinitely. The right holder must pay a renewal fee every 10 years in order to maintain its validity.	The exclusive right granted by copyright exists from the moment of the creation and lasts for the life of the author plus 70 years. If the author is unknown or a legal person, this term begins from the first publication of the work (e.g., computer programmes created by a software developer).	Indefinite, no need for renewal	For most plant varieties, 25 years; 30 years for vines, trees

Overall, the type of IP rights covered and the scope of protection in Uruguay are very similar to those in the EU. Uruguay is an active member of the WIPO

and party to many of the main international treaties related to intellectual property such as the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement, the Paris Convention for the Protection of Industrial Property or the Berne Convention for the Protection of Literary and Artistic Works. This means that, on the substance, the legislation on intellectual property is to a great extent aligned with that of the EU and its member states. However, Uruguay is not yet a party to several international registration systems including the Madrid System for the international registration of trade marks, the Patent Cooperation Treaty (PCT) for the international registration of patents, the Hague System for the international registration of industrial designs nor the Lisbon System for the international registration of appellations of origin.

Uruguay's Ministry of Industry, Energy and Mining (MIEM), together with the WIPO, have created Technology and Innovation Support Centres (TISCs). The TISCs provide advice to national and foreign SMEs on IPRs as well as knowledge on development and innovation (European Commission, 2020a).

6. Methodology of the study

The aim of this study is to identify IPR-intensive industries in Uruguay and analyse their contribution to the Uruguayan economy. The methodology follows EPO and EUIPO (2019) as close as possible in order to achieve maximum comparability, and its principles are essentially the same: first, determine IPR use across industries and identify those industries that use IPR more intensively; second, use industry-level economic data to characterize IPR-intensive industries in terms of employment, wages, value added (GDP) and international trade; third, compare industry-level aggregates to the overall economy to estimate the weight of IPR-intensive industries in the economy.

As in EPO and EUIPO (2019), the unit of analysis in this study is the industry. Although Uruguay adapted a version of the United Nations' International Standard Industrial Classification Revision 4 (ISIC Rev. 4) for its 2010 Census to define industries, not all economic variables in Uruguay are reported under this classification. Instead, different international and national classifications are used depending on the economic variable.

For employment and wages data, which is the data used to determine relative IPR-intensity as defined below, the (adapted) ISIC Rev. 4 is used. In this classification, economic activity is divided into 21 sections, 88 divisions (two digits) and 426 classes (four digits) (INE, 2008). Some 4-digit classes in the adapted version are further divided into sub-classes at the five-digit level. For the purposes of the study, in order to maintain comparability with other studies, we collapse 5-digit classes into 4-digit ones and consider this level of aggregation as the main definition of industry for the study. Some industries in the Uruguayan version of the ISIC, which turn out to be IPR-intensive, are different than or not present in the original ISIC Rev. 4 classification:

- “Rural establishments” (class 0190) is specific to Uruguay

- “Processing and preserving of cold-cut meat” (class 1012) is specific to Uruguay
- “Telecommunications” is a single class (6100) in Uruguay, rather than a set of classes
- “Wholesale of poultry and its products” (class 4631) is specific to Uruguay

For value added (and national accounts more generally), Uruguay uses an “Industries and Products Classification” developed by the Central Bank of Uruguay (CNBCU). In this classification, economic activity is divided into 16 sections, 34 divisions (two digits), 41 groups (three digits), 43 classes (4 digits), and 45 products.⁸ A correspondence between the CNBCU and the ISIC Rev. 3 is available, and we use this to then convert the CNBCU to make it consistent with the ISIC Rev. 4.

The international trade data we use is reported under the Harmonized Commodity Description and Coding System (HS) at the 6-digit level. This corresponds to 4-digit classes in the ISIC Rev. 3, which we then convert to ISIC Rev. 4 classes. Given that the ISIC Rev. 4 includes more classes than previous revisions, the correspondence is not one-to-one, and some adjustments are made to provide the best possible match.

The list of industries that are intensive in the use of copyrights will be taken as predetermined as in EPO and EUIPO (2019). This is explained in section 6.7. For patents, trade marks, designs, and PVRs, IPR intensity is determined by examining the number of IP rights obtained by all industries at the National Directorate of Industrial Property of Uruguay (DNPI) and the National Register of Cultivars (RNC) of Uruguay’s National Institute of Seeds (INASE) relative to their level of employment. As mentioned above, employment data is available at the 4-digit ISIC Rev. 4 level, and IPR-intensive industries for these IPRs

⁸ The classification is available at <https://www.bcu.gub.uy/Estadisticas-e-Indicadores/Cuentas%20Nacionales/Forms/AllItems.aspx>

are therefore reported at the ISIC Rev. 4 class (4-digit) level. In this respect, the study can provide estimates comparable to those in EPO and EUIPO (2019).⁹ This stage is the most computationally intensive and demanding exercise of the study, involving matching of names of right owners in IPR registers with those of firms and individuals in business registers. Employment data are available for all industries with at least one IPR for patents, designs, and PVRs. For trade marks, some trade mark-intensive industries have missing employment data, as we explain in more detail below. This process is explained in sections 6.3 to 6.6.

Regarding industries associated with geographical indications (GI), to our knowledge, there are no existing studies estimating their contribution to employment, value added, or international trade for Uruguay.

6.1. Data sources and selection criteria

The study uses a variety of sources of IPR and economic data to determine industries' IPR intensity and their contribution to employment, GDP, trade, and other economic variables. They include:

- LATIPAT, a database using *Espacenet* technology developed by the EPO to facilitate access to patent data. LATIPAT allows us to access information on patents published by the National Directorate of Industrial Property of Uruguay (DNPI) through a unique interface.
- DNPI's database of trade marks and designs applications.
- National Register of Cultivars (RNC) of Uruguay's National Institute of Seeds (INASE).

⁹ EUIPO and EPO (2019) provide estimates of IPR-intensive industries using the NACE Rev. 2 classification. Since the NACE classification is a derived classification of the ISIC, most ISIC classes (i.e., industries) can be linked to NACE classes, although some ISIC classes can be linked only to *groups* of NACE classes, since the NACE may contain further disaggregated classes not present in the ISIC.

- Business registers derived from Uruguay's Social Security Bank (BPS), provided by the Ministry of Labour and Social Security (MTSS), and business registers publicly available from Uruguay's National Institute of Statistics (INE). These registers provide the database to identify applicant's industry classification.
- Employment and wage data at the 4-digit ISIC Rev. 4 level provided by BPS.
- Central Bank of Uruguay's (BCU) National Accounts Statistics, which is the main source for official data on GDP and sectoral value added in Uruguay.
- Central Bank of Uruguay's (BCU) balance of payments data, which is the main source for international trade in services data.
- UN-COMTRADE, which provides a source for comparable international trade in goods data.
- Ministry of Education and Culture of Uruguay's satellite account for culture.

The IP rights chosen for this study were patents, trade marks, and designs published by DNPI, PVRs published by RNC for the 2014-2019 period, and geographical indications. For patents, trade marks, and designs, data limitations prevent the identification of patents that were subsequently granted.

The contribution to the economy made by IPR-intensive industries was estimated using economic data for 2014-2019, except for their contribution to value added, for which data for 2014-2018 was used since 2019 data were not available at the time of this study.

Only patents, trade marks, and designs with at least one Uruguayan resident were considered for this study. However, a significant portion of IPRs in Uruguay are published by non-residents. To the extent that an industry's IPR intensity is an inherent characteristic of that industry, irrespective of its geographical location, as assumed by EPO AND EUIPO (2019), this feature

should not affect the goal of the data-matching exercise. When calculating the contribution of IPR-intensive industries to Uruguay's economy, all relevant industries are included, regardless of the ultimate ownership of the companies within each industry. For PVRs, data do not allow the identification of residents and non-residents, so all applications are considered and then matched to the business register.

For patents, given the importance of non-resident applications, we dedicate a special section to analysing patenting behaviour of non-residents in Appendix 9.

6.1.1. Economic data

The main source of employment and wage data is Uruguay's Social Security Bank (BPS), which contains information on all formal private employers and their employees, as well as most public enterprises and agencies. Defence and public order maintenance activities are an exception, since they are not included in the BPS and are hence not considered in this study. Total employment and average wages for each 4-digit ISIC Rev. 4 sector based on the BPS was kindly provided by the Ministry of Labour and Social Security. Total employment and average wages are available for the 2014-2019 period.

International trade data for Uruguay is available from several sources. For trade in goods, data are available from the National Customs Directorate (DNC) and from the UN COMTRADE database. For this study, data from the UN COMTRADE database was considered in order to ensure comparability and quality of the data. For trade in services, information comes from the Central Bank of Uruguay's (BCU) balance of payments exports and imports database for selected groupings of services, but only items' descriptions are included (e.g., "Telecommunication services" or "Computer services") without any indication of classification codes. Even though the BCU uses its own classification of economic activities for reporting national accounts data, items' descriptions in current account data, although similar, do not exactly match

with descriptions in the BCU classification. For example, current account data indicate “Telecommunication services”, and the BCU classification includes a “Postal and telecommunications services” product-level category. With these limitations, we use to trade in services data to the best of our ability to report the contribution of IPR-intensive industries to trade in services.

6.2. Data matching for patents, trade marks, designs, and plant variety rights

In order to identify IPR-intensive industries, records from LATIPAT, the DNPI, and the RNC were matched with official formal business registers. Business registers include information about industry classification, name and other information for the universe of formal firms in Uruguay. An advantage of using official local business registers rather than proprietary databases, such as Orbis or Economatica, is that they *may* contain information on individuals registered as independent workers or microenterprises (including sole proprietor enterprises). This is relevant since a significant fraction of IPR holders in Uruguay are individuals. However, it should be clear that business registers data do not allow us to distinguish individuals from businesses. Hence, we cannot report results for individuals and businesses separately.

A matching algorithm based on businesses’ names using approximate string matching was implemented according to the following steps:

1. **Name harmonization.** Given the absence of common unique business identifiers, the first step involved harmonisation of holders’ and businesses’ names. The main aspect of this harmonization had to do with corporate and legal forms (e.g., “SA”, “S A”, “S.A.”).
2. **Grouping.** IPR records and registers were divided into subgroups by their initial character.
3. **Similarity computation.** For each subgroup, their similarity was computed using *Pair-letters similarity*, an algorithm that dissects the two

strings in pairs and calculates the similarity of the two strings by dividing the number of common pairs by the sum of the pairs from both strings. Appendix 10 describes other approaches that were tested and their performance.

4. **Revision and selection.** Candidates were selected based on the similarity index. Matches with similarity values between 1 (identical) and 0.9 were accepted without revision. Matches with similarity values between 0.89 and 0.65 were manually revised. Finally, matches with similarity values below 0.65 were discarded. The similarity thresholds were empirically defined after an extensive revision of samples.

For patents and designs, unmatched records were further manually revised to assign an industry classification.

Depending on the type of IPR, between 62% (trade marks) and 99% (PVRs) of IPRs filed by residents were matched with information of their owners. Below we provide a detailed description of the matching procedure and results for each type of IPR. Although business registers in Uruguay may contain individuals, one reason why not all IPR owners could be found is that not all individuals registering IPRs could be on the business register. Even if individuals have sole proprietor businesses, they may file IPR applications using their personal name, which need not coincide with the business name in the register. Other reasons can be spelling differences not captured by the matching algorithm and changes in businesses names not reflected in business registers.¹⁰

By using information about each owner's industry classification, data was aggregated to compute the total number of IPRs in each industry, which is a

¹⁰ Firm exit should not be a reason for failure to identify applicants in the business register, since we consider all firms that were ever present at least once in the formal business register since 2014.

key step in determining which industries are intensive in their use of patents, trade marks, and designs. The data matching process is illustrated in Figure 1.

6.3. Definition of absolute and relative intensities

For each industry, **absolute intensity** of patents, trade marks, and designs is defined as the total number of each of these IPRs. In turn, **relative intensity** is defined as the absolute intensity divided by the total number of employees in each industry. Finally, for each IPR, an industry is considered **IPR-intensive** if its relative intensity is above the employment-weighted average of relative intensities among those industries with a positive absolute intensity.

Formally, absolute intensity for industry i is defined as

$$A_i = \sum_j IPR_{ij} ,$$

where IPR_{ij} indices intellectual property right application j in industry i matched with an owner in the business register. Given total employment L_i , relative intensity is given by

$$R_i = A_i/L_i.$$

Finally, define the employment-weighted average of relative intensities as

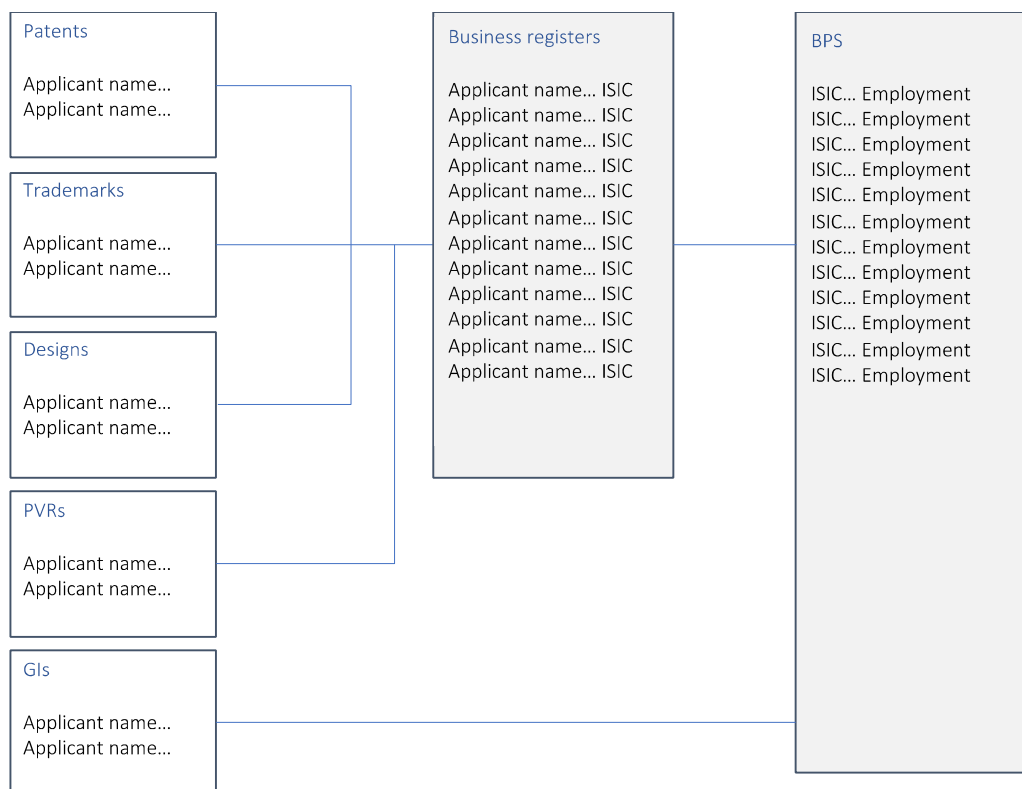
$$\bar{R} = \sum_{k \in K} (L_k/L) R_k,$$

where $L \equiv \sum_{k \in K} L_k$ and K is the set of all industries with $R_i > 0$. An industry is IPR-intensive if $R_k > \bar{R}$.

To compute relative intensities below, we use the total number of (formal) employees for each industry derived from Uruguay's Social Security Bank's

administrative records, kindly provided by the Ministry of Labour and Social Security (MTSS).

Figure 1: Simplified illustration of the data matching process



6.4. Identification of patent-intensive industries

This section describes the methodology for identifying patent-intensive industries. First, the process for computing the absolute intensity of each industry is described. Then, the process for identifying the relative intensity of each industry is described. The description of patent-intensive industries is contained in section 7.1.

6.4.1. Absolute intensity

The process to compute absolute patent intensity involved the following steps:

1. **Retrieval of patent applications.** The total number of published patents was obtained from the LATIPAT database. The sample of patents was restricted to those patents published between January 1, 2014, and December 31, 2019. Moreover, applications with at least one Uruguayan applicant were considered. Out of a total of 3,400 patents published between 2014 and 2019, only 114 (3%) patents included at least one resident. This is in line with an average of 4.8% resident applications for the last 20 years in Uruguay, as reported by RICYT¹¹.
2. **Matching with business records** After identifying published patents with at least one resident, resident applicants' names were matched with business records as described in section 6.2. A match was found for 81 applicants (72% of published patents with at least one resident) and assigned an industry classification.
3. **Manual matching.** For those applicants that couldn't be matched to an industry using the business register, we performed a manual search exploiting several additional registers. First, we searched applicants' names in the CVUY database, a database administered by Uruguay's National Innovation and Research Agency (ANII), which concentrates the pool of CVs for every active researcher in the country (both in public and private sectors). Then, we searched applicants on LinkedIn and assigned these applicants the industry of their latest employer. With these procedures, a match was found for 28 applicants (17% of published patents with at least one resident) and assigned an industry classification. Overall, we were able to match 89% of patents with at least one resident.
4. **Multiple owners.** In those cases where a patent had multiple resident owners, each owner was assigned a proportional fraction of the patent.

¹¹ RICYT collects comparable science, technology and innovation indicators, including patent applications and patents granted by the country of residence of the applicant for Latin America and the Caribbean. See www.ricyt.org.

5. **Missing ISIC industries.** In some cases, matched applicants had a missing ISIC industry in the business register. While the ISIC industry could be replaced by or inferred from the associated IPC class, it was found that patents' IPC classes, which mainly reflect the industry where the patent is destined, differed widely from businesses' industries of origin in those cases where both were available. This is because the use of a patent need not coincide with the owner's registered economic activity. This could occur, for instance, when a firm in the services sector (e.g., a law firm or a commercial office) is the owner of a patent used in manufacturing. We discuss this further in Appendix 9.
6. **Differing levels of industry aggregation.** For some firms, the business register assigns ISIC industry codes at a higher level of aggregation than the 4-digit level used in the analysis, i.e., division or group code. In these cases, patents were reallocated to the lower level of ISIC proportionally to the number of patents assigned to each 4-digit class in the subset of patents associated with correct 4-digit ISIC industries. For patents, this is the case only for "Wholesale trade, except of motor vehicles and motorcycles" (ISIC division 46).

6.4.2. Relative intensity

In order to compute relative patent intensity, employment data aggregated at the 4-digit ISIC level provided by the MTSS was matched with the data on industries' absolute intensities. Relative patent intensity was then calculated following the definition in section 6.3 as patents per 1,000 employees. The employment-weighted average of relative patent intensities is 0.25 per 1,000 employees. Industries with relative patent intensities above this threshold were identified as patent-intensive industries.

6.5. Identification of trade mark-intensive industries

This section describes the methodology for identifying trade mark-intensive industries. First, the process for computing the absolute intensity of each industry is described. Then, the process for identifying the relative intensity of each industry is described. The description of trade mark-intensive industries is contained in section 7.2

6.5.1. Absolute intensity

The process to compute absolute trade mark intensity involved the following steps:

1. **Retrieval of trade mark registers.** The total number of registered trade marks was obtained from the DNPI registers. The sample of registered trade marks was restricted to rights published between January 1, 2014, and December 31, 2019. Moreover, applications with at least one Uruguayan applicant were considered. Out of a total of 45,425 trade marks published between 2014 and 2019, only 17,687 (39%) trade marks included at least one resident.
2. **Matching with business registers.** After identifying published trade marks with at least one resident, resident applicants' names were matched with business registers as described in section 6.2. A match was found for 10,858 registers (62% of published trade marks with at least one resident) and assigned an industry classification.
3. **Missing employment data for selected industries.** One trade mark application was found in class 8422 "Defence activities". As we explained above, the BPS does not include employment data for this class, and hence we drop this application from the sample, leaving it at 10,857 matched registered applications.
4. **Multiple owners.** In those cases where a register had multiple resident owners, each owner was assigned a proportional fraction of the trade mark.
5. **Differing levels of industry aggregation.** For some firms, the business register assigns ISIC industry codes at a higher level of aggregation

than the 4-digit level used in the analysis, i.e., division or group code. For trade marks, this is the case for “Education” (ISIC division 85) and “Activities of business, employers and professional membership organizations” (ISIC group 941). Given that there is only one trade mark in lower-level education classes and there is no obvious way to allocate trade marks among the 8 ISIC classes included in this group, we decide to collapse all trade marks at the group level so that trade marks are assigned to industry 8500. For ISIC group 941, trade marks were reallocated to the lower level proportionally to the number of trade marks assigned to each 4-digit class in the subset of patents associated with correct 4-digit ISIC industries.

6.5.2. Relative intensity

To compute relative trade mark intensity, employment data aggregated at the 4-digit ISIC level provided by the MTSS was matched with the data on industries’ absolute intensities. Relative intensity was then calculated following the definition in section 6.3 as trade marks per 1,000 employees. The employment-weighted average of relative trade mark intensities is 11 per 1,000 employees. Industries with relative trade mark intensities above this threshold were identified as trade mark-intensive industries.

6.6. Identification of design-intensive industries

This section describes the methodology for identifying design-intensive industries. First, the process for computing the absolute intensity of each industry is described. Then, the process for identifying the relative intensity of each industry is described. The description of design-intensive industries is contained in section 7.3.

6.6.1. Absolute intensity

The process to compute absolute design intensity involved the following steps:

1. **Retrieval of design registers.** The total number of published designs was obtained from the DNPI registers. The sample of registered designs was restricted to rights published between January 1, 2014, and December 31, 2019. Moreover, applications with at least one Uruguayan applicant were considered. Out of a total of 563 designs published between 2014 and 2019, only 56 (10%) designs included at least one resident.
2. **Matching with business records.** After identifying published designs with at least one resident, resident applicants' names were matched with business records as described in section 6.2. A match was found for 38 entries (68% of published designs with at least one resident) and assigned an industry classification.
3. **Manual matching.** For those applicants that couldn't be matched to an industry using business records, we performed a manual search exploiting several additional registers, similar to patents. First, we searched applicants' names in ANII's CVUY database, which concentrates the pool of CVs for every active researcher in the country (both in public and private sectors). Then, we searched for applicants in LinkedIn and assigned these applicants the industry of their latest employer. With these procedures, a match was found for 6 registers (11% of published designs with at least one resident) and assigned an industry classification. Overall, we were able to assign an industry classification to 79% of designs applications with at least one resident.
4. **Multiple owners.** In those cases where a register had multiple resident owners, each owner was assigned a proportional fraction of the design.
5. **Differing levels of industry aggregation.** There were no differing levels of aggregation, and all firms were assigned a 4-digit ISIC code.

6.6.2. Relative intensity

In order to compute relative design intensity, employment data aggregated at the 4-digit ISIC level provided by the MTSS was matched with the data on industries' absolute intensities. Relative intensity was then calculated following the definition in section 6.3 as designs per 1,000 employees. The employment-weighted average of relative designs intensities is 0.8 per 1,000 employees. Industries with relative design intensities above this threshold were identified as design-intensive industries.

6.7. Identification of copyright-intensive industries

Although copyright is registered in Uruguay, this report does not exploit this information. Instead, the identification of copyright-intensive industries follows EPO and EUIPO (2019) in order to keep consistency and is based on the methodology developed by WIPO (2003, revised as 2015b).

The guidelines in WIPO (2015b) group industries into four categories according to the degree to which their activity depends on copyright: core copyright industries, inter-dependent copyright industries, partial copyright industries, and non-dedicated support industries.

Among *core copyright industries*, the WIPO guide distinguishes between the types of works that can be copyrighted, the industries in which those works are created, and the distribution industries delivering the produced copyrighted works to the public. Specifically, core copyright industries are defined as “wholly engaged in the creation, production and manufacturing, performance, broadcast, communication and exhibition, or distribution and sales of works and other protected subject matter” (WIPO, 2015b). The underlying idea behind this definition is that core copyright industries, as a category, would not exist or would be significantly different without copyright in works. Core copyright industries as defined by WIPO, include:

- Press and literature
- Music, theatrical productions, operas
- Motion picture and video
- Radio and television
- Photography
- Software and databases
- Visual and graphic arts
- Advertising services
- Copyright collecting societies

Inter-dependent copyright industries are industries that are engaged in the production, manufacture and sale of equipment whose function is wholly or primarily to facilitate the creation, production or use of works and other protected subject matter. They include manufacture of pulp, paper and paperboard, and wholesale of electronic and telecommunication equipment, among others.

Partial copyright industries are industries in which some activities are related to works and other protected subject-matter and may involve the creation or works, production and manufacturing, performance, broadcast, communication and exhibition or distribution and sale. They include the manufacture of games and toys, museum activities, and manufacture of jewellery, among others.

Non-dedicated support industries are industries in which some activities are related to facilitating the broadcast, communication, distribution or sale of works and other protected subject-matter, but whose activities have not been included in the core copyright industries. They include general wholesale and transportation, among others.

Following EPO and EUIPO (2019), in this report, the following industries are considered copyright-intensive:

- Core copyright industries.

- Inter-dependent copyright industries.
- Partial copyright industries with factors above 20%.

Non-dedicated support industries are excluded from the study, as their factors are below 20%.

After selecting copyright-intensive industries, their corresponding NACE 4-digit codes were merged with the NACE Rev. 2 to ISIC Rev. 4 correspondence. Section 7.4 below includes the detail of all copyright-intensive industries at the 4-digit ISIC level included in the study, while Appendix 11.4 includes the complete list of copyright industries and their associated factors.

6.8. Identification of geographical indications-intensive industries

As EPO and EUIPO (2019) mention, geographical indications (GIs) have one important characteristic which had to be considered when designing a methodology to identify GI-intensive industries: GIs are not owned by private parties. Instead, they are usually applied for by regional producer associations. This means that there are no comparable databases that could be used to match right-holder information with economic information. In this respect, there is a certain similarity between GIs and copyrights, for which the approach entails applying a pre-defined set of industries.

Uruguay has 55 registered GIs, all of them related to wine, which limits the set of industries to essentially one, “Manufacture of wines” (ISIC class 1102). Table 6 shows the full list of GIs in Uruguay.

Table 6: List of geographical indications in Uruguay

Product	Geographical indication
Wine	Artigas*
Wine	Atlántida
Wine	Bella Unión
Wine	Canelón Chico
Wine	Canelones
Wine	Carmelo
Wine	Carpintería
Wine	Cerro Carmelo
Wine	Cerro Chapeu
Wine	Cerro Largo*
Wine	Colón*
Wine	Colonia*
Wine	Constancia
Wine	El Carmen
Wine	Flores*
Wine	Garzón
Wine	José Ignacio
Wine	Juanico
Wine	La Caballada
Wine	La Cruz
Wine	La Paz*
Wine	La Puebla
Wine	Las Brujas
Wine	Las Violetas
Wine	Lomas De La Paloma
Wine	Los Cerrillos
Wine	Los Cerros De San Juan
Wine	Maldonado*
Wine	Manga
Wine	Montevideo*
Wine	Norte de Florida*

Wine	Norte de Lavalleja*
Wine	Norte de Rocha*
Wine	Paso Cuello
Wine	Paysandú*
Wine	Progreso
Wine	Rincón De Olmos
Wine	Rincón del Colorado
Wine	Rio Negro*
Wine	Rivera*
Wine	Salto*
Wine	San Carlos*
Wine	San José
Wine	Santa Lucía*
Wine	Santa Rosa*
Wine	Santos Lugares
Wine	Sauce
Wine	Sierra de la Ballena
Wine	Sierra de Mahoma
Wine	Soriano*
Wine	Suarez
Wine	Sur de Florida*
Wine	Sur de Rocha*
Wine	Tacuarembó*
Wine	Villa Del Carmen

Notes: * indicates a procedure made before the registry provided for in Decree 283/93 (before CEE).

Source: Own elaboration based on <https://www.cancilleria.gob.ar/es/acuerdo-mercosur-ue/propiedad-intelectual>.

The concentration of GIs in the wine industry does not imply that the whole industry should be considered for the estimation of its contribution in terms of employment, value added or exports. To estimate the contribution, the first step consisted in identifying the wineries that operate inside a GI-protected

region or area in Uruguay.¹² Second, since firm-level exports are publicly available for Uruguay, the share of total wine exports accounted for by this subset of wineries was estimated. Exports of wineries in GI-protected areas represented 88% of total wine exports, on average, between 2014 and 2019.

This share was applied to value added and employment of the ISIC 1102 class. Unfortunately, other alternatives to estimate an adjustment factor for this class, such as firm-level employment or production, are not available. The underlying assumption is that the value added and employment ratios among firms producing GI-protected varieties are the same as the one for exports. Although exports are a fraction of total sales, this assumption may not be entirely accurate for a number of reasons. First, exporting firms are selected from the population of firms, and should be expected to be more productive than non-exporters. Second, exports can command a price premium over domestic sales. On the other hand, GI products may also cost more to produce, which would, at least partially, offset this error (EPO and EUIPO, 2019).

Neither customs data nor the COMTRADE database allows us to distinguish imports of GI-protected wines from those that are not. Hence, regarding imports, we adapted the methodology followed in EPO and EUIPO (2019) and considered as GI-imports those imports to Uruguay that are related to all goods recognized by trade agreements currently in place for Uruguay. In particular, we consider the merchandise imports of GI-protected products from MERCOSUR countries that could be associated univocally to an HS code that doesn't include other goods that are not protected by GI. Table 7 lists the GI-protected goods that are used to estimate GI-imports.

¹² The complete list of wineries is available from the National Institute of Winemaking of Uruguay (INAVI) at <http://www.inavi.com.uy/bodegas/>.

Table 7: List of geographical indications from MERCOSUR countries and countries in which they are recognized

GI-protected product	Protected in	HS Code
Cachaca and sugar cane spirits	Brazil, Paraguay	220890
Cassava flour	Brazil	110814
Chipá	Paraguay	1905
Coffee	Brazil	901
Cocoa Beans	Brazil	1801
Coconut oil	Paraguay	1513
Melon	Brazil, Paraguay	807
Honey	Brazil	0409
Shrimps	Brazil	306
Stevia	Paraguay	293890
Turmeric	Brazil	91030
Wines and sparkling wines	Argentina, Brazil, Paraguay	2204
Yerba mate and yerba mate tea	Argentina, Brazil, Paraguay	90300

Source: Own elaboration based on <https://www.cancilleria.gob.ar/es/acuerdo-mercosur-ue/propiedad-intelectual>.

6.9. Identification of PVR-intensive industries

This section describes the methodology for identifying PVR-intensive industries. First, the process for identifying the absolute intensity of each industry is described. Then, the process for identifying the relative intensity of each industry is described. The description of PVR-intensive industries is contained in section 7.5.

6.9.1. Absolute intensity

The process to compute absolute PVR intensity involved the following steps:

- 1. Retrieval of PVR registers.** The primary source for the identification of PVR-intensive industries in this study is registered data from Uruguay's

National Registry of Cultivars (RNC). There were 915 applications granted to 117 applicants between January 1, 2014, and December 31, 2019, at the RNC. Unfortunately, information about the residency of applicants was not available.

2. **Matching with business records.** Data from PVR applications were matched with the applicant's information in the business register as described in section 6.2. A match was found for 908 registers (99% of granted applications) and assigned an industry classification. Given that these applicants were in the business register, we assume they are all residents.
3. **Differing levels of industry aggregation.** There were no differing levels of aggregation, and all firms were assigned a 4-digit ISIC code.

6.9.2. Relative intensity

To compute relative PVR intensity, employment data aggregated at the 4-digit ISIC level provided by the MTSS was matched with the data on industries' absolute PVR intensities. Relative intensity was then calculated following the definition in section 6.3 as PVRs per 1,000 employees. The employment-weighted average of relative PVR intensities is 5.7 per 1,000 employees. Industries with relative PVR intensities above this threshold were identified as PVR-intensive industries.

6.10. Limitations of data and methodology

Due to data limitations and the scope of analysis, the methodology suffers from some limitations.

First, IPR applications in Uruguay, especially for patents, are predominantly made by non-residents. As the report only considers applications by residents,

the selection of IPR-intensive industries may be biased if applications by non-residents are more common in some industries than in others. Moreover, data limitations prevent the identification of granted patents within the set of published patents.

Second, as in EPO and EUIPO (2019), to qualify as an IPR-intensive industry, an industry has to intensively use at least one of the IPRs covered in the present study. However, the protected subject matter, legal strength and other aspects may differ across different IPRs, and therefore IPR intensity has a different meaning for different IPRs.

Third, in determining IPR intensity, all the IPRs are aggregated industry by industry with equal weights so that their individual values are not evaluated. In reality, however, the distribution of the economic value of individual IPRs is highly skewed. As a result, some industries with few IPRs, which may nevertheless be very valuable for the operation of those industries, may not be considered as IPR-intensive. Moreover, the study does not consider other forms of IP protection which may be preferred by some firms in some industries, such as trade secrets.

Fourth, the lack of availability of sufficiently disaggregated economic data in Uruguay, especially for value-added data, forces the study to apply simplifying assumptions when reporting the contribution of IPRs to economic activity. This implies that, at the 4-digit ISIC level of disaggregation, estimates may not accurately reflect the economic contribution of IPRs in Uruguay.

A related issue applies to the publication of economic data using different industry classifications used in Uruguay. While data on industry employment and wages are available under the ISIC Rev. 4, value-added and trade data are not available under this industry classification, and there is no consistent and comprehensive correspondence between all the industry classifications used in Uruguay.

7. IPR-intensive industries in Uruguay

This chapter presents the main results of the analysis of IPR-intensity by industry in Uruguay described in Chapter 6. The results are presented separately for each IP right, and in terms of overall IPR-intensity, that is, taking into account the fact that some industries are intensive in more than one IPR.

7.1. Patent-intensive industries

Out of 411 industries (ISIC Rev. 4 classes) with positive employment in Uruguay in 2019, 49 filed patent applications during the period 2014-2019. Of those industries, 33 are patent-intensive. Table 8 shows the 20 most patent-intensive industries in Uruguay. The full list of patent-intensive industries is shown in Appendix 11.2.

The list of patent-intensive industries is dominated by commerce and services activities, which account for 10 of the top-20 industries, followed by manufacturing, with 7 activities. There are two agricultural activities in the list, related to viticulture and growing of aromatic, drug, and pharmaceutical crops.

Table 8: The 20 most patent-intensive industries

ISIC code	ISIC description	Patents per 1,000 employees
2821	Manufacture of agricultural and forestry machinery	24.86
8030	Investigation activities	12.53
990	Support activities for other mining and quarrying	7.73
3290	Other manufacturing n.e.c.	5.19
128	Growing of spices, aromatic, drug and pharmaceutical crops	2.99
121	Growing of grapes	2.47
8530	Higher education	1.95
6311	Data processing, hosting and related activities	1.55
4661	Wholesale of solid, liquid and gaseous fuels and related products	1.45

7110	Architectural and engineering activities and related technical consultancy	1.13
8299	Other business support service activities n.e.c.	1.05
2599	Manufacture of other fabricated metal products n.e.c.	0.96
4669	Wholesale of waste and scrap and other products n.e.c.	0.93
3100	Manufacture of furniture	0.93
4100	Construction of buildings	0.69
9521	Repair of consumer electronics	0.69
7490	Other professional. scientific and technical activities n.e.c.	0.65
190	Rural establishments	0.65
2592	Treatment and coating of metals; machining	0.65
2710	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	0.60

Notes: based on patents filed in 2014-2019.

7.2. Trade mark-intensive industries

Businesses in 270 industries in the matched database filed trade mark applications during the period 2014-2019. 124 of these are trade mark-intensive industries.

Table 9 shows the 20 most trade mark-intensive industries in Uruguay. The full list of trade mark-intensive industries can be found in Appendix 11.3.

Different from patents, manufacturing activities are dominant among the 20 most trade mark-intensive industries, and account for 11 industries. Only 4 services industries can be found among the top-20 trade mark-intensive industries. It should be noted that industry 6420 “Activities of holding companies” includes firms that are headquarters of a group of firms, where the relevant activity is the main activity of the economic group. Data limitations prevent us from being able to identify the contribution of the underlying industries within this class.

Table 9: The 20 most trade mark-intensive industries

ISIC code	ISIC description	Trade marks per 1,000 employees
6492	Other credit granting	820.51
6419	Other monetary intermediation	392.27
1200	Manufacture of tobacco products	315.22
2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	295.81
7740	Leasing of intellectual property and similar products, except copyrighted works	280.00
6420	Activities of holding companies	223.34
2733	Manufacture of wiring devices	200.00
1101	Distilling, rectifying and blending of spirits	172.73
2023	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	135.36
2029	Manufacture of other chemical products n.e.c.	123.65
2732	Manufacture of other electronic and electric wires and cables	92.59
1102	Manufacture of wines	91.38
1073	Manufacture of cocoa, chocolate and sugar confectionery	90.91
190	Rural properties	79.50
3290	Other manufacturing n.e.c.	75.79
4100	Construction of buildings	69.49
2021	Manufacture of pesticides and other agrochemical products	68.97
3230	Manufacture of sports goods	67.80
9200	Gambling and betting activities	59.55

Notes: Based on trade marks filed in 2014-2019.

7.3. Design-intensive industries

Only a handful of businesses that filed design applications in the 2014-2019 period were identified in the matched database, totalling 15 industries. Of these, 6 are design-intensive.

Table 10 shows the full list of design-intensive industries. All but one of the design-intensive industries are manufacturing industries.

Table 10: Design-intensive industries

ISIC code	ISIC description	Designs per 1,000 employees
2599	Manufacture of other fabricated metal products n.e.c.	9.13
2732	Manufacture of other electronic and electric wires and cables	6.43
2392	Manufacture of clay building materials	4.24
1040	Manufacture of vegetable and animal oils and fats	1.71
5629	Other food service activities	0.91
2220	Manufacture of plastics products	0.81

Notes: Based on designs filed in 2014-2019.

7.4. Copyright-intensive industries

Table 11 lists the copyright-intensive industries considered for this study, as described in section 6.7, sorted by intensity factor. The “type” column indicated whether an industry is core, interdependent, or partially copyright-intensive according to the WIPO classification. The “factor” column shows the percentage of each industry’s activity considered to be copyright-intensive, including for core sectors, whose factor is 100%.

Table 11: List of copyright-intensive industries considered in the study.

ISIC code	ISIC description	Type	Factor
1811	Printing	Core	100%
1812	Service activities related to printing	Core	100%
1820	Reproduction of recorded media	Core	100%
4761	Retail sale of books, newspapers and stationery in specialized stores	Core	100%

4762	Retail sale of music and video recordings in specialized stores	Core	100%
5811	Book publishing	Core	100%
5813	Publishing of newspapers, journals and periodicals	Core	100%
5819	Other publishing activities	Core	100%
5820	Software publishing	Core	100%
5911	Motion picture, video and television programme production activities	Core	100%
5912	Motion picture, video and television programme post-production activities	Core	100%
5913	Motion picture, video and television programme distribution activities	Core	100%
5914	Motion picture projection activities	Core	100%
5920	Sound recording and music publishing activities	Core	100%
6010	Radio broadcasting	Core	100%
6020	Television programming and broadcasting activities	Core	100%
6110	Wired telecommunications activities	Core	100%
6120	Wireless telecommunications activities	Core	100%
6130	Satellite telecommunications activities	Core	100%
6190	Other telecommunications activities	Core	100%
6201	Computer programming activities	Core	100%
6202	Computer consultancy and computer facilities management activities	Core	100%
6209	Other information technology and computer service activities	Core	100%
6311	Data processing, hosting and related activities	Core	100%
6312	Web portals	Core	100%
6391	News agency activities	Core	100%
6399	Other information service activities n.e.c.	Core	100%
7310	Advertising	Core	100%
7410	Specialized design activities	Core	100%
7420	Photographic activities	Core	100%
7490	Other professional, scientific and technical activities n.e.c.	Core	100%
7990	Other reservation service and related activities	Core	100%
8219	Photocopying, document preparation and other specialized office support activities	Core	100%
8542	Cultural education	Core	100%
9000	Creative, arts and entertainment activities	Core	100%
9101	Library and archives activities	Core	100%
9321	Activities of amusement parks and theme parks	Core	100%

9329	Other amusement and recreation activities n.e.c.	Core	100%
9412	Activities of professional membership organizations	Core	100%
9102	Museum's activities and operation of historical sites and buildings	Partial	50%
3240	Manufacture of games and toys	Partial	46%
9499	Activities of other membership organizations n.e.c.	Partial	41%
3220	Manufacture of musical instruments	Interdependent	35%
3211	Manufacture of jewellery and related articles	Partial	34%
4741	Retail sale of computers, peripheral units, software and telecommunications equipment in specialized stores	Interdependent	33%
4742	Retail sale of audio and video equipment in specialized stores	Interdependent	33%
4773	Other retail sale of new goods in specialized stores	Interdependent	33%
2620	Manufacture of computers and peripheral equipment	Interdependent	30%
2630	Manufacture of communication equipment	Interdependent	30%
2640	Manufacture of consumer electronics	Interdependent	30%
2670	Manufacture of optical instruments and photographic equipment	Interdependent	30%
2731	Manufacture of fibre optic cables	Interdependent	30%
2817	Manufacture of office machinery and equipment (except computers and peripheral equipment)	Interdependent	30%
4651	Wholesale of computers, computer peripheral equipment and software	Interdependent	30%
4659	Wholesale of other machinery and equipment	Interdependent	30%
7730	Renting and leasing of other machinery, equipment and tangible goods	Interdependent	28%
1701	Manufacture of pulp, paper and paperboard	Interdependent	25%
2029	Manufacture of other chemical products n.e.c.	Interdependent	25%
4652	Wholesale of electronic and telecommunications equipment and parts	Interdependent	25%
4669	Wholesale of waste and scrap and other products n.e.c.	Interdependent	25%
7722	Renting of video tapes and disks	Interdependent	20%
7729	Renting and leasing of other personal and household goods	Interdependent	20%

7.5. PVR-intensive industries

Overall, firms in 38 industries were granted PVRs during 2014-2019, out of which 12 were PVR-intensive.

Table 12 shows the PVR-intensive industries in Uruguay. The full list of industries with PVRs can be found in Appendix 11.5.

Although agricultural activities are predominant among PVR-intensive industries, industries related to forestry, pharmaceutical, and scientific and research activities in natural science are also among the list. The presence of some seemingly unrelated industries (e.g., legal activities) may suggest that some businesses hold rights on behalf of other firms or that applicants are large corporations operating in several fields, which are not entirely captured by the business register in Uruguay (e.g., real estate).

Table 12: PVR-intensive industries

ISIC code	ISIC description	Trade marks per 1,000 employees
129	Growing of other perennial crops	240.00
128	Growing of spices, aromatic, drug, and pharmaceutical crops	83.67
4620	Wholesale of agricultural raw materials and live animals	70.62
4669	Wholesale of waste and scrap and other products n.e.c.	38.04
122	Growing of tropical and subtropical fruits	32.00
4662	Wholesale of metals and metal ores	17.79
7210	Research and experimental development on natural sciences and engineering	17.40
6430	Trusts, funds and similar financial entities	11.18
220	Logging	9.74
1103	Manufacture of malt liquors and malt	9.00
2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	8.72
6910	Legal activities	7.03

210	Silviculture and other forestry activities	5.23
2012	Manufacture of fertilizers and nitrogen compounds	4.06
113	Growing of vegetables and melons, roots and tubers	3.89
150	Mixed farming	3.60
112	Growing of rice	2.90
6810	Real estate activities with own or leased property	2.89
7490	Other professional, scientific and technical activities n.e.c.	2.75

Notes: based on plant variety rights granted in 2014-2019.

7.6. All IPR-intensive industries

Overall, the study identified 173 IPR-intensive industries in Uruguay in 2014-2019. Although most industries are intensive in only one IPR, results indicate that some industries are intensive in more than one IP right. For example, industry 2011 “Manufacture of basic chemicals” is intensive in both trade marks and patents. Industry 2100 “Manufacture of pharmaceuticals, medicinal chemical and botanical products” is an intensive user of trade marks, patents, and plant variety rights. As Table 13 shows, 54 industries (31%) are intensive in more than one IPR. About half of the copyright-intensive industries are also trade mark-intensive, similar to the EU case (EPO and EUIPO, 2019). Table 25 in Appendix 11 summarises the results presented so far by listing all 173 IPR-intensive industries, together with an indication of the IPR they are intensive in.

Table 13: Overlapping use of IP rights

IP right	Number of industries intensive in the IPRs
CR	30
DES	1
PAT	14
PVR	2
TM	72
PAT, PVR	2
TM, CR	25
TM, DES	4
TM, GI	1
TM, PAT	11
TM, PVR	5
TM, PAT, CR	2
TM, PAT, DES	1
TM, PAT, PVR	2
TM, PAT, CR, PVR	1
Intensive in one IPR	119
Intensive in more than one IPR	54

Trade marks are used intensively by 72% of the industries, similar to the EU, while a total of 33 industries (19%) use patents intensively. Significant overlaps are those between trade marks and copyrights (25 industries), as indicated above, as well as between trade marks and patents (11 industries). Only one industry, 4669 “Wholesale of waste and scrap and other products n.e.c.” is intensive in the use of four IPRs (trade marks, patents, copyrights, and plant variety rights).

Among industries that are intensive in only one IPR, 72 industries are intensive exclusively on trade marks, 30 on copyrights, 14 on patents, and 2 on plant variety rights. Only one industry is exclusively design-intensive.

Regarding the distribution across sectors, manufacturing industries tend to use trade marks more intensively than any other IPR. Out of the 72 manufacturing industries that are IPR-intensive, 52 are trade mark-intensive. Only 8 manufacturing industries are patent-intensive. Only 8 industries in agriculture, forestry and fishing are IPR-intensive, most of them intensive in both trade marks and plant variety rights.

Of those industries that intensive exclusively on one IPR, the distribution is as follows. Among trade marks-only-intensive industries, about half belong to manufacturing, and about half belong to commerce and services. The 14 industries that are exclusively patent-intensive are concentrated in commerce and services, for example, 8530 “Higher education” or 9521 “Repair of consumer electronics”. 5629 “Other food service activities” is the only industry exclusively intensive in designs. Industries exclusively intensive in plant variety rights are 129 “Growing of perennial crops” and 220 “Logging”.

To prevent double-counting in the contribution of IPR-intensive industries to the economy, the fact that some IPR-intensive industries use multiple rights intensively was taken into account when quantifying their employment, value added, and trade contributions in Chapter 8.

8. Contribution of IPR-intensive industries to the Uruguayan economy

The previous Chapter focused on the identification of IPR-intensive industries. Drawing on economic data of the Uruguayan economy, this Chapter characterizes IPR-intensive industries in terms of their contribution to employment, GDP, international trade, and wages.

8.1. Contribution to employment, GDP, trade, and wages

8.1.1. Employment

A total of approximately 980,000 people were formally employed in Uruguay per year on average in 2014-2019. Table 14 shows the contribution of IPR-intensive industries to total formal employment. Around 36% of the formally employed worked in IPR-intensive industries in 2014-2019, accounting for a little bit over 350,000 workers. Trade mark-intensive industries account for the largest share of employment, with 27.4%, followed by patent-intensive industries. Together, copyright- and design-intensive industries account for less than 10% of total formal employment. PVR- and GI-intensive industries account for around 3% of total formal employment.

Since some industries are intensive in more than one IPR, the sum of employment shares for each IP right is more than the employment share of all IPR-intensive industries. The latter is calculated by counting industries only once, to avoid double-counting. Moreover, the contribution of copyright-intensive industries is weighted according to their corresponding factors. For example, if a copyright-intensive industry has a factor equal to 20%, only 20% of employment in that 4-digit industry is considered. The only GI-intensive industry is weighted with a factor equal to 0.88, as explained in section 6.8. Whenever an industry is intensive in the use of copyrights or GIs as well as in another IPR, then the factor considered for its contribution is 100%.

Table 14: Direct contribution of IPR-intensive industries to formal employment, 2014-2019

IPR-intensive industries	Employment (direct)	Share of total employment (direct)
Copyright-intensive	65,757	6.7%
Design-intensive	8,022	0.8%
Geographical indication-intensive	1,279	0.1%
Patent-intensive	116,253	11.8%
Plant variety rights-intensive	22,815	2.3%
Trade mark-intensive	268,983	27.4%
All IPR-intensive	352,999	35.9%
Total formal employment in Uruguay	982,948	

Notes: Due to overlapping use of IP rights, the sum of the shares of the individual IPRs exceeds the total share of IPR-intensive industries.

8.1.2. GDP

Gross domestic product (GDP) is the most common measure of economic activity. It accounts for the total value of final goods and services produced in a given country during a given time period, generally a year. In the case of Uruguay, the Central Bank of Uruguay (BCU) is responsible for producing national accounts statistics, including GDP. Value added produced in each industry is reported at factor cost, excluding product-specific taxes and subsidies. Industry value added equals the industry's sales minus its purchases of intermediate goods and services from other industries. GDP for Uruguay averaged around UY\$1,612,000 million per year, or US\$ 56,400 million, in 2014-2018.

As in EPO and EUIPO (2019), the starting point for estimating the share of IPR-intensive industries in GDP involved obtaining value added figures for each industry at the lowest level of disaggregation. Industry-level value added in Uruguay is available only at the 2-digit level under the CNBCU classification,

as explained in Chapter 6. In order to disaggregate value-added at the 4-digit level, first, correspondences between the CNBCU and the ISIC Rev. 3 and between ISIC Rev. 3 and ISIC Rev. 4 were applied. Second, the share the wage bill of each IPR-intensive class in the wage bill of its corresponding 2-digit division was applied as a factor to disaggregate value added.

However, before sectoral estimates could be compared with the economy-wide GDP, they had to be adjusted in order to ensure that measurement of sector value added was consistent with total value. Specifically, industry-level value added is defined at factor cost, which excludes taxes and subsidies associated with production. On the other hand, GDP is the sum of gross value added (GVA) at basic prices in all industries of the economy net of taxes and subsidies. The difference between factor cost and basic prices is that the latter (for each industry) take into account taxes and subsidies associated with production. Therefore, to obtain a homogenous ratio based on GDP, the figures from the BCU had to be converted to be consistent with the GDP definition. Otherwise, the ratios of sectoral GDP to total GDP would be understated because the nominator and denominator would not be defined in the same way.

In order to achieve consistency, the data was adjusted by multiplying industry value-added for each IPR-intensive industry by a factor equal to the ratio between value added at factor cost and gross value added (GVA) at basic prices for each industry. All classes within each division were divided by the same factor. Second, the ratio between GDP and GVA for the whole economy was applied to each adjusted value-added figure from the first step. The resulting industry-level adjusted value-added figures are compatible with GDP.

The contribution of IPR-intensive industries to the Uruguayan economy is shown in Table 15. Almost 50% of total economic output in the country is generated in IPR-intensive industries. Trade mark-intensive industries contribute with 43.3% of GDP, while patent-intensive and copyright-intensive industries

contribute with 22.8% and 4.3%, respectively, with smaller contributions coming from PVR-, design-, and GI-intensive industries. As was the case for the employment estimates described in the preceding section, for the purposes of calculating the total contribution of IPR-intensive industries to GDP, each industry was counted only once, even if it used more than one IP right intensively.

Table 15: Contribution of IPR-intensive industries to GDP, 2014-2019 average

IPR-intensive industries	Value-added (UY\$ million)	Share of total GDP
Copyright-intensive	69,668.7	4.3%
Design-intensive	9,604.9	0.6%
Geographical indication-intensive	1,840.3	0.1%
Patent-intensive	368,110.3	22.8%
Plant variety rights-intensive	37,543.0	2.3%
Trade mark-intensive	698,128.1	43.3%
All IPR-intensive	788,726.3	48.9%
Total GDP	1,611,666.9	

Notes: Due to overlapping use of IP rights, the sum of the shares of the individual IPRs exceeds the total share of IPR-intensive industries.

8.1.3. International trade

The third major economic variable to which IPR-intensive industries contribute to the economy of Uruguay is international trade. A sizable fraction of both imports and exports of goods corresponds to IPR-intensive industries.

Table 16 summarizes international trade in goods in IPR-intensive industries, based on data for 2014-2019. In the case of exports, 44.0% of total exports are related to IPR-intensive sectors, while in the case of imports, 53.8% are due to IPR-intensive sectors. Overall, IPR-intensive industries generated a trade

deficit of about US\$ 1,315 million. In both trade directions, trade mark-intensive industries are responsible for the majority of trade flows.

As in the case of the employment and GDP figures, the trade figures for the four IP rights add up to more than the overall figure for IPR-intensive industries because many industries are intensive in more than one IP right.

Table 16: Contribution of IPR-intensive industries to international trade in goods, 2014-2019 average

IPR-intensive industries	Exports (US\$)	Share of total exports	Imports (US\$)	Share of total imports
Copyright-intensive	23,011,258	0.3%	263,158,917	3.0%
Design-intensive	300,811,165	3.8%	497,469,121	5.6%
Geographical indication- intensive	11,730,206	0.1%	90,927,658	1.0%
Patent-intensive	318,494,755	4.0%	1,245,847,355	14.0%
Plant variety rights-intensive	553,816,871	7.0%	358,451,699	4.0%
Trade mark-intensive	3,189,225,498	40.4%	4,024,562,680	45.2%
All IPR-intensive	3,473,685,710	44.0%	4,788,365,346	53.8%
Total for Uruguay	7,901,689,614		8,895,034,419	

Notes: Due to overlapping use of IP rights, the sum of the shares of the individual IPRs exceeds the total share of IPR-intensive industries.

Regarding trade in services, balance of payments data from the BCU include exports and imports of services at higher level of disaggregation than needed to match trade data to 4-digit IPR-intensive industries. Moreover, the BCU does not provide a correspondence between these services categories and the ISIC. For this reason, a manual assignment of 4-digit industries was made to estimate the contribution of IPR-intensive industries to trade in services. Appendix 10.2 includes a description of this assignment, including contributing factors of each 4-digit industry within higher aggregated services categories, based on their share of the corresponding wage bill. Table 17 shows the

contribution of IPR-intensive industries to exports and imports of services for 2014-2019. On average, IPR-intensive industries were responsible for 74.6% of services exports and 50.7% of services imports, recording a trade surplus of US\$ 1,448 million.

Table 17: Contribution of IPR-intensive industries to international trade in services in, 2014-2019 average

Trade in services	IPR-intensive services industries (US\$ million)	Total for Uruguay (US\$ million)	Share of IPR-intensive services industries (%)
Services exports	3,319	4,450	74.6%
Services imports	1,871	3,693	50.7%

8.1.4. Wages

The data from the BPS used in this study allows for the calculation of the average wage paid by each industry to its workforce. In order to properly compute average wages for IPR-intensive industries, the following procedure was employed. First, using the information on total employment and the average wage for each 4-digit industry, the total wage bill was calculated for each industry. Then, the total wage bill of IPR-intensive industries as a whole was calculated by summing across all IPR-intensive industries. Finally, the average wage of IPR-intensive industries was computed by dividing the total wage bill of IPR-intensive industries by total employment in IPR-intensive industries (as reported in Table 14). Table 18 presents the results.

The average monthly wage in 2014-2019 in IPR-intensive industries was UY\$ 39,532 compared to UY\$ 29,498 for non-IPR-intensive industries, while it was UY\$ 33,102 for the overall economy (at the 4-digit industry level). This implies a 34% wage premium for IPR-intensive industries in 2014-2019. The highest

premium was estimated for PVR-intensive industries, at 200%, followed by patent-intensive industries (41%). Copyright-intensive industries had the lowest premium, at 22%.

Table 18: Average wages in IPR-intensive industries, 2014-2019

IPR-intensive industries	Average wage (UY\$ per month)	Premium (compared to non-IPR-intensive industries)
Copyright-intensive	35,848	22%
Design-intensive	38,565	31%
Geographical indication-intensive	36,936	25%
Patent-intensive	41,492	41%
Plant variety rights-intensive	88,433	200%
Trade mark-intensive	39,881	35%
All IPR-intensive	39,532	34%
Non-IPR-intensive	29,498	
All industries	33,102	

8.1.5. The main IPR-intensive industries in Uruguay

So far, the analysis in this chapter has focused on IPR-intensive industries aggregated by IP right or in total. In this section, the contributions to employment and GDP are broken down by industry. Table 19 shows the top-20 IPR-intensive industries making the largest contribution to employment.

Table 19: IPR-intensive industries (employment, 2014-2019)

ISIC code	ISIC description	Employment	Intensive IPR
6820	Real estate activities on a fee or contract basis	17,641	TM, PAT
4630	Wholesale of food, beverages and tobacco	17,483	TM
1071	Manufacture of bakery products	14,682	TM
9499	Activities of other membership organizations n.e.c.	9,942	CR
4772	Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialized stores	9,734	TM, PAT
6810	Real estate activities with own or leased property	9,337	TM, PAT

4773	Other retail sale of new goods in specialized stores	9,228	CR
4649	Wholesale of other household goods	8,721	TM
9329	Other amusement and recreation activities n.e.c.	8,515	CR
6201	Computer programming activities	8,422	TM, CR
4100	Construction of buildings	7,941	TM, PAT
9609	Other personal service activities n.e.c.	7,793	PAT
4690	Non-specialized wholesale trade	7,679	TM
4759	Retail sale of electrical household appliances, furniture, lighting equipment and other household articles in specialized stores	7,676	TM
7490	Other professional, scientific and technical activities n.e.c.	7,637	TM, PAT, CR
4663	Wholesale of construction materials, hardware, plumbing and heating equipment and supplies	7,236	TM
4510	Sale of motor vehicles	7,158	TM
190	Rural establishments	7,043	TM, PAT
4641	Wholesale of textiles, clothing and footwear	6,307	TM
1012	Processing and preserving of cold-cut meat	6,258	TM

Employment in these 20 industries adds up to 186,430 people, accounting for 53% of total employment in the 173 IPR-intensive industries identified in this study. The list is dominated by trade mark-intensive (16 out of 20, either individually or combined). In terms of sectors, retail and wholesale trade activities account for half of the industries, and almost 50% of employment of the top-20 industries. There are only two manufacturing activities in the list.

Table 20 shows the top-20 IPR-intensive industries ranked according to their contribution to GDP. Overall, these 20 industries account for 69% of total value-added generated in the 173 IPR-intensive industries identified in this study (equivalent to 34% of economy-wide value-added). Interestingly, only 7 manufacturing industries appear in the top-20 IPR-intensive industries ranked by value-added.

Table 20: IPR-intensive industries (GDP, 2014-2019 average)

ISIC code	ISIC description	Value-added (UY\$)	Value-added (%)	Intensive IPR
6820	Real estate activities on a fee or contract basis	130,860,248	8.1%	TM, PAT
4100	Construction of buildings	77,037,469	4.8%	TM, PAT
6810	Real estate activities with own or leased property	64,076,476	4.0%	TM, PAT
8411	General public administration activities	37,900,117	2.4%	TM
1200	Manufacture of tobacco products	26,499,292	1.6%	TM
6100	Telecommunications	24,291,438	1.5%	TM
3510	Electric power generation, transmission and distribution	17,532,851	1.1%	TM
1701	Manufacture of pulp, paper and paperboard	16,797,663	1.0%	TM, CR
4630	Wholesale of food, beverages and tobacco	15,762,636	1.0%	TM
6611	Administration of financial markets	14,935,573	0.9%	TM
8530	Higher education	14,715,304	0.9%	PAT
1050	Manufacture of dairy products	14,458,687	0.9%	TM
1071	Manufacture of bakery products	13,998,732	0.9%	TM
6201	Computer programming activities	13,452,356	0.8%	TM, CR
1104	Manufacture of soft drinks; production of mineral waters and other bottled waters	12,043,682	0.7%	TM
1012	Processing and preserving of cold-cut meat	12,016,629	0.7%	TM
2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	11,391,541	0.7%	TM, PAT, PVR
6499	Other financial service activities, except insurance and pension funding activities, n.e.c.	11,168,946	0.7%	TM
4649	Wholesale of other household goods	8,840,182	0.5%	TM
6622	Activities of insurance agents and brokers	8,082,995	0.5%	PAT

9. Appendix: Patenting by resident status in Uruguay

A relevant feature about patenting behaviour in Uruguay is that only around 3% of patent holders were residents in 2014-2019, and only 10% of design holders were residents. This low fraction is not specific to the period under study, but a general characteristic of patenting behaviour in Uruguay. In fact, the average fraction of patents filed by residents in the last 20 years in Uruguay is 4.8%, as reported by RICYT¹³. Unfortunately, this results in very few industries that have IPRs associated with residents, especially for patents. This is not a limitation of the data but a characteristic of patenting in Uruguay (and in most LAC countries more generally), which, in itself, is a result worth highlighting because it shows a fundamental difference with patenting behaviour in most EU countries.

An alternative is to consider both resident and non-resident holders. However, this would make results non-comparable with earlier (and ongoing) efforts to characterize IPR-intensive industries in other countries in the EU or LAC. On the one hand, firms may decide to register patents in Uruguay even if they do not operate in the country, hence not contributing to employment nor value added. This could overstate the IPR-intensity of some industries and the contribution of certain IPRs to economic activity. On the other, some activities outside manufacturing (e.g., general education) which generate significant innovation and R&D in Uruguay may not appear as IPR-intensive because the industry of use (IOU), rather than industry of origin (IOO), would be recorded.

To be concrete, the difference between IOO and IOU approaches for patents might induce a non-trivial bias in the case of the Uruguayan economy, in which manufacturing activities only account for 11% of total GDP (BCU, 2021). Two examples will illustrate this point clearly:

¹³ RICYT collects comparable science, technology and innovation indicators, including patent applications and patents granted by the country of residence of the applicant for Latin America and the Caribbean. See www.ricyt.org.

1. Consistent with patenting activity worldwide, pharmaceutical patents will surely account for a sizable share of non-residents' patents in Uruguay¹⁴. However, as might be inferred from their negligible contribution to GDP in Uruguay (0.5% of total GDP), it is fair to infer that there is practically no pharmaceutical manufacturing in the country. Instead, international pharmaceutical companies register their patents in Uruguay to protect their inventions and, eventually, sell their products. In this case, most likely, they will supply their products with imports, having a contribution to the Uruguayan economy in freight, logistics, wholesale and retail sectors. Nevertheless, the approach based on using patents' IPC sectors will suggest that pharmaceutical manufacturing will play an important role in the Uruguayan economy (which will also produce a higher intensity given its small employment levels). Patents on medical devices and computer technology could have a similar bias.
2. One of the top applicants and holders of patents in Uruguay is Universidad de la República (UDELAR), by far the largest public university in the country.¹⁵ By matching the UDELAR patents to its industry code, we were capable of identifying higher education as a patent-intensive sector (ranked in the 6th position). However, if we rely on the IPC concordance tables, those patents will certainly be assigned to industries such as renewable energy, agricultural activities, and various manufacturing activities. By following this approach, we will miss the opportunity to highlight a very characteristic feature of science, technology and innovation systems in LAC countries (i.e., the relevant

¹⁴EPO places pharmaceutical technology-related patents as the 6th technology domain in Europe in 2020. More information can be found at <https://www.epo.org/about-us/annual-reports-statistics/statistics/2020/statistics/patent-applications.html#pharmaceuticals>.

¹⁵ According to RICYT, higher education explains almost 60% of total R&D investment in the country (and explains 40% of total R&D use). It is followed by government organizations such as INIA and other public research organizations.

role of public organizations and higher education sector funded with public funds).

Even if we still decided to consider non-residents for identifying IPR-intensive industries in Uruguay, a related issue is the assignment of economic activities to applicants. We will illustrate this issue with patents, but a similar argument applies to trade marks and designs. Since most non-residents are not included in Uruguay's business register, we would not have a source to assign industries to non-resident applicants. An alternative is to use patents' IPC categories.¹⁶ However, this strategy changes the focus of the study and renders results non-comparable with previous efforts. This is because, rather than classifying IPRs into the industry of the holder, the exercise would classify IPRs according to their area of technology.¹⁷ These two are not necessarily the same, nor should they be in the same group of industries.

As an example, consider Table 21 and Table 22, which report absolute patent intensities in Uruguay using data on patents with at least one resident applicant matched to the business register and for which an IPC category is available. Both tables report the top-20 industries by their absolute intensities. Table 21 reports results using applicants registered economic activity (under the ISIC Rev. 4) and Table 22 reports results using patents' IPC industry (converted to the NACE 2 in order to make it comparable to the ISIC Rev. 4).¹⁸ As can be

¹⁶ For Uruguay, one drawback is that industry correspondences between the IPC and the ISIC are not straightforward or may be outdated. For instance, a MERIT correspondence between the IPC and ISIC is available, but for the ISIC Rev. 2, which is far from ISIC Rev. 4 in which employment data in Uruguay are available. We are not aware of any other *direct* correspondence between the IPC and the ISIC. Eurostat makes available correspondences between the IPC V8 and the NACE Rev. 2 and between the NACE Rev. 2 and the ISIC Rev. 4.

¹⁷ Dorner and Harhoff (2017) discuss the applicability of different methodologies and correspondences to produce better matches to either the industry of use (IOU) or the industry of origin (IOO).

¹⁸ The IPC to NACE correspondence is available from the EPO at <https://forums.epo.org/concordance-table-between-ipc-and-nace2-9756>.

seen from the tables, there are significant differences between applicants' industries of origin and patents' areas of technology. Whereas only 5 manufacturing industries are included in the top-20 list using applicants' industry of origin, all but one industry are manufacturing industries if we consider patents' areas of technology. These results suggest that using IPC categories to impute applicant's economic activities could introduce important biases that would affect the interpretation of results and limit their comparability with previous efforts to estimate IPR-intensive industries.

For reference, Table 23 reports the full list of industries' absolute intensities using applications filed by non-residents in Uruguay during 2014-2019. All but four industries are manufacturing industries.

Table 21: Absolute patent intensity of selected industries with at least one resident holder in Uruguay, using applicants registered economic activity

ISIC code	ISIC description	Absolute intensity
8530	Higher education	7.83
4100	Construction of buildings	5.50
7490	Other professional, scientific and technical activities n.e.c.	5.00
2821	Manufacture of agricultural and forestry machinery	5.00
6820	Real estate activities on a fee or contract basis	5.00
190	Rural establishments	4.58
9609	Other personal service activities n.e.c.	4.00
3100	Manufacture of furniture	3.75
8690	Other human health activities	3.50
7110	Architectural and engineering activities and related technical consultancy	3.33
4922	Other passenger land transport	3.00
4772	Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialized stores	3.00
141	Raising of cattle and buffaloes	3.00
6810	Real estate activities with own or leased property	3.00
4669	Wholesale of waste and scrap and other products n.e.c.	2.50
3290	Other manufacturing n.e.c.	2.00

2599	Manufacture of other fabricated metal products n.e.c.	2.00
2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	2.00
4661	Wholesale of solid, liquid and gaseous fuels and related products	2.00
6201	Computer programming activities	1.50

Notes: based on patents filed by residents in 2014-2019.

Table 22: Absolute patent intensity of selected industries with at least one resident holder in Uruguay, using patents' areas of technology

NACE code	NACE description	Absolute intensity
28.30	Manufacture of Agricultural and Forestry Machinery	16.33
32.50	Manufacture of medical and dental instruments and supplies	12.00
21.00	Manufacture of Basic Pharmaceutical Products and Pharmaceutical Preparations	11.00
29.10	Manufacture of Motor Vehicles	10.50
43.00	Specialised Construction Activities	7.75
10.00	Manufacture of Food Products	6.50
30.00	Manufacture of Other Transport Equipment	4.00
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	4.00
28.23	Manufacture of Office Machinery and Equipment Except Computers and Peripheral Equipment	3.50
28.10	Manufacture of General-Purpose Machinery	3.00
20.20	Manufacture of pesticides and other agrochemical products	2.50
26.70	Manufacture of Optical Instruments and Photographic Equipment	2.00
27.40	Manufacture of Electric Lighting Equipment	2.00
20.10	Manufacture of Basic Chemicals, Fertilisers and Nitrogen Compounds, Plastics and Synthetic Rubber in Primary Forms	2.00
32.99	Manufacturing NEC	2.00
28.25	Manufacture of Non-Domestic Cooling and Ventilation Equipment	2.00
32.00	Other Manufacturing	2.00
28.29	Manufacture of Other General-Purpose Machinery NEC	2.00
31.00	Manufacture of Furniture	2.00
23.00	Manufacture of Other Non-Metallic Mineral Products	2.00

Notes: based on patents filed by residents in 2014-2019. A correspondence between patents' IPC category and the NACE classification was used to convert areas of technology.

Table 23: Absolute patent intensity of industries based on filings by non-residents in Uruguay

NACE code	NACE description	Absolute intensity
21.00	Manufacture of Basic Pharmaceutical Products and Pharmaceutical Preparations	1,381.0
20.20	Manufacture of pesticides and other agrochemical products	517.5
10.00	Manufacture of Food Products	155.5
20.10	Manufacture of Basic Chemicals, Fertilisers and Nitrogen Compounds, Plastics and Synthetic Rubber in Primary Forms	99.0
32.50	Manufacture of medical and dental instruments and supplies	68.0
28.90	Manufacture of Other Special-Purpose Machinery	52.0
28.30	Manufacture of Agricultural and Forestry Machinery	51.0
28.10	Manufacture of General-Purpose Machinery	33.0
29.10	Manufacture of Motor Vehicles	31.0
43.00	Specialised Construction Activities	25.0
28.29	Manufacture of Other General-Purpose Machinery NEC	22.0
17.00	Manufacture of Paper and Paper Products	21.0
32.00	Other Manufacturing	20.0
19.00	Manufacture of Coke and Refined Petroleum Products	18.0
27.50	Manufacture of Domestic Appliances	17.0
26.30	Manufacture of Communication Equipment	15.0
26.20	Manufacture of computers and peripheral equipment	15.0
28.40	Manufacture of Metal Forming Machinery and Machine Tools	15.0
28.23	Manufacture of Office Machinery and Equipment Except Computers and Peripheral Equipment	13.0
20.50	Manufacture of Other Chemical Products	11.0
22.00	Manufacture of Rubber and Plastic Products	10.0
26.50	Manufacture of Instruments and Appliances for Measuring, Testing and Navigation; Watches and Clocks	10.0
20.30	Manufacture of Paints, Varnishes and Similar Coatings, Printing Ink and Mastics	10.0
30.00	Manufacture of Other Transport Equipment	9.0
25.70	Manufacture of Cutlery, Tools and General Hardware	9.0
26.10	Manufacture of Electronic Components and Boards	8.0
27.10	Manufacture of Electric Motors, Generators, Transformers and Electricity Distribution and Control Apparatus	7.0

11.00	Manufacture of Beverages	6.0
20.20	Manufacture of Pesticides and Other Agrochemical Products	6.0
27.33	Manufacture of Wiring Devices	6.0
42.91	Construction of Water Projects	5.0
23.50	Manufacture of Other Non-Metallic Mineral Products - Manufacture of Cement, Lime and Plaster	5.0
12.00	Manufacture of Tobacco Products	5.0
20.40	Manufacture of Soap and Detergents, Cleaning and Polishing Preparations, Perfumes and Toilet Preparations	5.0
14.00	Manufacture of Wearing Apparel	4.0
23.00	Manufacture of Other Non-Metallic Mineral Products	4.0
28.14	Manufacture of Other Taps and Valves	4.0
10.50	Manufacture of Dairy Products	3.0
13.00	Manufacture of Textiles	3.0
16.00	Manufacture of Wood and of Products of Wood and Cork, Except Furniture; Manufacture of Articles of Straw and Plaiting Materials	3.0
22.20	Manufacture of Plastics Products	3.0
62.00	Computer Programming, Consultancy and Related Activities	3.0
28.22	Manufacture of Lifting and Handling Equipment	3.0
27.12	Manufacture of Electricity Distribution and Control Apparatus	3.0
27.90	Manufacture of other electrical equipment	3.0
27.20	Manufacture of Batteries and Accumulators	2.0
24.00	Manufacture of Basic Metals	2.0
18.10	Printing and Service Activities Related to Printing	2.0
32.99	Manufacturing NEC	2.0
23.10	Manufacture of Other Non-Metallic Mineral Products - Manufacture of Glass and Glass Products	2.0
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	2.0
26.51	Manufacture of Instruments and Appliances for Measuring, Testing and Navigation	2.0
28.21	Manufacture of Ovens, Furnaces and Furnace Burners	1.0
42.20	Construction of Utility Projects	1.0
28.94	Manufacture of Machinery for Textile, Apparel and Leather Production	1.0
31.00	Manufacture of Furniture	1.0
25.94	Manufacture of Fasteners and Screw Machine Products	1.0
28.99	Manufacture of Other Special-Purpose Machinery NEC	1.0
25.40	Manufacture of Weapons and Ammunition	1.0
23.42	Manufacture of Ceramic Sanitary Fixtures	1.0
28.11	Manufacture of Engines and Turbines, Except Aircraft, Vehicle and Cycle Engines	1.0

20.51	Manufacture of Other Chemical Products Manufacture of Explosives	1.0
28.92	Manufacture of Machinery for Mining, Quarrying and Construction	1.0
26.70	Manufacture of Optical Instruments and Photographic Equipment	1.0
26.11	Manufacture of Electronic Components	1.0
25.90	Manufacture of Other Fabricated Metal Products	1.0
27.40	Manufacture of Electric Lighting Equipment	1.0

Notes: based on patents filed by non-residents in 2014-2019. A correspondence between patents' IPC category and the NACE classification was used to convert areas of technology.

10. Appendix: Methodology

10.1. Description of approximate string-matching algorithms

The main difficulty of matching information of IPR holders present in patents, trade marks, and designs to candidate firms and individuals in business registers resided in the lack of a unique common identifier to link datasets. Instead, the matching process had to rely on holders' reported names. In turn, this was complicated by the frequent discrepancies between the names reported in IPR records and those present in business records.

There are several computational approaches to this kind of problem, usually known as approximate string-matching tools. Different algorithms have been designed to match similar but not identical strings and tackle this problem. In this study, four different approaches were tested to determine the best candidate in the business register for each IPR holder:

1. **SoundEx**: a phonetic algorithm that tries to match strings based on how they would sound.
2. **Levenshtein**: an algorithm that calculates the distance between two strings by looking at how many edit steps are needed to get from one string to another. The score indicates the minimum number of changes needed.
3. **Jaro Winkler**: an algorithm that calculates a similarity index between two strings based on the number of characters that match, with a correction that gives a higher rank for the match at the beginning of the string. The result is a fraction between zero, indicating no similarity, and one, indicating an identical match.
4. **Pair-letters similarity**: an algorithm that dissects the two strings in pairs and calculates the similarity of the two strings by dividing the number of common pairs by the sum of the pairs from both strings.

The use of SoundEx gave poor results because the implementation was limited to a certain number of characters and because it was developed for English phonetics. As a result, many candidates had the same rating for each holder and with very low accuracy. Levenshtein, Jaro Winkler, and Pair-letters showed better results and were manually checked on a smaller random sample. The best-performing method turned out to be the application of Pair-letters on subsets of holders and candidates sharing the same initial character. This improved accuracy and had a much lower computational cost.

10.2. Assignment of IPR-intensive industries to service categories in international trade in services data

In order to compute the contribution of IPR-intensive industries to exports and imports of services, an assignment of 4-digit ISIC industries had to be made to services categories published in the balance of payments data. Table 24 shows the IPR-intensive industries assigned to each category and their corresponding weighting factor, which was derived by computing the wage bill of each 4-digit industry as a share of the corresponding 2-digit aggregate, which most closely matched the aggregate service category. These weights were used to compute the contribution of each IPR-intensive industry in exports and imports of each service category.

Table 24: Assignment and factors of IPR-intensive service-providing industries to service categories in the balance of payments data

Services industries / ISIC Code	ISIC Description	Factor	IPR Intensive
Maintenance and repair services n.e.c.			
3313	Repair of electronic and optical equipment	0.02	TM
Air Transport. Freight and others			

5120	Freight air transport	1.00	TM
Travels			
7911	Travel agency activities	1.00	TM
Construction			
4100	Construction of buildings	0.81	PAT, TM
Direct insurance			
6512	Non-life insurance	0.99	TM
Auxiliary insurance services			
6622	Activities of insurance agents and brokers	0.42	PAT
Explicitly charged services and other financial services			
6499	Other financial service activities, except insurance and pension funding activities, n.e.c.	0.58	TM
6492	Other credit granting	0.05	TM
6430	Trusts, funds and similar financial entities	0.12	TM
6420	Activities of holding companies	0.25	TM
Charges for the use of intellectual property n.e.c.			
7740	Leasing of intellectual property and similar products, except copyrighted works	1.00	TM
Telecommunications services			
6190	Other telecommunications activities	0.25	CR
6130	Satellite telecommunications activities	0.25	CR
6120	Wireless telecommunications activities	0.25	CR
6110	Wired telecommunications activities	0.25	CR
IT services			
6201	Computer programming activities	0.67	TM, CR
6202	Computer consultancy and computer facilities management activities	0.13	TM, CR
6209	Other information technology and computer service activities	0.19	CR
Information services			
6311	Data processing, hosting and related activities	0.63	TM, CR
6312	Web portals	0.14	TM, CR
6391	News agency activities	0.05	TM, CR
6399	Other information service activities n.e.c.	0.17	TM, CR

Professional and consulting services in business administration

6910	Legal activities	0.64	PAT
------	------------------	------	-----

Technical services related to trade and other business services

8211	Combined office administrative service activities	0.04	TM
8219	Photocopying, document preparation and other specialized office support activities	0.00	CR
8299	Other business support service activities n.e.c.	0.04	PAT
7110	Architectural and engineering activities and related technical consultancy	0.14	PAT, TM
7310	Advertising	0.19	TM, CR
7410	Specialized design activities	0.03	TM, CR
7420	Photographic activities	0.06	CR
7490	Other professional, scientific and technical activities n.e.c.	0.28	PAT, TM, CR

Audiovisual and related services

5811	Book publishing	0.00	TM, CR
5813	Publishing of newspapers, journals and periodicals	0.01	CR
5819	Other publishing activities	0.01	CR
5820	Software publishing	0.00	CR
5911	Motion picture, video and television programme production activities	0.09	TM, CR
5912	Motion picture, video and television programme post-production activities	0.01	CR
5913	Motion picture, video and television programme distribution activities	0.02	TM, CR
5914	Motion picture projection activities	0.02	CR
5920	Sound recording and music publishing activities	0.01	CR
6010	Radio broadcasting	0.15	TM, CR
6020	Television programming and broadcasting activities	0.69	TM, CR

Other personal cultural and recreational services

8530	Higher education	0.02	PAT
8542	Cultural education	0.00	TM, CR
9000	Creative, arts and entertainment activities	0.02	CR
9101	Library and archives activities	0.00	CR
9102	Museums activities and operation of historical sites and buildings	0.00	CR
9103	Botanical and zoological gardens and nature reserves activities	0.00	TM

9200	Gambling and betting activities	0.01	TM
9321	Activities of amusement parks and theme parks	0.00	CR
9329	Other amusement and recreation activities n.e.c.	0.04	CR
Government goods and services, n.e.c.			
8411	General public administration activities	0.56	TM
8413	Regulation of and contribution to more efficient operation of businesses	0.00	TM

11. Appendix: Additional results

11.1. All IPR-intensive industries in Uruguay

Table 25 lists all IPR-intensive industries in Uruguay identified by the study in 2014-2019, with the corresponding IPRs in which they are intensive. Overall, the study identified 173 IPR-intensive industries.

Table 25: List of all IPR-intensive industries in Uruguay

ISIC code	ISIC description	Intensive in IPR indicator					
		TM	PAT	DES	CR	PVR	GI
121	Growing of grapes		x				
122	Growing of tropical and subtropical fruits	x				x	
126	Growing of oleaginous fruits	x					
128	Growing of spices, aromatic, drug and pharmaceutical crops	x	x			x	
129	Growing of other perennial crops					x	
190	Rural establishments	x	x				
220	Logging					x	
321	Marine aquaculture	x					
990	Support activities for other mining and quarrying		x				
1012	Processing and preserving of cold-cut meat	x					
1040	Manufacture of vegetable and animal oils and fats	x		x			
1050	Manufacture of dairy products	x					
1061	Manufacture of grain mill products	x					
1071	Manufacture of bakery products	x					
1072	Manufacture of sugar	x					
1073	Manufacture of cocoa, chocolate and sugar confectionery	x					
1079	Manufacture of other food products n.e.c.	x					

1080	Manufacture of prepared animal feeds	x	
1101	Distilling, rectifying and blending of spirits	x	
1102	Manufacture of wines	x	x
1103	Manufacture of malt liquors and malt	x	x
1104	Manufacture of soft drinks; production of mineral waters and other bottled waters	x	
1200	Manufacture of tobacco products	x	
1392	Manufacture of made-up textile articles, except apparel	x	
1399	Manufacture of other textiles n.e.c.	x	
1410	Manufacture of wearing apparel, except fur apparel	x	
1430	Manufacture of knitted and crocheted apparel	x	
1520	Manufacture of footwear	x	
1701	Manufacture of pulp, paper and paperboard	x	x
1709	Manufacture of other articles of paper and paperboard	x	
1811	Printing	x	x
1812	Service activities related to printing		x
1820	Reproduction of recorded media		x
2011	Manufacture of basic chemicals	x	x
2012	Manufacture of fertilizers and nitrogen compounds	x	
2013	Manufacture of plastics and synthetic rubber in primary forms	x	
2021	Manufacture of pesticides and other agrochemical products	x	
2022	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	x	
2023	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	x	
2029	Manufacture of other chemical products n.e.c.	x	x

2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	x	x		x
2211	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	x			
2220	Manufacture of plastics products	x		x	
2392	Manufacture of clay building materials	x		x	
2394	Manufacture of cement, lime and plaster	x			
2399	Manufacture of other non-metallic mineral products n.e.c.	x			
2430	Casting of iron and steel	x			
2592	Treatment and coating of metals; machining		x		
2599	Manufacture of other fabricated metal products n.e.c.	x	x	x	
2620	Manufacture of computers and peripheral equipment				x
2630	Manufacture of communication equipment	x			x
2640	Manufacture of consumer electronics				x
2670	Manufacture of optical instruments and photographic equipment	x			x
2710	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus		x		
2720	Manufacture of batteries and accumulators	x			
2731	Manufacture of fibre optic cables				x
2732	Manufacture of other electronic and electric wires and cables	x		x	
2733	Manufacture of wiring devices	x			
2750	Manufacture of domestic appliances	x			
2790	Manufacture of other electrical equipment	x			

2817	Manufacture of office machinery and equipment (except computers and peripheral equipment)			x
2819	Manufacture of other general-purpose machinery	x		
2821	Manufacture of agricultural and forestry machinery	x	x	
2920	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	x		
3100	Manufacture of furniture		x	
3211	Manufacture of jewellery and related articles	x		x
3220	Manufacture of musical instruments			x
3230	Manufacture of sports goods	x		
3240	Manufacture of games and toys	x		x
3250	Manufacture of medical and dental instruments and supplies	x		
3290	Other manufacturing n.e.c.	x	x	
3313	Repair of electronic and optical equipment	x		
3510	Electric power generation, transmission and distribution	x		
4100	Construction of buildings	x	x	
4510	Sale of motor vehicles	x		
4530	Sale of motor vehicle parts and accessories	x		
4620	Wholesale of agricultural raw materials and live animals	x		x
4630	Wholesale of food, beverages and tobacco	x		
4631	Wholesale of poultry and its products	x		
4641	Wholesale of textiles, clothing and footwear	x		
4649	Wholesale of other household goods	x		
4651	Wholesale of computers, computer peripheral equipment and software	x		x

4652	Wholesale of electronic and telecommunications equipment and parts	x			x	
4653	Wholesale of agricultural machinery, equipment and supplies	x				
4659	Wholesale of other machinery and equipment	x			x	
4661	Wholesale of solid, liquid and gaseous fuels and related products	x	x			
4662	Wholesale of metals and metal ores	x				x
4663	Wholesale of construction materials, hardware, plumbing and heating equipment and supplies	x				
4669	Wholesale of waste and scrap and other products n.e.c.	x	x		x	x
4690	Non-specialized wholesale trade	x				
4722	Retail sale of beverages in specialized stores	x				
4741	Retail sale of computers, peripheral units, software and telecommunications equipment in specialized stores	x			x	
4742	Retail sale of audio and video equipment in specialized stores				x	
4753	Retail sale of carpets, rugs, wall and floor coverings in specialized stores	x				
4759	Retail sale of electrical household appliances, furniture, lighting equipment and other household articles in specialized stores	x				
4761	Retail sale of books, newspapers and stationary in specialized stores				x	
4762	Retail sale of music and video recordings in specialized stores				x	
4763	Retail sale of sporting equipment in specialized stores	x				
4772	Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialized stores	x	x			

4773	Other retail sale of new goods in specialized stores			x
4791	Retail sale via mail order houses or via Internet	x		
4799	Other retail sale not in stores, stalls or markets		x	
5120	Freight air transport	x		
5223	Service activities incidental to air transportation	x		
5629	Other food service activities			x
5630	Beverage serving activities		x	
5811	Book publishing	x		x
5813	Publishing of newspapers, journals and periodicals			x
5819	Other publishing activities			x
5820	Software publishing			x
5911	Motion picture, video and television programme production activities	x		x
5912	Motion picture, video and television programme post-production activities			x
5913	Motion picture, video and television programme distribution activities	x		x
5914	Motion picture projection activities			x
5920	Sound recording and music publishing activities			x
6010	Radio broadcasting	x		x
6020	Television programming and broadcasting activities	x		x
6100	Telecommunications	x		
6201	Computer programming activities	x		x
6202	Computer consultancy and computer facilities management activities	x		x
6209	Other information technology and computer service activities			x
6311	Data processing, hosting and related activities	x	x	x
6312	Web portals	x		x
6391	News agency activities	x		x
6399	Other information service activities n.e.c.	x		x

6419	Other monetary intermediation	x		
6420	Activities of holding companies	x		
6430	Trusts, funds and similar financial entities	x		x
6492	Other credit granting	x		
6499	Other financial service activities, except insurance and pension funding activities, n.e.c.	x		
6512	Non-life insurance	x		
6611	Administration of financial markets	x		
6612	Security and commodity contracts brokerage	x		
6622	Activities of insurance agents and brokers		x	
6810	Real estate activities with own or leased property	x	x	
6820	Real estate activities on a fee or contract basis	x	x	
6910	Legal activities		x	x
7110	Architectural and engineering activities and related technical consultancy	x	x	
7210	Research and experimental development on natural sciences and engineering		x	x
7310	Advertising	x		x
7410	Specialized design activities	x		x
7420	Photographic activities			x
7490	Other professional, scientific and technical activities n.e.c.	x	x	x
7721	Renting and leasing of recreational and sports goods	x		
7722	Renting of video tapes and disks	x		x
7729	Renting and leasing of other personal and household goods			x
7730	Renting and leasing of other machinery, equipment and tangible goods			x

7740	Leasing of intellectual property and similar products, except copyrighted works	x		
7911	Travel agency activities	x		
7912	Tour operator activities	x		
7990	Other reservation service and related activities			x
8030	Investigation activities	x	x	
8130	Landscape care and maintenance service activities		x	
8219	Photocopying, document preparation and other specialized office support activities			x
8299	Other business support service activities n.e.c.		x	
8411	General public administration activities	x		
8413	Regulation of and contribution to more efficient operation of businesses	x		
8530	Higher education		x	
8542	Cultural education	x		x
8620	Medical and dental practice activities		x	
9000	Creative, arts and entertainment activities			x
9101	Library and archives activities			x
9102	Museums activities and operation of historical sites and buildings			x
9103	Botanical and zoological gardens and nature reserves activities	x		
9200	Gambling and betting activities	x		
9321	Activities of amusement parks and theme parks			x
9329	Other amusement and recreation activities n.e.c.			x
9411	Activities of business and employers membership organizations	x		
9412	Activities of professional membership organizations			x
9420	Activities of trade unions	x		

9499	Activities of other membership organizations n.e.c.	x
9521	Repair of consumer electronics	x
9609	Other personal service activities n.e.c.	x

Notes: based on IPRs filed in 2014-2019.

11.2. Patent-intensive industries

Table 26 presents the complete list of patent-intensive industries and the information related to their intensity measured in terms of patents per 1,000 employees.

Table 26: Complete list of patent-intensive industries

ISIC code	ISIC description	Patents per 1,000 employees
2821	Manufacture of agricultural and forestry machinery	24.86
8030	Investigation activities	12.53
990	Support activities for other mining and quarrying	7.73
3290	Other manufacturing n.e.c.	5.19
128	Growing of spices, aromatic, drug and pharmaceutical crops	2.99
121	Growing of grapes	2.47
8530	Higher education	1.95
6311	Data processing, hosting and related activities	1.55
4661	Wholesale of solid, liquid and gaseous fuels and related products	1.45
7110	Architectural and engineering activities and related technical consultancy	1.13
8299	Other business support service activities n.e.c.	1.05

2599	Manufacture of other fabricated metal products n.e.c.	0.96
4669	Wholesale of waste and scrap and other products n.e.c.	0.93
3100	Manufacture of furniture	0.93
4100	Construction of buildings	0.69
9521	Repair of consumer electronics	0.69
7490	Other professional, scientific and technical activities n.e.c.	0.65
190	Rural establishments	0.65
2592	Treatment and coating of metals; machining	0.65
2710	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	0.60
9609	Other personal service activities n.e.c.	0.58
2011	Manufacture of basic chemicals	0.52
4799	Other retail sale not in stores, stalls or markets	0.49
6910	Legal activities	0.44
2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	0.44
6622	Activities of insurance agents and brokers	0.35
8620	Medical and dental practice activities	0.34
8130	Landscape care and maintenance service activities	0.32
6810	Real estate activities with own or leased property	0.32
4772	Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialized stores	0.31
7210	Research and experimental development on natural sciences and engineering	0.30
5630	Beverage serving activities	0.29
6820	Real estate activities on a fee or contract basis	0.28

Notes: based on patents filed in 2014-2019.

11.3. Trade mark-intensive industries

Table 27 presents the complete list of trade mark-intensive industries and the information related to their intensity measured in terms of trade marks per 1,000 employees.

Table 27: List of trade mark-intensive industries considered in the study.

ISIC code	ISIC description	Trade marks per 1,000 employees
6492	Other credit granting	929.03
7740	Leasing of intellectual property and similar products, except copyrighted works	541.94
6419	Other monetary intermediation	470.20
8413	Regulation of and contribution to more efficient operation of businesses	307.69
2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	292.08
1200	Manufacture of tobacco products	284.55
6420	Activities of holding companies	195.88
2733	Manufacture of wiring devices	155.84
2029	Manufacture of other chemical products n.e.c.	128.72
2023	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	121.93
1101	Distilling, rectifying and blending of spirits	114.69
1102	Manufacture of wines	84.63
190	Rural establishments	83.20
2732	Manufacture of other electronic and electric wires and cables	80.43
3290	Other manufacturing n.e.c.	80.42
4100	Construction of buildings	70.14
2750	Manufacture of domestic appliances	68.97
9411	Activities of business and employer's membership organizations	62.91
2021	Manufacture of pesticides and other agrochemical products	61.86
9200	Gambling and betting activities	59.85
1040	Manufacture of vegetable and animal oils and fats	59.79
1073	Manufacture of cocoa, chocolate and sugar confectionery	59.48
5913	Motion picture, video and television programme distribution activities	59.21
3250	Manufacture of medical and dental instruments and supplies	57.01
3230	Manufacture of sports goods	55.94
6430	Trusts, funds and similar financial entities	55.90
4649	Wholesale of other household goods	55.73
1103	Manufacture of malt liquors and malt	49.49
1104	Manufacture of soft drinks; production of mineral waters and other bottled waters	49.39

3313	Repair of electronic and optical equipment	48.84
2211	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	46.88
2399	Manufacture of other non-metallic mineral products n.e.c.	46.44
1079	Manufacture of other food products n.e.c.	46.00
9103	Botanical and zoological gardens and nature reserves activities	43.69
4791	Retail sale via mail order houses or via Internet	42.19
2011	Manufacture of basic chemicals	41.25
6391	News agency activities	39.60
6010	Radio broadcasting	37.93
5811	Book publishing	35.29
6312	Web portals	34.76
6611	Administration of financial markets	34.65
4669	Wholesale of waste and scrap and other products n.e.c.	33.20
2920	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	32.73
6810	Real estate activities with own or leased property	32.02
4661	Wholesale of solid, liquid and gaseous fuels and related products	29.62
2022	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	29.42
1709	Manufacture of other articles of paper and paperboard	28.85
4690	Non-specialized wholesale trade	28.65
2012	Manufacture of fertilizers and nitrogen compounds	28.42
4763	Retail sale of sporting equipment in specialized stores	28.24
2013	Manufacture of plastics and synthetic rubber in primary forms	28.10
4641	Wholesale of textiles, clothing and footwear	26.64
6311	Data processing, hosting and related activities	26.32
126	Growing of oleaginous fruits	26.26
6020	Television programming and broadcasting activities	25.79
9420	Activities of trade unions	25.23
2430	Casting of iron and steel	24.59
2720	Manufacture of batteries and accumulators	23.81
1392	Manufacture of made-up textile articles, except apparel	23.08
321	Marine aquaculture	23.08
8542	Cultural education	22.74
3240	Manufacture of games and toys	22.28
7911	Travel agency activities	21.97

2394	Manufacture of cement, lime and plaster	21.72
4663	Wholesale of construction materials, hardware, plumbing and heating equipment and supplies	21.70
6820	Real estate activities on a fee or contract basis	21.43
2392	Manufacture of clay building materials	21.19
2790	Manufacture of other electrical equipment	21.05
4630	Wholesale of food, beverages and tobacco	20.36
1701	Manufacture of pulp, paper and paperboard	20.28
6399	Other information service activities n.e.c.	19.80
1430	Manufacture of knitted and crocheted apparel	19.65
1080	Manufacture of prepared animal feeds	19.38
1520	Manufacture of footwear	19.22
1061	Manufacture of grain mill products	18.61
7721	Renting and leasing of recreational and sports goods	17.77
7310	Advertising	17.11
4753	Retail sale of carpets, rugs, wall and floor coverings in specialized stores	16.95
3211	Manufacture of jewellery and related articles	16.83
4653	Wholesale of agricultural machinery, equipment and supplies	16.51
4659	Wholesale of other machinery and equipment	16.44
4722	Retail sale of beverages in specialized stores	16.17
122	Growing of tropical and subtropical fruits	16.00
4741	Retail sale of computers, peripheral units, software and telecommunications equipment in specialized stores	15.86
4620	Wholesale of agricultural raw materials and live animals	15.85
4651	Wholesale of computers, computer peripheral equipment and software	15.52
5911	Motion picture, video and television programme production activities	15.26
2821	Manufacture of agricultural and forestry machinery	14.91
2630	Manufacture of communication equipment	14.78
6612	Security and commodity contracts brokerage	14.66
6512	Non-life insurance	14.43
6202	Computer consultancy and computer facilities management activities	14.23
7722	Renting of video tapes and disks	14.21
7410	Specialized design activities	14.10
8411	General public administration activities	14.07
4530	Sale of motor vehicle parts and accessories	13.86
4652	Wholesale of electronic and telecommunications equipment and parts	13.80

1811	Printing	13.59
6499	Other financial service activities, except insurance and pension funding activities, n.e.c.	13.44
4759	Retail sale of electrical household appliances, furniture, lighting equipment and other household articles in specialized stores	13.42
7110	Architectural and engineering activities and related technical consultancy	13.27
1050	Manufacture of dairy products	13.26
3510	Electric power generation, transmission and distribution	13.24
1072	Manufacture of sugar	13.23
5120	Freight air transport	13.19
4772	Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialized stores	13.05
2599	Manufacture of other fabricated metal products n.e.c.	12.97
2670	Manufacture of optical instruments and photographic equipment	12.93
2819	Manufacture of other general-purpose machinery	12.72
7912	Tour operator activities	12.70
8030	Investigation activities	12.53
4662	Wholesale of metals and metal ores	12.46
2220	Manufacture of plastics products	12.41
1012	Processing and preserving of cold-cut meat	12.31
5223	Service activities incidental to air transportation	12.11
6201	Computer programming activities	11.99
128	Growing of spices, aromatic, drug and pharmaceutical crops	11.95
4631	Wholesale of poultry and its products	11.90
1399	Manufacture of other textiles n.e.c.	11.68
6100	Telecommunications	11.65
1410	Manufacture of wearing apparel, except fur apparel	11.62
1071	Manufacture of bakery products	11.44
7490	Other professional, scientific and technical activities n.e.c.	11.39
4510	Sale of motor vehicles	11.32

Notes: based on trade marks registered in 2014-2019.

11.4. Copyright-intensive industries

Table 28 presents the complete list of copyright-intensive industries considered in this study.

Table 28: List of copyright-intensive industries considered in the study.

ISIC code	ISIC description	Type	Factor
1811	Printing	Core	100%
1812	Service activities related to printing	Core	100%
1820	Reproduction of recorded media	Core	100%
4761	Retail sale of books, newspapers and stationery in specialized stores	Core	100%
4762	Retail sale of music and video recordings in specialized stores	Core	100%
5811	Book publishing	Core	100%
5813	Publishing of newspapers, journals and periodicals	Core	100%
5819	Other publishing activities	Core	100%
5820	Software publishing	Core	100%
5911	Motion picture, video and television programme production activities	Core	100%
5912	Motion picture, video and television programme post-production activities	Core	100%
5913	Motion picture, video and television programme distribution activities	Core	100%
5914	Motion picture projection activities	Core	100%
5920	Sound recording and music publishing activities	Core	100%
6010	Radio broadcasting	Core	100%
6020	Television programming and broadcasting activities	Core	100%
6110	Wired telecommunications activities	Core	100%
6120	Wireless telecommunications activities	Core	100%
6130	Satellite telecommunications activities	Core	100%
6190	Other telecommunications activities	Core	100%
6201	Computer programming activities	Core	100%
6202	Computer consultancy and computer facilities management activities	Core	100%
6209	Other information technology and computer service activities	Core	100%
6311	Data processing, hosting and related activities	Core	100%
6312	Web portals	Core	100%
6391	News agency activities	Core	100%

6399	Other information service activities n.e.c.	Core	100%
7310	Advertising	Core	100%
7410	Specialized design activities	Core	100%
7420	Photographic activities	Core	100%
7490	Other professional, scientific and technical activities n.e.c.	Core	100%
7990	Other reservation service and related activities	Core	100%
8219	Photocopying, document preparation and other specialized office support activities	Core	100%
8542	Cultural education	Core	100%
9000	Creative, arts and entertainment activities	Core	100%
9101	Library and archives activities	Core	100%
9321	Activities of amusement parks and theme parks	Core	100%
9329	Other amusement and recreation activities n.e.c.	Core	100%
9412	Activities of professional membership organizations	Core	100%
9102	Museums activities and operation of historical sites and buildings	Partial	50%
3240	Manufacture of games and toys	Partial	46%
9499	Activities of other membership organizations n.e.c.	Partial	41%
3220	Manufacture of musical instruments	Interdependent	35%
3211	Manufacture of jewellery and related articles	Partial	34%
4741	Retail sale of computers, peripheral units, software and telecommunications equipment in specialized stores	Interdependent	33%
4742	Retail sale of audio and video equipment in specialized stores	Interdependent	33%
4773	Other retail sale of new goods in specialized stores	Interdependent	33%
2620	Manufacture of computers and peripheral equipment	Interdependent	30%
2630	Manufacture of communication equipment	Interdependent	30%
2640	Manufacture of consumer electronics	Interdependent	30%
2670	Manufacture of optical instruments and photographic equipment	Interdependent	30%
2731	Manufacture of fibre optic cables	Interdependent	30%
2817	Manufacture of office machinery and equipment (except computers and peripheral equipment)	Interdependent	30%
4651	Wholesale of computers, computer peripheral equipment and software	Interdependent	30%
4659	Wholesale of other machinery and equipment	Interdependent	30%

7730	Renting and leasing of other machinery, equipment and tangible goods	Interdependent	28%
1701	Manufacture of pulp, paper and paperboard	Interdependent	25%
2029	Manufacture of other chemical products n.e.c.	Interdependent	25%
4652	Wholesale of electronic and telecommunications equipment and parts	Interdependent	25%
4669	Wholesale of waste and scrap and other products n.e.c.	Interdependent	25%
7722	Renting of video tapes and disks	Interdependent	20%
7729	Renting and leasing of other personal and household goods	Interdependent	20%

11.5. PVRs granted by industry

Table 29 shows the full list of industries that were granted PVRs in 2014-2019, together with their absolute intensity.

Table 29: Absolute PVR intensity of industries with granted PVRs

ISIC code	ISIC description	PVRs granted
4620	Wholesale of agricultural raw materials and live animals	441
4669	Wholesale of waste and scrap and other products n.e.c.	110
7210	Research and experimental development on natural sciences and engineering	58
150	Mixed farming	44
2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	40
6810	Real estate activities with own or leased property	27
7490	Other professional, scientific and technical activities n.e.c.	21
220	Logging	20
210	Silviculture and other forestry activities	18
6910	Legal activities	16
4510	Sale of motor vehicles	15
4690	Non-specialized wholesale trade	15
4662	Wholesale of metals and metal ores	10
190	Rural establishments	10

128	Growing of spices, aromatic, drug and pharmaceutical crops	7
113	Growing of vegetables and melons, roots and tubers	7
112	Growing of rice	5
111	Growing of cereals (except rice), leguminous crops and oilseeds	5
1103	Manufacture of malt liquors and malt	4
7110	Architectural and engineering activities and related technical consultancy	4
6430	Trusts, funds and similar financial entities	3
2012	Manufacture of fertilizers and nitrogen compounds	3
1080	Manufacture of prepared animal feeds	3
129	Growing of other perennial crops	2
122	Growing of tropical and subtropical fruits	2
8299	Other business support service activities n.e.c.	2
1102	Manufacture of wines	2
9700	Activities of households as employers of domestic personnel	2
8530	Higher education	2
9609	Other personal service activities n.e.c.	2
1399	Manufacture of other textiles n.e.c.	1
1040	Manufacture of vegetable and animal oils and fats	1
123	Growing of citrus fruits	1
2220	Manufacture of plastics products	1
7020	Management consultancy activities	1
161	Support activities for crop production	1
4719	Other retail sale in non-specialized stores	1
6820	Real estate activities on a fee or contract basis	1

Notes: based on PVRs granted in 2014-2019.

12. References

- Aboal, D., P. Garda, B. Lanzilotta, and M. Perera. 2011a. "Innovation, Firm Size, Technology Intensity, and Employment Generation in Uruguay. The Microeconometric Evidence.", IDB Technical Notes No. IDB-TN-314. Washington, DC: IDB.
- Aboal, D., P. Garda, B. Lanzilotta, and M. Perera. 2011b. "Firm Size, Knowledge Intensity and Employment Generation: The Microeconometric Evidence for the Service Sector in Uruguay." IDB Technical Notes No. IDB-TN-335. Washington, DC: IDB.
- Aboal, D. and P. Garda, 2012. "Technological and Non-technological Innovation and Productivity in Services vis a vis Manufacturing in Uruguay.", IDB Discussion Papers, No. IDB-DP-264, December.
- Alvarez, R., J. M. Benavente, R. Campusano, and C. Cuevas. 2011. Employment Generation, Firm Size, and Innovation in Chile. IDB Technical Notes, No. IDB-TN-319. Washington, DC: IDB.
- Benavente, J. M. and R. Lauterbach. 2008 "Technological Innovation and Employment: Complements or Substitutes?" The European Journal of Development Research 20(2): 318-29.
- Crépon, B., E. Duguet, and J. Mairesse. 1998. "Research, Innovation and Productivity: An Econometric Analysis at the Firm Level." Economics of Innovation and New Technology 7 (2): 115-158.
- Crespi, G. and P. Zuñiga, 2012. "Innovation and Productivity: Evidence from Six Latin American Countries," World Development, vol. 40(2), 273-290.
- Crespi, G. and P. Zuñiga, 2013. "Innovation Strategies and Employment in Latin American Firms." Structural Change and Economic Dynamics, vol. 24, issue C, 1-17.
- Crespi, G., E. Tacsir and M. Pereira, 2019. "Effects of Innovation on Employment in Latin America" (co-authored with G. Crespi and M. Pereira), Industrial and Corporate Change 28(1), 139 – 159. Special issue edited by G.Dosi and P. Mohnen.

- Crespi, G., E. Tacsir and F. Vargas, 2014. "Innovation and Productivity in Services: Empirical Evidence from Latin America" Inter-American Development Bank Technical Notes Series, IDB-TN-690.
- Crespi, G., E. Tacsir and F. Vargas, 2016. "Innovation Dynamics and Productivity: Evidence for Latin America". Chapter IV in Pietrobelli, C. and Grazzi, M (eds), "Firm Innovation and Productivity in Latin America and the Caribbean The Engine of Economic Development", Palgrave Macmillan US, New York, USA, 37-71.
- De Elejalde, R., D. Giuliadori, and R. Stucchi. 2015. "Employment and Innovation: Firm-level Evidence from Argentina." Emerging Markets Finance and Trade, Volume 51, 2015 - Issue 1, 27-47.
- European Commission, 2020a. Uruguay IP country factsheet. Latin America IPR SME Helpdesk.
- European Commission, 2020b. Report on the protection and enforcement of intellectual property rights in third countries. Commission Staff Working Document, SWD (2019) 452 final/2, Brussels.
- EPO (European Patent Office) and EUIPO (European Union Intellectual Property Office), 2013. "Intellectual property rights intensive industries and economic performance in the European Union. Industry-Level Analysis Report", September.
- EPO (European Patent Office) and EUIPO (European Union Intellectual Property Office), 2016. "Intellectual property rights intensive industries and economic performance in the European Union. Industry-Level Analysis Report", October, Second edition.
- EPO (European Patent Office) and EUIPO (European Union Intellectual Property Office), 2019. "Intellectual property rights intensive industries and economic performance in the European Union. Industry-Level Analysis Report", September, Third edition.
- EUIPO (European Union Intellectual Property Office) and INDECOP (Instituto Nacional de Defensa de la Competencia y de la Protección de la Propiedad Intelectual), 2021. "La contribución económica de la Propiedad Industrial en Perú".

- EUIPO (European Union Intellectual Property Office) and IMPI (Instituto Mexicano de la Propiedad Intelectual), 2021. "La contribución económica de la Propiedad Intelectual en México".
- Griliches, Z., 1990. "Patent Statistics as Economic Indicators: A Survey." *Journal of Economic Literature* 28 (4): 1661-1707.
- Harrison, R., J. Jaumandreu, J. Mairesse, and B. Peters, 2014. "Does Innovation Stimulate Employment? A Firm-Level Analysis Using Comparable Micro-Data from Four European Countries", *International Journal of Industrial Organization*, vol. 35, 29-43.
- IMPI, 2020. "La Contribución económica de la Propiedad Intelectual en México. IMPI and IP Key, mimeo.
- Instituto Nacional de Estadística (INE) (2008). "Clasificación Industrial Internacional Uniforme. Estructura y notas explicativas a cinco dígitos". Available at <https://www.ine.gub.uy/clasificador-internacional-industrial-uniforme-ciiu->.
- Löf, H., J. Mairesse and P. Mohnen, 2017. "CDM 20 years after", *Economics of Innovation and New Technology*, 26:1-2, 1-5.
- Monge-González, R., J. A. Rodríguez-Alvarez, J. Hewitt, J. Orozco, and K. Ruiz. 2011. "Innovation and Employment Growth in Costa Rica: A Firm-level Analysis", IDB Technical Notes IDB-TN-318. Washington, DC: IDB.
- Office of the United States Trade Representative (USTR), 2019. "2019 Special 301 Report", Washington, D.C., April.
- Office of the United States Trade Representative (USTR), 2020. "2020 Special 301 Report", Washington, D.C., April.
- Pereira, M. and E. Tacsir, 2019. "Quién Impulsó la Generación de Empleo Industrial en la Argentina? Un Análisis sobre el rol de la innovación", *Revista de la CEPAL*, 127, 195 – 216.
- Raffo, J., S. Lhuillery, and L. Miotti, 2008. "Northern and southern innovativity: a comparison across European and Latin American countries", *European Journal of Development Research* 20, 219-239.
- USPTO, 2016. "Intellectual Property and the U.S. Economy: 2016 update". Washington, D.C., March.

WIPO, 2015a. World Intellectual Property Report. Breakthrough Innovation and Economic Growth, WIPO Publication No. 944E, Geneva.

WIPO, 2015b. Guide on Surveying the Economic Contribution of the Copyright Industries. 2015 revised edition. WIPO Publication No. 893 E, Geneva.

WIPO, 2020. What is intellectual property? WIPO Publication No. 450E/20, Geneva.