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The Impact of Design Rights on Australian Firms

IP Australia Economic Research Paper 09

Trevor Kollmann, Achinthya Koswatta, Alfons Palangkaraya and Elizabeth Webster

Centre for Transformative Innovation, Swinburne University of Technology

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Executive summary

IP Australia commissioned the Centre for Transformative Innovation (CTI) at Swinburne University of Technology to assess the impact of past policy changes and whether Australia's design rights system is providing incentives for Australians to invest in design. Using financial records from over 1 million Australian firms between 2001–02 and 2016–17 and an in-depth survey of 50,000 Australian firms, the study covers all active Australian firms.

Firms in design rights-intensive industries spend nearly 50 per cent more on research and development (R&D) than the average Australian firm, are more labour-intensive and are more active in global value chains, as they have high exports and material costs relative to their contribution to economic growth. There are 45 design rights-intensive industries in Australia. Most—31 of the 45—are in manufacturing and nine are in wholesale trade. These wholesale trade firms possibly carry out the design in Australia and contract others to manufacture or assemble the final products.

In these design rights-intensive industries, holding a registered or certified design right is associated with higher productivity (sales per employee, minus materials and equipment). This effect is greater when the design right is examined and certified. Among all Australian firms, having design rights is a forward indicator of more R&D and more exports. In turn, a firm's use of design rights is predicted by its R&D and exports and is coupled with the ownership of patents and trade marks.

These results suggest that the value of design rights stems from their use as part of a broader competitive strategy to manage the intangible aspects of products—a strategy highly relevant to globally active firms. Using a survey of 50 000 firms, the study found that design innovators spend more on R&D, are more global in their strategy and compete by innovating products and processes. They rely on all forms of intellectual property (IP) protection, including lead-time advantage, trade secrets and registered IP rights.

We assessed whether past policy changes around design rights contributed to a framework that supports entrepreneurship and economic growth. We found no conclusive evidence that major changes made by the *Designs Act 2003* affected either demand for design rights or productivity in Australian firms. Key changes in 2004 included a reduction in the term of protection for designs by six years and the loss of unregistered protection (under copyright) for two-dimensional designs. Neither change affected productivity or the level of design rights use, including in the textile, clothing and footwear industry, which is said to have depended on unregistered protection for designs. The introduction in 2013 of a streamlined court process for resolving design disputes also had no clear impact on the economy.

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1. Introduction

To compete with an increasingly skilled labour force from newly industrialised countries, Australia and other developed countries have been focusing investment toward research, development and design. A key purpose of the design rights system is to provide an incentive for producers to invest in the creation of new designs. The logic is that without the ability to protect their designs individuals and firms may be unable to obtain adequate returns on their investment in design and will as a result underinvest in design (see Arrow, 1962; Nelson, 1959).

In this report, we assess how Australia stands with respect to its investments in design (meaning aesthetic innovation and the planning or testing of new products) and whether the system of registered designs is providing incentives for firms to optimally invest in new designs.

1.1 What is design?

Design in this report refers to the form characteristics of a product which may provide utilitarian, experiential or symbolic benefits to the user (Bloch, 2011).

Although design is variously referred to as the appearance, the function or the process of producing a product, these are conceptually separate attributes. However, in practice writers find these attributes hard to separate and the concepts morph together in discussion. This is apparent from the management literature, which discusses appearance and functionality simultaneously (see Walsh, Roy and Bruce 1988; Heikkilä and Peltoniemi, 2019[i]) and in the data showing that firms apply for patents, trade marks and designs concurrently (possibly for the same product).

The visual appearance of products can be registered for design rights, a type of intellectual property (IP) right that gives creators exclusive control over their designs. When Apple was famously awarded $1 billion in compensation from Samsung for IP infringement, three of the six infringed IP rights were design rights.[ii] Buccafusco, Lemley and Masur (2018) claim that, although design rights protection is supposed to extend only to the ornamental aspects of a work, United States (US) design patent law has traditionally afforded at least some protection to parts of a work that are both ornamental and functional. Australian designs law allows visual design features that serve a functional purpose to be registered as designs.

1.2 The data: over 1 million firms over 16 years

To assess whether having design rights is an indicator of higher productivity, investment in research and development (R&D) and exports, this study uses data covering the full population of Australian firms over a 16-year period. Business Longitudinal Analysis Data Environment (BLADE) is a comprehensive database combining administrative, tax and IP records at the individual firm level. It tracks the full population of around 1.1 million Australian firms (including subsidiary parts of larger corporations) from 2001–02 to 2016–17.

BLADE also includes data from the annual Business Characteristics Survey. This survey covers approximately 50,000 unique firms or sections of (large) firms over the period 2004–05 to 2016–17. Of these, about 14 per cent are large firms and 86 per cent are small or medium sized enterprises (SMEs). The survey is not intended to be representative and, as there are repeat observations for most firms, we reduce the dataset to a cross-section by reducing each business characteristic to its mean value over time.

In our analysis, we define a firm as a design innovator if survey respondents indicated that the firm either (a) made significant changes to its aesthetic design or its packaging of goods and services, or (b) undertook significant expenditure on design, planning or testing to develop or introduce new goods. Employee numbers are measured as head counts.

1.3 Defining design rights-intensive industries

Design rights are meaningful legal rights to only a small number of industries. As with other research in the field, this study looked separately at *design rights-intensive industries* and the economy more generally. To obtain a meaningful measure of a design rights-intensive industry, each Australian industry was ranked for the number of design rights filed by its members between 2002 and 2016 divided by the total number of full-time-equivalent employees in the industry in the same period. In constructing our samples, we imposed a cut-off at the 95th percentile of all firms as ranked by the design rights intensity of their industry; firms above the 95th percentile were deemed to be in a design rights-intensive industry regardless of whether they had ever applied for a design right themselves.

In our analysis, we define a firm to be the highest owning entity (the parent company) in Australia. Appendix A lists design rights-intensive industries in Australia based on this method.

Our definition of a design rights-intensive industry differs from the approach taken in the United Kingdom (UK), where a design rights-intensive industry is defined as any industry where over 5 per cent of firms have a design right (Bascavusoglu-Moreau and Tether, 2011). This definition works well in studying countries with many firms that are active design rights users, but in the Australian context there are no industries that fit this description. Our definition differs also from that used in the US and the European Union (EU), where design rights-intensive industries are defined as those with an above average number of design rights per employee (EPO/EUIPO, 2016; USPTO, 2012). The definition used by the EU and the US is aimed at understanding the broad use of rights, not how they affect individual firms and industries. The definition used by the US and EU would apply to nearly half of the firms in our data and would conceal important differences between industries.

2. Summary of findings

2.1 Characteristics of design innovators

Data on over 50 000 Australian firms reveals that design innovators are more likely to possess these characteristics than the average Australian firm:

- They are more globally active, in that they are more likely to have some foreign ownership, be both an exporter and an importer and to be growing their export markets.
- They are likely to spend more on R&D and be an innovator of goods, services, operational processes and organisational and marketing methods.
- They operate in more competitive markets and their competitive strategy is to be on the cutting edge of industry and be responsive to customers.
- They collaborate more than their counterparts.
- To protect their innovations, they are more likely to use all forms of formal IP rights and informal protection methods (such as secrecy and design complexity) and consider engineering to be one of their core business skills.
- Importantly for this study, they are more likely to use product design and registered design rights to aid the appropriation of their innovation profits.

2.2 Characteristics of design rights applicants

Not all design innovators file for design rights and not all design rights holders view themselves as making significant changes to their product designs. Nonetheless there is considerable overlap in the characteristics of both groups.

Only 0.4 per cent, or 4 400, of the 1.1 million firms in Australia applied for at least one design right over the period 2001–02 to 2016–17. A small number of applicants are heavy users of design rights.

The average number of design rights per employee has been falling since 2004–05. This is more likely to be the symptom of reductions in design investment than an outcome of changes to the design rights system.

Design rights-intensive industries, compared with other industries, are more engaged with global value chains. A value chain is the set of value-creating activities by which a product is produced (beginning with R&D and the extraction of raw materials) and brought to market (ending in consumption by a householder

of the final product and post-sales service). A global value chain is a value chain where value is added to the final product in three or more countries. We find several key features of firms in design rights-intensive industries that distinguish them from firms in other parts of the economy:

- They have higher material costs and exports relative to value added. This is characteristic of firms that fit into a value chain, because their business model is to buy in many parts, components and services, add a small amount of value and then on-sell to the next firm, which adds their value before the product is ready for household consumption.
- They have higher R&D.
- They appear to be clustered in intermediate industries that primarily produce components, as opposed to finished goods. Parts and components appear to make up 60 per cent of design applications.
- They are more labour-intensive.

Manufacturing is the most design rights-intensive industry, followed by wholesale trade. The most design rights-intensive industry subclasses are:

- electric lighting equipment manufacturing
- aluminium rolling, drawing, extruding
- rigid and semi-rigid polymer product manufacturing
- offshore longline and rack aquaculture
- other fabricated metal product manufacturing.

Large firms have nearly twice as many design rights per employee as SMEs, and metropolitan firms have about 25 per cent more design rights per employee compared with non-metropolitan firms.

2.3 Do design rights aid business performance?

Empirical models of the economic effects of possessing design rights reveal that:

- Owning design rights appears to increase productivity but only for firms in design rights-intensive industries. Productivity is measured as sales per employee, once we account for plant and equipment.
- Owning design rights is a forward indicator of higher exports. It would be reasonable to expect that an equivalent foreign design right is held by an Australian firm undertaking export activity.

- Owning design rights appears to be a forward indicator of more R&D on average across all industries. It is reasonable to expect that R&D and design are complementary activities.
- Our model implies that if a firm in a design rights-intensive industry with an annual turnover of $4 million increases the number of design rights they own from one to two, the firm's annual turnover will increase by $17 895.

The model results cannot separately identify the cause of this higher turnover. Value may be derived from the underlying investment in design innovation or from owning the legal right.

2.4 What causes a firm to apply for a design right?

Models of the determinants of applying for design rights found that a firm is more likely to apply for a design right:

- the greater its prior R&D spending
- the larger its size as measured by employee numbers
- the higher its prior exports
- the greater its numbers of prior patent and trade mark applications and trade marks in force.

Other factors that have firm-specific and time-invariant components, such as managerial quality, strategic posture, the specific market and the nature of the product, explain over 40 per cent of the decision to apply for design rights. We can pin these factors down to:

- having a strategy of targeting more export markets
- introducing new or significantly improved goods
- using engineering as a core business skill
- being Australian owned.

2.5 Economic effects of past legislative changes

Designs Act 2003

The major changes made to the Designs Act in 2003 were to:

- reduce the maximum length of the term of a design right from 16 to 10 years

- require that the design be new and distinctive relative to designs anywhere in the world, not just in Australia

- reduce the cost of acquiring protection, as registration no longer needed costly examination and multiple designs could be included on the same application form.

We anticipated that the reduction in the maximum term length would reduce appeal of design rights but that the other changes would make design rights more attractive. Accordingly, we had no prior view on whether demand for design rights would rise or fall post 2004. If the Act also changed the certainty rights holders felt about the appropriability of their design profits, it was possible that firm productivity would rise.

We undertook extensive modelling on both the demand for design rights and business productivity post 2004 and found no evidence that the *Designs Act 2003* affected either activity.

Move to the Federal Circuit Court in 2013

In 2013, to make litigation decisions faster and cheaper for business, the jurisdiction for hearing design rights disputes was transferred to the Federal Circuit Court from the Federal Court. If this change made infringement more certain and easier to defend, we would expect to see productivity and demand for design rights rise post 2013.

We undertook extensive modelling on both the demand for design rights and business productivity post 2013 and found no conclusive evidence that the introduction of the streamlined court process for design rights disputes in 2013 increased the usage of design rights by firms, both overall or in design rights-intensive industries.

Loss of unregistered protection for designs in the form of copyright post 2004

Before 2003, the *Copyright Act 1968* allowed the owner of two-dimensional sketches or designs to receive copyright protection. Many textile, clothing and footwear firms relied on this as a form of unregistered design protection. If this unregistered right was a major part of these firms' business models, we would expect its removal in 2004 to have two effects. The first effect would be to increase demand for registered design rights (as a substitute for copyright protection). The second effect would be to reduce productivity (as the preferred form of legal protection was removed).

We undertook extensive modelling on both the demand for design rights and business productivity post 2004 in the textiles, clothing and footwear industries (including related industries in manufacturing, wholesale and retail trade). We found no evidence of economic effects from the removal of unregistered design protection, in the form of copyright for two-dimensional sketches.

3. Characteristics of design innovators

In comparing the characteristics of firms that do and do not innovate in design, a matched sample approach was used. This approach takes each firm known to be a design innovator and searches the dataset for a non-design innovator firm that is 'matched' for size (with a similar number of employees). For example, to test whether design innovators are more likely than non-design innovators to have some foreign ownership, we examined whether firms with some foreign ownership were on average likely to score higher than firms without that characteristic for design innovation intensity.

Column 3 in Table 1 gives the difference in average design innovation intensity of firms according to whether they possess various business characteristics (column 1) or do not (column 2). The t-statistic in column 4 indicates whether this difference is statistically significant—i.e. whether design innovators differ from non-innovators with respect to the characteristic. Three stars implies that, if we were to take repeat samples of firms, 99 in 100 of these samples would show a difference in average design innovation intensity. Two stars implies that this would hold for 95 in 100 samples, and one star implies that it holds for 90 in 100 samples.

Our mean differences indicate that design innovators tend to be globally active. They are more likely to have some foreign ownership, be both an exporter and an importer and to be growing their export markets.[iii] Furthermore, they are more likely to spend more on R&D and be an innovator of goods, services, operational processes and organisational and marketing methods. They operate in more competitive markets, and their competitive strategy is to be on the cutting edge of industry and increase responsiveness to customers. They collaborate more than their counterparts. They are more likely to use all forms of formal IP rights and non-formal protection methods (for example, secrecy and complexity of production). They consider engineering to be one of their core business skills.

Reassuringly, design-intensive firms are more likely to use complexity in product design and registered design rights as their preferred method for protecting their innovation investments. However, not all design innovators apply for design rights and not all design rights-active firms would be classified as design innovators. Given that design rights only relate to the aesthetic aspects of design, not all design investments would qualify for formal IP rights, so we do not expect all design innovators (using our definition) to apply for design rights. Conversely, firms may apply for a design right but consider design innovation to be a marginal part of their business strategy and consequently not regard their design activity as significant.

Table 1: Difference in design innovation intensity according to business characteristic (control matched on employees), 2004–05 to 2016–17

Business characteristic	Average design intensity			
	With the characteristic	Without the characteristic	Difference = (2) – (3)	t-stat
(1)	(2)	(3)	(4)	(5)
Global reach				
Any foreign ownership	0.128	0.075	0.053	2.17**
Exporter	0.147	0.060	0.087	3.91***
Importer	0.191	0.120	0.071	2.53**
Geographic markets—Overseas	0.159	0.075	0.084	3.48***
Compared to the previous year—Export markets targeted	0.113	0.065	0.048	1.80*
Innovator				
Business focus—Innovation measures	0.060	0.016	0.044	1.68*
Goods	0.192	0.124	0.067	2.23**
Services	0.169	0.114	0.055	1.73*
Operations	0.251	0.080	0.170	4.98***
Organisation management	0.196	0.075	0.121	4.04***
Marketing	0.351	0.076	0.275	7.44***
Expenditure on innovation—Research and experimental development performed by this firm	0.341	0.165	0.176	4.52***
Expenditure on innovation—Other activities—New marketing methods	0.268	0.191	0.078	2.04**
Competition				
Number of competitors	0.088	0.030	0.059	2.29**
Main reason for innovating—Be at the cutting edge of the industry	0.210	0.061	0.149	5.53***
Main reason for innovating—Increase responsiveness to customer needs	0.307	0.173	0.135	3.53***
Collaboration				
Collaborated	0.146	0.064	0.083	3.00***
Appropriation of innovation				
Methods used to protect intellectual property—Complexity of product design	0.192	0.085	0.107	3.18***
Methods used to protect intellectual property—Patents	0.201	0.091	0.110	4.23***
Methods used to protect intellectual property—Registration of design	0.205	0.090	0.116	4.24***
Methods used to protect intellectual property—Copyright or trade marks	0.185	0.067	0.118	5.00***
Methods used to protect intellectual property—Secrecy/confidentiality	0.153	0.062	0.091	3.69***
Skills				
Skills used in undertaking core business activities—Engineering	0.098	0.034	0.064	3.69***

Note: Three stars implies that, if we were to take repeat samples of firms, 99 in 100 of these samples would show a difference in average design innovation intensity. Two stars implies that this would hold for 95 in 100 samples, and one star implies that it holds for 90 in 100 samples

Source: Business Characteristics Survey, Business Longitudinal Analysis Data Environment (2019), Australian Bureau of Statistics.

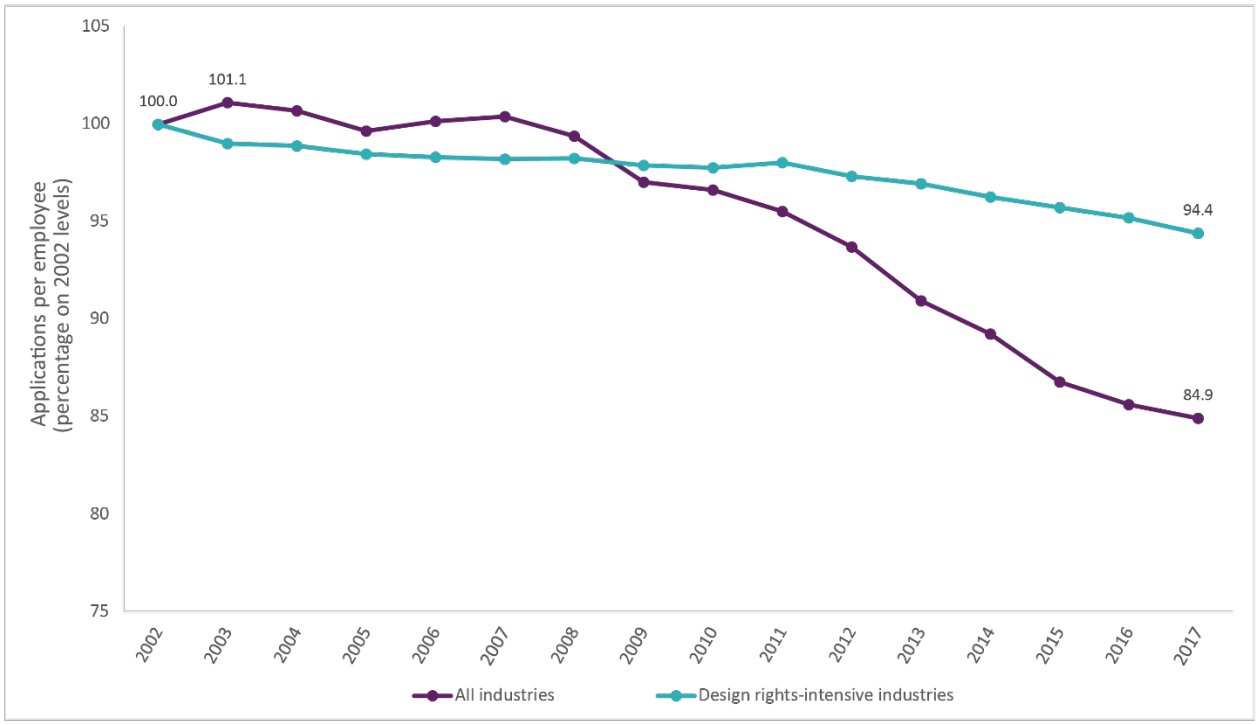
4. Characteristics of design rights applicants

4.1 Frequency of use

In Australia, for the rights in a design to be enforced, the design must be applied for, registered, and certified via a substantive examination process. However, since 2004, firms can register a design but need not certify it until they require formal legal enforcement, and only a small percentage of firms proceed to certification.

In this report, the term *design rights (applications)* refers to the number of applications for design rights filed in any given year.[iv] Figure 1 shows the declining trend in the average number of design rights (applications) per employee since 2004–05 across the economy. This decline was less marked for the design rights-intensive industries.

Figure 1: Design rights (applications) per employee fell from their 2002 levels, from 2002 to 2017

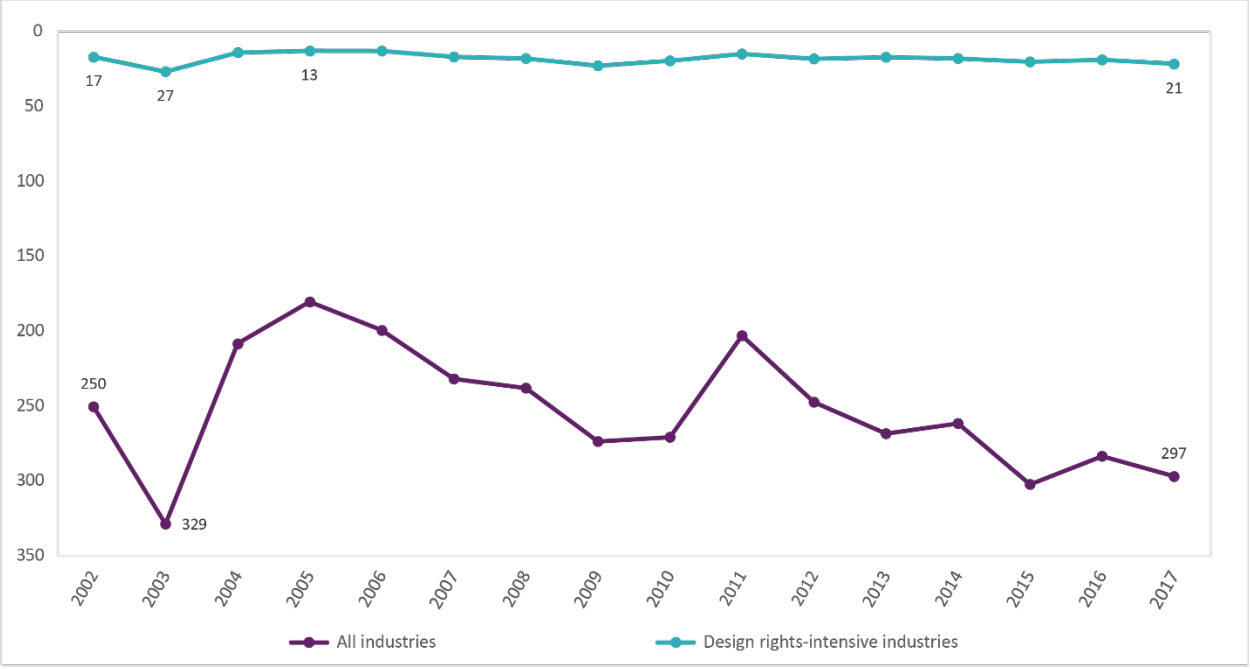


Design rights (registrations) refers to the number of new applications that have complied with a formalities check (post 2004) and have accordingly been registered with IP Australia. *Design rights (active)* refers to the number of registered design rights in force in a given year which may be certified.[v]

The average number of design rights (applications) per employee contrasts with the average number of design rights (applications) per firm. Over the period 2001–02 to 2016–17, only 4 435 (or 0.4 per cent) of the 1 108 958 firms in BLADE filed at least one design right application. In design rights-intensive industries, an

average of one in 21 firms filed a design right application in any year. For all industries, that number drops to an average of 1 in 297 firms.

Figure 2: On average, one in every 21 firms in design rights-intensive industries filed for a design right in 2017



Design rights are heavily concentrated on a small number of applicants. Firms that have more than one design right tend to be larger and have more design rights per employee than firms with only one design right.

Large firms have nearly twice as many design rights per employee as SMEs (contradicting Jensen and Webster, 2006); and metropolitan firms have about 25 per cent more design rights per employee than non-metropolitan firms (see Tables 2 and 3).

Table 2: Average annual number of design rights (applications) per employee in each firm, by size, 2002–2017

Business characteristic	Design rights (applications) per firm	Employees (FTE)	Design rights (applications) per employee (FTE)
(1)	(2)	(3)	(4)
Business size			
Large (≥200)	0.2826	1 267.3	0.00032
SME (<200)	0.0020	7.5	0.00019
Total	0.0041	16.9	0.00019

Note: [a] mean $= (1/n)\sum_{i=1}^{n}\left(\frac{d_i}{E_i}\right)$ where d = number of design rights applications in firm i, E = number of employees (FTE) in firm i, and n = number of firms.

Table 3: Average annual number of design rights (applications) per employee in each firm, by location, 2002–2017

Business location type	Design rights (applications) per firm	Employees (FTE)	Design rights (application) per employee (FTE)
Non-metropolitan	0.002	9.4	0.00018
Metropolitan	0.007	27.8	0.00021
Total	0.004	16.9	0.00019

Note: [a] $\text{mean} = (1/n)\sum_{i=1}^{n}\left(\frac{d_i}{E_i}\right)$ where d = number of design rights applications in firm i, E = number of employees (FTE) in firm i, and n = number of firms.

In Australia, registering a design allows the owner to exclude others from commercially exploiting the design for an initial five years, with the option to renew protection for a further five years. The information on design renewals in BLADE indicates that firms that have a lower rate of renewal (relative to their number of active design rights) tend to file for fewer design rights per firm. The decision not to renew is consistent with the applicant not believing that the design right was effective for their firm.

4.2 Industries using design rights

Table 4 shows that manufacturing is the most design rights-intensive industry, followed by wholesale trade. Appendix B lists the most prolific applicant firms in the wholesale trade industry. We believe that many former product manufacturers are now undertaking R&D, design, sales and service but assembling offshore. This could place them in the wholesale trade or the professional, scientific and technical services industries.

At the more granular (four-digit industry level), those industries with the most design applications per employee are (in descending order):

- electric lighting equipment manufacturing
- aluminium rolling, drawing, extruding
- rigid and semi-rigid polymer product manufacturing
- offshore longline and rack aquaculture
- other fabricated metal product manufacturing (n.e.c.).

The four-digit industries with the most design rights per firm are (in descending order):

- corrugated paperboard and paperboard container manufacturing
- clay brick manufacturing
- aluminium rolling, drawing, extruding
- plumbing goods wholesaling.

These design rights-intensive industries are disproportionately in the private (for-profit) sector.

Table 4: Average annual number of design rights (applications), by 1-digit industry, 2002–2017

ANZSIC 1-digit industry division[a]	Average annual employment per firm (FTE)	Annual design rights (applications)		
		Total	Average per firm[b]	Average per firm per employee (FTE)
A Agriculture, forestry and fishing	3.6	201	0.00048	0.00004
B Mining	111.5	107	0.00611	0.00007
C Manufacturing	**30.8**	**8 215**	**0.02744**	**0.00111**
D Electricity, gas, water and waste services	44.6	13	0.00082	0.00004
E Construction	10.06	324	0.00052	0.00006
F Wholesale trade	**23.1**	**4 083**	**0.01842**	**0.00074**
G Retail trade	24.6	2 305	0.00645	0.00029
H Accommodation and food services	14.7	32	0.00012	0.00001
I Transport, postal and warehousing	20.9	87	0.00041	0.00002
J Information media and telecommunications	57.6	62	0.00161	0.00002
K Financial and insurance services	31.6	53	0.00032	0.00002
L Rental, hiring and real estate services	9.3	376	0.00173	0.00014
M Professional, scientific and technical services	11.1	462	0.00085	0.00009
N Administrative and support services	26.6	70	0.00046	0.00002
O Public administration and safety	30.4	5	0.00030	0.00001
P Education and training	37.3	37	0.00094	0.00000
Q Health care and social assistance	13.0	42	0.00019	0.00003
R Arts and recreation services	17.7	20	0.00051	0.00003
S Other services	7.9	114	0.00056	0.00007
Total	16.9	16 615	0.00410	0.00019

Note: [a] For the profiled population with more than one type of activity unit (TAU), the ANZSIC division is associated with the largest TAU by turnover. [b] Average is defined as $(1/n)\sum_{i=1}^{n}\left(\frac{d_i}{E_i}\right)$ where d = annual number of design rights applications in firm i, E = annual number of employees (FTE) in firm i, and n = annual number of firms.

4.3 Innovation characteristics

In Table 5 we examine how firms in design rights-intensive industries compare with firms in all other industries across a range of business characteristics. In Table 6 we conduct a similar analysis focused on IP-related characteristics (the use of patents, trade marks and design rights).

According to Table 5, the average firm in a design rights-intensive industry, compared with other firms, employed more workers and had lower (tangible) assets. This makes these firms more labour-intensive than firms from other industries. They also had higher R&D per firm.

Table 5: Average annual business characteristics for firms in design rights-intensive industries vs firms in all other industries[a], 2001–02 to 2016–17

Industry category	FTE	Turnover ($000)	Exports ($000)	Tangible investment ($000)	Material costs ($000)	Value added ($000)	R&D ($000)	Assets ($000)	Exports/ value added	Material costs/value added
Design rights-intensive 5 per cent of firms	22.4	8 830	597	379	6 435	2 395	40 859	15 100	0.25	2.7
Remaining 95 per cent of firms	16.6	11 300	712	830	7 028	4 311	27 134	22 000	0.17	1.6
Total	16.9	11 200	706	808	6 997	4 217	27 806	21 700	0.17	1.7

Note: [a] A 'design rights-intensive industry' is a four-digit industry with, on average, more than 0.0012 active design rights per employee (in a given year). The four-digit industries that we deem design rights-intensive are fixed over the time period of our analysis.

Table 6 shows that the average firm in a design rights-intensive industry was more likely to apply for patents and trade marks than the average business—a finding confirmed in other studies (Bascavusoglu-Moreau and Tether, 2011; Griffiths, Jensen and Webster, 2011; Munari and Santoni, 2010; Gallié and Legros, 2012). This may reflect the firm's greater familiarity with the formal IP system (see the qualitative study by Falk et al., 2014) but, given the correlations with R&D spending, it is also likely to reflect the firm's strategic focus on new products.

Table 6: Average annual business IP characteristics for firms in design rights-intensive industries vs firms in all other industries[a], 2001–02 to 2016–17

Industry category	Patents (in force)	Trade marks (in force)	Design rights (applications)	Design rights (active)	Design rights (certified)
Design rights-intensive[a] 5 per cent of firms	0.152	1.579	0.058	0.422	0.020
Remaining 95 per cent of firms	0.019	0.300	0.001	0.013	0.001
Total	0.025	0.363	0.004	0.033	0.002

Note: [a] A 'design rights-intensive industry' is a four-digit industry with, on average, more than 0.0012 active design rights per employee (in a given year). The four-digit industries that we deem design rights-intensive are fixed over the time period of our analysis.

4.4 Value chain characteristics

The above findings in relation to design rights-intensive industries paint a picture of firms that are more engaged with global value chains than the average Australian firm. First, these firms have high material costs and exports relative to value added, and high R&D. Second, many are in industries producing components, not finished goods.

According to Table 5, firms in design rights-intensive industries had a ratio of exports to value added of 0.25 (compared with 0.17 in the other 95 per cent of firms) and a ratio of material costs to value added of 2.7

(compared with 1.6 in the remaining 95 per cent of firms). Firms that fit into a value chain have high material costs relative to value added because their business model is to buy in many parts and components, add small amounts of value and then on-sell to the next firm, which adds its own value before the product is ready for household consumption. A firm in a global value chain does this but with suppliers and clients who are disproportionately overseas.

Table 7 presents the numbers of registrations per Locarno class between 2005 and 2016. Locarno is the framework of product classes used internationally and in Australia to classify registered designs. In Table 7, classes with more than 1 000 registrations are bolded. It shows that, although articles of clothing and haberdashery is the largest class, registrations in product classes that appear to be household goods comprise only 39 per cent of all Australian registrations, with the remaining 61 per cent being for intermediate goods.

This industry pattern of design rights usage is particular to Australia. Although some international studies find that both low-tech and high-tech industries use the design rights system, no studies (to our knowledge) assess the value chain characteristics of industries that are design rights-intensive. Two pertinent studies are:

- Research on applications filed with the European Intellectual Property Office between 2003 and 2011. The highest number of applications came from fashion and furniture, both low-tech industries (Filitz et al., 2015). By 2016 there had been significant increases in applications in information technologies and lighting apparatus (Kur et al., 2018).

- Research by Bascavusoglu-Moreau and Tether (2011) identifying office equipment and computers, electronics, and machinery and instrumentation as the UK's most 'design-intensive industries' (those with over 5 per cent of firms in the industry having registered an industrial design).

Until we establish a more comprehensive picture that clusters firms according to related characteristics, we cannot be sure that firms that are export, design and R&D intensive are also producing parts and components. This should be the subject of further investigation.

Table 7: Design rights registrations in Locarno classes, by Australian and foreign applicants, total, 2005–2016

Locarno class code	Class name	Australian registration	Foreign registration
1	Foodstuffs	166	454
2	**Articles of clothing and haberdashery**	**4 708**	**1 442**
3	Travel goods, cases, parasols and personal belongings, not elsewhere specified	780	821
4	Brushware	114	570
5	Textile piece goods, artificial and natural sheet material	287	119
6	**Furnishing**	**3 456**	**1 583**
7	**Household goods, not elsewhere specified**	**2 129**	**3 122**
8	**Tools and hardware**	**3 379**	**2 064**
9	**Packages and containers for the transport or handling of goods**	**2 322**	**4 276**
10	Clocks and watches and other measuring instruments, checking and signalling instruments	405	842
11	Articles of adornment	635	325
12	**Means of transport or hoisting**	**2 876**	**2 713**
13	**Equipment for production, distribution or transformation of electricity**	**1 113**	**1 044**
14	Recording, telecommunication or data processing equipment	738	3 952
15	Machines, not elsewhere specified	664	1 923
16	Photographic, cinematographic and optical apparatus	137	357
17	Musical instruments	43	0
18	Printing and office machinery	14	99
19	Stationery and office equipment, artists' and teaching materials	495	517
20	Sales and advertising equipment, signs	468	284
21	**Games, toys, tents and sports goods**	**1 158**	**1 466**
22	Arms, pyrotechnic articles, articles for hunting, fishing and pest killing	256	216
23	**Fluid distribution equipment, sanitary, heating, ventilation and air-conditioning equipment, solid fuel**	**2 551**	**1 920**
24	Medical and laboratory equipment	512	2 071
25	**Building units and construction elements**	**3 409**	**611**
26	**Lighting apparatus**	**1 061**	**1 534**
27	Tobacco and smokers' supplies	56	157
28	Pharmaceutical and cosmetic products, toilet articles and apparatus	272	1 178
29	Devices and equipment against fire hazards, for accident prevention and for rescue	84	130
30	Articles for the care and handling of animals	226	118
31	Machines and appliances for preparing food or drink, not elsewhere specified	138	345
32	Graphic symbols and logos, surface patterns, ornamentation	1	10
99	Miscellaneous	24	10
	Subtotal (mainly) household goods	**13 403**	**10 548**
	Subtotal (mainly) intermediate goods	**21 274**	**25 725**
	TOTAL	**34 677**	**36 273**

Source: IP Australia, Designs database.

Note: Not all design applications are registered. To be registered post 2004, the application must pass a formalities check. Hence design registrations are not equal to design rights applications.

5. Do design rights aid business performance?

The study adds to a handful of international studies that measure the impact of design rights on business performance (Bascavusoglu-Moreau and Tether, 2011; Griffiths and Webster, 2010; Griffiths, Jensen and Webster, 2011).[vi] As with previous studies, any estimated effect of holding design rights may be due to either the economic value of the design or the economic value of the right per se. Additionally, a positive effect of design rights on turnover does not mean the design investment was profitable, as we have not accounted for the investment costs of the design or the design right.[vii]

Building on earlier work, this study explores also how design rights affect R&D and exports by firms. While owning design rights is found to affect productivity only for firms in design rights-intensive industries, design rights are found to be a forward indicator of more R&D and more exports in the general population of Australian firms.

5.1 Effect on firm productivity

We estimate the effect of a firm having active design rights on its performance, measured primarily as a firm's annual turnover after accounting for inputs such as plant and equipment.

The key explanatory variables are the number of active (registered) design rights and the number of certified design rights held by a firm by the end of a given financial year. Certified design rights are a subset of active design rights. For a design right to be certified, it must be found to be new and distinctive, or not substantially similar in overall impression to designs that constitute prior art. To control for other factors affecting performance, we include in our model the firm's number of employees, tangible assets, material costs, patents in force and trade marks in force.

In addition to these variables, we include a set of year and business dummy variables and a random term to capture the sum of all other factors that affect turnover.[viii] Firm performance is likely to be a function not only of observable characteristics but also of time-invariant firm-specific differences such as differences in capability. We account for these unobserved firm-specific effects using a fixed effects estimator.[ix]

Table 8 presents the results estimated via a fixed effects (within) estimator on two samples of the data: (a) all industries, and (b) the five per cent of firms in designated design rights-intensive industries.[x] The four-digit industries that we deem design rights-intensive are fixed over the time period of our analysis.

Table 8: Determinants of business turnover

Dependent variable: Turnover (in logs), 2001–02 to 2016–17

Explanatory variables (in logs)	All firms		Design rights-intensive industry	
	Coef.	Std Err.	Coef.	Std Err.
Employment (FTE)	0.0758***	0.0001	0.0515***	0.0005
Total (tangible) assets	0.1148***	0.0003	0.0995***	0.0010
Materials	0.6773***	0.0003	0.7391***	0.0012
Patents (in force)	0.0097***	0.0012	0.0092***	0.0019
Trade marks (in force)	0.0049***	0.0004	0.0038***	0.0009
Designs (certified)	0.0041	0.0023	0.0052**	0.0023
Designs (active)	–0.0051***	0.0014	0.0045***	0.0015
Post 2004	–0.0144***	0.0003	–0.0090***	0.0009
Post-2004* designs (active)	0.0037***	0.0012	–0.0016	0.0013
Post 2013	–0.0001	0.0003	–0.0010	0.0009
Post-2013* designs (active)	0.0009	0.0011	–0.0016	0.0011
Year dummies	Yes		Yes	
Number of observations	4 101 775		199 905	
Number of groups	1 108 958		50,464	
Rho	0.6157		0.5467	
R^2—within	0.7693		0.8507	
R^2—between	0.9404		0.9779	
R^2—overall	0.9417		0.9778	

Note: **/*** statistically significant at the five/one per cent level of significance. All values are normalised by industry average. The coefficient estimates represent estimates of elasticities. The four-digit industries that we deem design rights-intensive are fixed over the time period of our analysis.

With respect to the all industries model, we found:

- The coefficients on patents and trade marks in force were positive and significant.
- The coefficient on active design rights was negative and significant, and the coefficient on certified designs was insignificant.
- When we limited our sample to the design rights-intensive industries, the coefficient on active and certified designs was positive and significant. This suggests that design rights are very niche.

We note in passing that the coefficients on the standard Cobb-Douglas model variables—labour, capital and materials—make economic sense (they should add to less than one given the absence in the model of a comprehensive measure of intangible capital). As is commonly found, the explanatory contribution of firm fixed effects to turnover, as measured by rho in Table 8, is over 50 per cent. This result implies that time-invariant firm-specific factors are very important. Such factors may include managerial posture, strategy and

distinctive product market characteristics. The high R-squared (>0.9) refers to the explanatory power of the measured variables after accounting for the fixed effects.

If we mechanically apply the estimates in Table 8 to our data, we can estimate the effect of having **one more** design right on turnover, all else being equal, using the following formulae:

$\Delta Y_{it} = \theta \frac{Y}{D^a}$ (for active design rights)

$\Delta Y_{it} = \omega \frac{Y}{D^c}$ (for certified design rights)

where Y is turnover (level) and D^a and D^c are a firm's stock levels of active and certified designs, respectively.[xi] From Table 8, column 3, we can see that θ = 0.0045 and ω = 0.0052 in the design rights-intensive industries.

These estimates, presented in Table 9, suggest that for a small firm in a design rights-intensive industry with annual sales of $4 million, increasing its number of design rights from 1 to 2 will increase its annual revenue by 0.44 per cent (or $17 895).

Table 9: Simulation of the annual value of an additional active right and certified right, for given values of annual turnover and stocks of design rights, design rights-intensive industries

Annual turnover ($) = Y	Stock of designs (active or certified) = D	Marginal value of an active right = $\theta \frac{Y}{D^a}$	Marginal value of a certified right = $\omega \frac{Y}{D^c}$
1 000 000	1	4474	9664
4 000 000	1	**17 895**	**38 655**
8 000 000	1	35 790	77 310
16 000 000	1	71 581	154 621
32 000 000	1	143 162	309 242
1 000 000	2	2237	4832
4 000 000	2	8948	19 328
8 000 000	2	17 895	38 655
16 000 000	2	35 790	77 310
32 000 000	2	71 581	154 621
1 000 000	10	447	966
4 000 000	10	**1790**	**3866**
8 000 000	10	3579	7731
16 000 000	10	7158	15 462
32 000 000	10	14 316	30 924

The percentage benefit stays the same as the size of the firm grows but decreases the more prior design rights are held. The larger a firm is, the greater the marginal value it is likely to derive from having an additional design right. Conversely, the greater a firm's stock of design rights is, the smaller the marginal

benefit that it is likely to derive from having an additional design right. The annual increase to turnover from an additional active design right ranges from $17 895 for a small firm ($4 million turnover) with one existing active right to $1 790 for the same firm with 10 design rights. Certified design rights are more valuable, with the respective values being $38 655 and $3 866.

5.2 Effect on export activity

We modelled the preconditions of export activity using a reduced form model.[xii] The results in Table 10 show a positive and significant coefficient on the active design rights variable for the 'all industries' and 'design rights-intensive' samples. The coefficient on certified design rights was positive and significant only in the all industries sample.

Table 10: Determinants of business export

Dependent variable: Export (in logs), 2001–02 to 2016–17

Explanatory variables (in logs)	All firms		Design rights-intensive industry	
	Coef.	Std Err.	Coef.	Std Err.
Employment (FTE)	0.0298***	0.0005	0.0481***	0.0018
Total (tangible) assets	0.1011***	0.0009	0.2051***	0.0038
Patents (in force)	0.0902***	0.0043	0.0498***	0.0079
Trade marks (in force)	0.0547***	0.0013	0.0636***	0.0037
Designs (certified)	0.0518***	0.0080	–0.0170	0.0098
Designs (active)	0.0371***	0.0047	0.0330***	0.0065
Post 2004	–0.0066	0.0009	–0.0024	0.0038
Post-2004* designs (active)	–0.0027	0.0043	–0.0081	0.0057
Post 2013	0.0079	0.0009	–0.0027	0.0036
Post-2013* designs (active)	0.0076	0.0037	0.0004	0.0046
Year dummies	0.0298	0.0005	0.0481	0.0018
Number of observations	4 097 630		199 905	
Number of groups	1 108 348		50 464	
Rho	0.5951		0.6894	
R^2—within	0.0091		0.0380	
R^2—between	0.1069		0.2779	
R^2—overall	0.1291		0.3216	

Note: **/*** statistically significant at the five/one per cent level of significance. All values are normalised by industry average. The coefficient estimates represent estimates of elasticities. The four-digit industries that we deem design rights-intensive are fixed over the time period of our analysis.

5.3 Effect on R&D spending

Finally, we tested for the effects of design rights on R&D spending using a similar reduced form model.[xiii] The results in Table 11 suggest that all forms of IP rights in force are forward predictors of R&D spending, except for patents in force in the design rights-intensive industries.

Table 11: Determinants of business R&D spending

Dependent variable: R&D spending (in logs), 2004–05 to 2016–17

Explanatory variables (in logs)	**All firms**		**Design rights-intensive industry**	
	Coef.	Std Err.	Coef.	Std Err.
Employment (FTE)	0.0215***	0.0005	0.0286***	0.0026
Total (tangible) assets	0.0767***	0.0009	0.1364***	0.0055
Patents (in force)	0.0227***	0.0046	0.0067	0.0119
Trade marks (in force)	0.0934***	0.0015	0.0433***	0.0058
Designs (certified)	0.0890***	0.0078	0.1060***	0.0135
Designs (active)	0.0480***	0.0035	0.0847***	0.0069
Post 2013	0.0172***	0.0009	0.0251***	0.0049
Post-2013* designs (active)	–0.0029	0.0033	0.0142***	0.0059
Year dummies	Yes		Yes	
Number of observations	3 316 890		159 275	
Number of groups	961 565		43 333	
Rho	0.5496		0.5284	
R^2—within	0.0084		0.0151	
R^2—between	0.0851		0.1279	
R^2—overall	0.0900		0.1386	

Note: **/*** statistically significant at the five/one per cent level of significance. All values are normalised by industry average. The coefficient estimates represent estimates of elasticities. The four-digit industries that we deem design rights-intensive are fixed over the time period of our analysis.

6. What causes a firm to apply for a design right?

In this section, we focus on identifying what may drive a firm to apply for a design right. There are no authoritative datasets that allow us to model the determinants of firms' investments in design innovation, so it is not possible to discuss this question other than in an explorative way.[xiv] Readers interested in the descriptive literature on this topic should consult Appendix C.

Bascavusoglu-Moreau and Tether (2011) is the only existing quantitative empirical study on the determinants of design rights usage. It examined factors associated with applying for registered designs and found that design rights applicants are more likely to hold patents and/or trade marks.

We use the full BLADE dataset on approximately 950 000 firms between 2005 and 2017 to test whether selected financial variables pre-dated applications for a new design right by Australian firms.[xv] We estimate the reduced form model with a three-year forward moving average of design rights applications as the dependent variable. As explanatory variables, we include employment, R&D spending, exports, patents and trade marks in force and patent and trade mark applications filed for in a given year.[xvi] In addition to these variables, we include a set of year and firm dummy variables and a random term to capture the sum of all other factors that affect turnover.

We estimate this model using a fixed effects (within) regression estimator. The results are given in Table 12. The first column gives the results for all firms in the economy and the third column limits the sample of firms to design rights-intensive industries (as defined above).

The results indicate that the higher a firm's prior R&D spending, the more likely the firm is to apply for a design right. Design right applications are also positively linked to prior employee numbers, exports, patent and trade mark applications and trade marks in force. There is little difference between the determinants observed for the design rights-intensive industries and the all industries sample.

Table 12: Determinants of design rights applications

Dependent variable: Design rights (applications) per employee (forward three-year moving average) (in logs), 2004–05 to 2016–17

Explanatory variables (in logs)	All firms		Design rights-intensive industry	
	Coef.	Std Err.	Coef.	Std Err.
R&D spending	0.00175***	0.00008	0.00985***	0.00093
Employees (FTE)	0.00049***	0.00006	0.00525***	0.00081
Exports	0.00022***	0.00007	0.00454***	0.00122
Patents (applications)	0.05630***	0.00067	0.08221***	0.00407
Trade marks (applications)	0.01254***	0.00017	0.04662***	0.00155
Patents (in force)	–0.00003	0.00056	–0.00644	0.00374
Trade marks (in force)	0.00437***	0.00018	0.02722***	0.00183
Post 2013	–0.00101***	0.00011	–0.01076***	0.00155
Year dummies	Yes		Yes	
Number of observations	3 262 120		157 604	
Number of groups	945 364		42 896	
Rho	0.4150		0.4565	
R^2—within	0.0061		0.0162	
R^2—between	0.1005		0.1946	
R^2—overall	0.1096		0.2086	

Note: **/*** statistically significant at the five/one per cent level of significance. All value variables are in logs and normalised by industry average. The coefficient estimates represent estimates of elasticities. The four-digit industries that we deem design rights-intensive are fixed over the time period of our analysis.

Given the importance of these time-invariant factors, we linked the fixed effects from Table 12 to a selection of characteristics, averaged over time, from the Australian Bureau of Statistics Business Characteristics Survey.[xvii] In total, 19 597 firms were linked. The results are presented in Table 13. They show that a higher demand for design rights is related to:

- having a strategy of targeting more export markets
- introducing new or significantly improved goods
- using engineering as a core business skill
- using patents, trade marks, copyright and secrecy/confidentiality as methods to protect IP.

Demand for design rights was negatively related to foreign ownership and introducing a new or significantly improved service.

Table 13: Determinants of active design rights

Dependent variable: Fixed effects from Table 6

Explanatory variables (0/1)	**Coef.**	**Std Err.**
Number of persons working for this firm during last pay period	0.00000***	0.00000
Compared to the previous year: Export markets targeted	0.00618***	0.00100
Firm introduced any new or significantly improved goods	0.00950***	0.00254
Firm introduced any new or significantly improved services	–0.00837***	0.00248
Any degree of foreign ownership	–0.00729***	0.00253
Skills used in undertaking core business activities: Engineering	0.00958***	0.00200
Methods used to protect intellectual property: Patents	0.04154***	0.00376
Methods used to protect intellectual property: Registration of designs	0.06401***	0.00409
Methods used to protect intellectual property: Copyright or trade marks	0.00921***	0.00304
Methods used to protect intellectual property: Secrecy/confidentiality agreements	0.00722*	0.00300
Observations	19,597	
Adj R^2	0.0538	

Note: **/*** statistically significant at the five/one per cent level of significance.

A key finding from the results in Table 12 is that rho, which is an estimate of the contribution of the firm-specific time-invariant factors, is over 0.4 in both estimations. This indicates that unobserved factors that may have a time-invariant component—such as managerial quality, strategic posture, the specific market and the nature of the product—have a large influence on whether the firm is applying for design rights.

7. Economic effects of past legislative changes

7.1 Designs Act 2003

The *Designs Act 2003* embodied several changes to the benefit of design rights holders, some of which may have increased their demand for rights (such as the increase in the number of designs allowed to be registered per application and the non-examination option for registration) and some of which may have reduced demand (such as limiting the term of the right from 16 to 10 years). Appendix D gives a summary of the main changes.

It is not therefore theoretically clear whether demand for design rights should have increased or decreased under the 2003 Act. Table 14 shows that between the years before and after 2004 there was very little change in the average number of applications for design rights per firm, nor was there significant change in average applications per employee.

Table 14: Average annual number of design rights applications per employee in each firm, 2002–2004 and 2004–2017

Designs Act	Design rights (applications) per firm	Employees per firm (FTE)	Design rights (applications) per employees (FTE)
2002–2004	0.00400	14.4	0.00020
2004–2017	0.00413	17.5	0.00019
2002–2017	0.00410	16.9	0.00019

Note: [a] $\text{mean} = (1/n)\sum_{i=1}^{n}\left(\frac{d_i}{E_i}\right)$ where d = number of design rights applications in firm i, E = number of employees (FTE) in firm i, and n = number of firms.

To test more formally for whether there was a step effect post 2004, refer to Table 15, where we model the determinants of design rights applications per firm. Recall that a firm's numbers of employees and other IP rights were statistically significant determinants of its choice to apply for design rights. We included an interaction variable for post-2004 years and active designs. For firms in both samples ('all industries' and 'design rights-intensive industries') the interaction was insignificant, suggesting clear evidence that the change in the Act did not influence demand for design rights.

Table 15: Determinants of design rights (applications)

Dependent variable: Design rights (applications) per employee (forward three-year moving average) (in logs), 2001–02 to 2016–17

Explanatory variables (in logs)	All firms		Design rights-intensive industry	
	Coef.	Std Err.	Coef.	Std Err.
R&D spending	n.a.		n.a.	
Employees (FTE)	–0.000053***	0.000017	–0.00103**	0.00044
Exports	–0.000012	0.000010	–0.00032	0.00027
Patents (applications)	0.002305***	0.000093	0.00253***	0.00078
Trade marks (applications)	0.000745***	0.000024	0.00310***	0.00030
Patents (in force)	0.000215***	0.000075	0.00038	0.00067
Trade marks (in force)	0.000280***	0.000022	0.00113***	0.00031
Post 2004	–0.000005	0.000016	0.00046	0.00037
Post 2013	–0.000003	0.000015	0.00033	0.00036
Year dummies	Yes		Yes	
Number of observations	5 175 311		132 302	
Number of groups	1 406 162		31 094	
Rho	0.6211		0.7005	
R^2—within	0.0005		0.0016	
R^2—between	0.0040		0.0077	
R^2—overall	0.0026		0.0069	

Note: **/*** statistically significant at the five/one per cent level of significance. All value variables are in logs and normalised by industry average. The coefficient estimates represent estimates of elasticities.

We undertook a similar exercise in the model of firm performance shown in Table 8 and found that, in the 'all industries' sample, the interaction between post-2004 years and active designs was significant and positive (with a coefficient of 0.0037); this effect was not apparent in the design rights-intensive sample. If there was a robust effect, we would expect to observe a stronger effect of the Act for firms in the design rights-intensive sample. We are hesitant to conclude that the new Act influenced the perceived efficacy of design rights.

7.2 Federal Circuit Court from 2013

We performed a parallel exercise to test for the effects arising from the introduction of a more streamlined and accessible lower court for settling design rights disputes.

Although there were only 31 design-related cases between 2008 and 2016, a landmark case is sometimes notable enough to change perceptions and work culture. If changes in perception are profound and widespread, it is possible that firms that otherwise would not use the design rights system can be convinced that it is worthwhile to use it. An oft-cited example is how the establishment of the US Court of Appeals for the Federal Circuit changed business culture around the efficacy and use of patents (Henry and Turner, 2006;

Hall and Ziedonis, 2001). Unfortunately, there is minimal discussion in the literature about the effect of court decisions on the confidence rights holders and their peers have in the design rights system (in contrast to a larger literature on patent court decisions).

One exception is Church, Derclaye and Stupfler (2019), who find that in the EU the courts are more likely to find designs valid than invalid and decisions are more likely to be affirmed than reversed. Although litigation numbers have grown steadily since the introduction of the EU designs legal framework which began in 1998,[xviii] the growth in design applications does not appear to be strategic. Few rights holders go to court, and often a 'cease and desist' letter is enough to stop infringement. Interestingly, the study estimated that unregistered design rights are more likely to be found infringed than registered rights.

Heikkilä and Peltoniemi (2019) refer to the increased design litigation in the context of firms testing the boundaries of protection afforded under design rights and attempting to establish freedom to operate under the right. In their case study of Finnish sauna heaters, they conclude that litigation was primarily used to confirm the (rather narrow) scope of design rights.

In Australia, jurisdiction to hear design rights disputes transferred from the Federal Court to the Federal Circuit Court in 2013. The intention was to make litigation decisions faster and cheaper for business. To assess the impact of the new Federal Circuit Court process on demand for design rights, we first compared the simple average of design rights applications per firm and per employee before and after 2013. Table 16 shows that, if there was any change post 2013, it was to fall, not rise.

Table 16: Average annual number of design rights applications per employee in each firm, 2002–2013 and 2014–2017

New court	Design rights (applications) per firm	Employees per firm (FTE)	Design rights (applications) per employees (FTE)
2002–2013	0.00430	16.5	0.00020
2014–2017	0.00356	18.0	0.00017
2002–2017	0.00410	16.9	0.00019

Note: [a] $\text{mean} = (1/n)\sum_{i=1}^{n}\left(\frac{d_i}{E_i}\right)$ where d = number of design rights applications in firm i, E = number of employees (FTE) in firm i, and n = number of firms.

In Table 15 we include a post-2013 variable in a multivariate model of the determinants of design rights applications. It shows that there was no statistically significant effect post 2013. In further refinements to this model, we interacted the number of design rights applications with the post-2013 term but also did not find any significant results for this variable. Based on these results, we find no evidence that the new court has impacted firms' interest in registering design rights. In addition, the estimation results of the effect of design rights on firm turnover show no additional effect post 2013 (see Table 8).

In sum, we find no evidence that the change of court for hearing design rights disputes has influenced the performance of firms or the use of design rights in design rights-intensive industries. There is considerable international evidence that design-active firms know little about the design rights system (e.g. Baumgart et al., 2018). We expect that in Australia there is an even poorer awareness of the costs and benefits of pursuing infringers through the new court system. Hence it is not surprising that a change to the costs of litigation has had no perceptible impact on demand or the performance of firms.

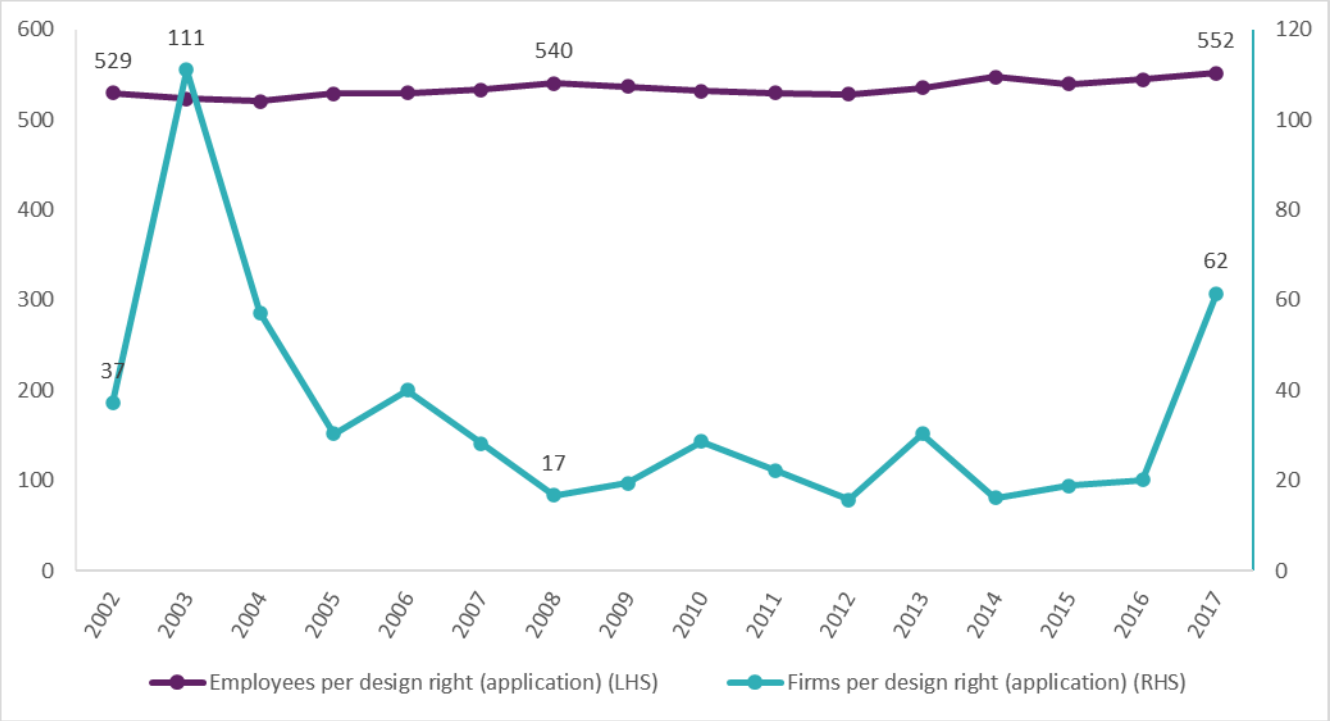
It is also possible that our null finding is due to the negligible numbers of infringement cases that have been tested in the courts. The rights conferred on rights holders may be too narrow regardless of the efficacy of the court. Further, the reduction in the cost of enforcement with the move to the new court may have been too small to change perceptions.

7.3 Loss of unregistered protection for designs in the form of copyright post 2004

In 2003 the *Copyright Act 1968* was amended to exclude protection for two-dimensional designs that are reproduced more than 50 times.[xix] Before this amendment, copyright was used as a form of unregistered design rights by certain design rights-intensive industries. In particular, before 2004, the textile, clothing and footwear (TCF) industries frequently used copyright to protect their two-dimensional cartoons in the design process.

To examine the effect of the removal of unregistered rights, we first present trends in the number of design rights applications filed by members of the TCF industries between 2001–02 and 2016–17. Figure 3 shows an increasing trend in the number of employees per design right application, suggesting that these industries have decreased in design rights intensity. Also shown in Figure 3, the average number of firms per application decreased between 2003 and 2008 but has been quite volatile since 2008. There was a notable rise in firms per applications between 2016 and 2017, but it is not clear whether this manifested a contraction in design rights use or was part of the volatility observed over the past decade.

Figure 3: On average, in the TCF industries, one in 552 employees and one in 62 firms filed for a design right in 2017



Note: TCF includes any manufacturing, wholesale and retail trade firm involved in the Textile, clothing and footwear industries.

Table 17 compares the TCF industries with all other industries for their number of employees and number of design right applications. TCF firms are larger on average (employing 38.4 people on average compared with 16.6 for other industries). These firms have an annual design rights per employee ratio that is an order of magnitude greater than for firms in other industries (0.0019 compared with 0.00019). The same magnitude difference is apparent for design right applications per firm.

Table 17: Average annual number of design rights applications per employee in each firm, inside and outside the TCF industries, 2001-02 to 2016-17

Industry	Design rights (applications) per firm	Employees per firm (FTE)	Design rights (applications) per employee (FTE)
TCF[b]	0.0370	38.4	0.00190
Other industries	0.0038	16.6	0.00019
Total	0.0041	16.8	0.00019

Note: [a] mean $= (1/n)\sum_{i=1}^{n}\left(\frac{d_i}{E_i}\right)$ where d = number of design rights applications in firm i, E = number of employees (FTE) in firm i, and n = number of firms. [b] TCF includes any manufacturing, wholesale or retail trade firm involved in the TCF industries.

To test the effect on the TCF industries of the loss of unregistered design protection in the form of copyright, we compared the number of design registrations before and after 2004. We expected that the loss of copyright protection encouraged TCF firms to register more design rights. Table 18 gives the average number of applications for design rights before and after the change in the Act in 2004. The results reveal that, whereas the average number of design rights per firm more than doubled post 2004, the average number of

design rights per employee fell slightly. It is possible that the change in the Act contributed to a consolidation of the TCF industries (a reduction in the number of firms). If the creative design of an industry is linked to the number of employees then there is limited evidence that the Act changed the rate of design rights usage by the industry.

Table 18: Average annual number of design rights applications per employee in each TCF[b] firm, 2002–2014, 2014 - 2017

New court	Design rights (applications) per firm	Employees per firm (FTE)	Design rights (applications) per employee (FTE)
2002–2013	0.01769	26.8	0.00191
2014–2017	0.04287	42.0	0.00187
2002–2017	0.03698	38.4	0.00188

Note: [a] $\text{mean} = (1/n)\sum_{i=1}^{n}\left(\frac{d_i}{E_i}\right)$ where d = number of design rights applications in firm i, E = number of employees (FTE) in firm i, and n = number of firms. [b] TCF includes any manufacturing, wholesale and retail trade firm involved in the TCF industries.

A more nuanced approach to understanding the effect of the loss of copyright on the TCF industries is to model the effect of design rights on firm productivity, exports, R&D and demand for design rights, focusing on whether having design rights affected these outcomes post 2004—in particular, for TCF firms.

Table 19 shows that post-2004 there was a significant fall in turnover among firms in the TCF industries. However, this was not significantly greater than the decline for firms across all industries (see Table 8). Hence, we cannot be clear that the slight step-decrease after 2004 was due to the loss of copyright protection for two-dimensional industrially applied designs or reflects a more general downturn in productivity in Australian industry.

Table 20 models the demand for design rights applications in the TCF industries. Of interest is whether there is a rise in demand post 2004. In this model, we include employee size and exports to control for the general expansion of firms. We include variables indicating ownership of patent and trade mark rights to control for the general innovativeness of firms. Our model reveals that, once we account for these factors, there was no step-increase in the demand for design rights in the TCF industries because of the 2003 change to the *Copyright Act 1968*.

Table 19: Determinants of TCF business turnover

Dependent variable: Turnover for firms in the TCF industries (in logs), 2001–02 to 2016–17

Explanatory variables (in logs)	Coef.	Std Err.
Employment (FTE)	0.05821***	0.00167
Total (tangible) assets	0.14587***	0.00390
Materials	0.69748***	0.00383
Patents (in force)	0.00975	0.00756
Trade marks (in force)	–0.00335	0.00312
Designs (active)	–0.00084	0.00531
Post 2004	–0.01688***	0.00322
Post-2004* designs (active)	0.00493	0.00500
Post 2013	0.00794***	0.00349
Post-2013* designs (active)	0.00118	0.00555
Year dummies	Yes	
Number of observations	18 973	
Number of groups	4905	
Rho	0.5169	
R^2—within	0.8574	
R^2—between	0.9773	
R^2—overall	0.9771	

Note: **/*** statistically significant at the five/one per cent level of significance. All value variables are in logs and normalised by industry average. The coefficient estimates represent estimates of elasticities. TCF includes any manufacturing, wholesale and retail trade business involved in the TCF industries.

Table 20: Determinants of design rights applications in the TCF industries

Dependent variable: Design rights applications per employee (forward three-year moving average) (in logs), 2001-02–2016-17

Explanatory variables (in logs)	Coef.	Std Err.
R&D spending	n.a.	
Employees (FTE)	–0.00079	0.00049
Exports	0.00004	0.00030
Patents (applications)	–0.00010	0.00133
Trade marks (applications)	0.00171***	0.00042
Patents (in force)	0.00506***	0.00116
Trade marks (in force)	0.00100**	0.00046
Post 2004	–0.00012	0.00047
Post 2013	–0.00015	0.00050
Year dummies	Yes	
Number of observations	24 131	
Number of groups	6488	
Rho	0.5967	
R^2—within	0.0033	
R^2—between	0.0025	
R^2—overall	0.0037	

Note: **/*** statistically significant at the five/one per cent level of significance. All value variables are in logs and normalised by industry average. The coefficient estimates represent estimates of elasticities. TCF includes any manufacturing, wholesale and retail trade business involved in the TCF industries.

Conclusion

There are grounds for believing that design is becoming a greater source of competitive advantage for both firms and nations, especially in the digital age, where the cost of mere physical assembly is rapidly falling. However, it is not clear that the operation of the design rights system is either a help or a hindrance.

Like other forms of IP, infringement is the tail that wags the dog. If the design rights system does not stop (illegitimate) infringement—by prevention, by 'cease and desist' letters or by filing in court—then a design rights system is at best benign and at worst an obstruction and a tax on design.

We have established that, in the most design rights-intensive industries, possession of rights does lead to higher turnover, all else being equal. However, without a new study method and more modelling, it is not possible to establish whether this is due to the production of well-designed products or the possession of the legal right *per se*. Although conceptually distinct, the two attributes are correlated in practice.

Other than establishing whether the possession of design rights does stop expropriation—and in which circumstances—a more fruitful way to enhance the profitability of design in Australian industry could be to:

- promote the advantages of design to industry
- educate prospective exporters on the options for international design rights
- establish enough of a community of practice around design that industry feel confident to move to the frontier of good design.

There is no silver bullet to achieve these policies. However, a sensible first step would be to survey design rights holders to assess their experience with infringement and copying and their attempts to stop it. Especially important would be to hear from firms with international design rights experience.

In addition, we need more comprehensive information from firms about whether better design is a feature of (their) market leaders and, if so, ways in which Australian industry can gain enough confidence to invest at the level required to make a critical difference to their competitive position.

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Appendices

Appendix A: Design rights-intensive industries

Table A1: Design rights-intensive industries (four-digit ANZSIC), ranked by order of rights per employee (FTE)

ANZSIC 06	INDUSTRY NAME	RANK
2432	Electric lighting equipment manufacturing	1
2142	Aluminium rolling, drawing, extruding	2
1912	Rigid and semi-rigid polymer product manufacturing	3
201	Offshore longline and rack aquaculture	4
2299	Other fabricated metal product manufacturing n.e.c.	5
2412	Medical and surgical equipment manufacturing	6
2291	Spring and wire product manufacturing	7
3332	Plumbing goods wholesaling	8
2224	Metal Roof and guttering manufacturing (except aluminium)	9
2021	Clay brick manufacturing	10
3311	Wool wholesaling	11
1521	Corrugated paperboard and paperboard container manufacturing	12
3712	Clothing and footwear wholesaling	13
1351	Clothing manufacturing	14
2439	Other electrical equipment manufacturing	15
3493	Telecommunication goods wholesaling	16
4211	Furniture retailing	17
2512	Metal furniture manufacturing	18
2511	Wooden furniture and upholstered seat manufacturing	19
1911	Polymer film and sheet packaging material manufacturing	20
2519	Other furniture manufacturing	21
3739	Other goods wholesaling n.e.c.	22
1331	Textile floor covering manufacturing	23
4251	Clothing retailing	24
3733	Kitchen and dining ware wholesaling	25
1352	Footwear manufacturing	26
2223	Architectural aluminium product manufacturing	27
2313	Automotive electrical component manufacturing	28
2592	Toy, sporting and recreational product manufacturing	29
6631	Heavy machinery and scaffolding rental and hiring	30
2419	Other professional and scientific equipment manufacturing	31
3731	Furniture and floor covering wholesaling	32
3734	Toy and sporting goods wholesaling	33
2229	Other structural metal product manufacturing	34
2210	Iron and steel forging	35
2319	Other motor vehicle parts manufacturing	36
3339	Other hardware goods wholesaling	37
2429	Other electronic equipment manufacturing	38
2311	Motor vehicle manufacturing	39
2149	Other basic non-ferrous metal product manufacturing	40
3239	Other building installation services	41
2449	Other domestic appliance manufacturing	42
1333	Cut and sewn textile product manufacturing	43
1192	Prepared animal and bird feed manufacturing	44
2451	Pump and compressor manufacturing	45

Appendix B: Wholesale trade applicants

Table B1: Names of most frequent design rights applicants, Wholesale Trade industry, Australia, 2002–2017

Applicant name	ANZSIC (4 digit)	ANZSIC (2 digit)	No.
Jets Swimwear	Clothing and footwear wholesaling	Other goods wholesaling	424
Resmed	Professional and scientific goods wholesaling	Machinery and equipment wholesaling	354
Aluminium Specialties Group	Other hardware goods wholesaling	Basic material wholesaling	151
Breville	Other electrical and electronic goods wholesaling	Machinery and equipment wholesaling	147
Sunbeam	Other electrical and electronic goods wholesaling	Machinery and equipment wholesaling	106
Everstone Intl	Other hardware goods wholesaling	Basic material wholesaling	92
Acco Brands Australia	Paper product wholesaling	Other goods wholesaling	83
Brown & Watson Intl	Car wholesaling	Motor vehicle and motor vehicle parts wholesaling	65
Lm Australasia	Clothing and footwear wholesaling	Other goods wholesaling	58
Kim Meller Imports	Clothing and footwear wholesaling	Other goods wholesaling	54
Jackson Industries	Telecommunication goods wholesaling	Machinery and equipment wholesaling	51
Argent Australia	Other hardware goods wholesaling	Basic material wholesaling	50
Thinking Ergonomix	Computer and computer peripheral wholesaling	Machinery and equipment wholesaling	49
Millswest	Clothing and footwear wholesaling	Other goods wholesaling	49
Colorado Products	Plumbing goods wholesaling	Basic material wholesaling	48
Funtastic	Toy and sporting goods wholesaling	Other goods wholesaling	44
Brightgreen	Other electrical and electronic goods wholesaling	Machinery and equipment wholesaling	43
BFX Ho	Furniture and floor covering wholesaling	Other goods wholesaling	40
Mayo Group Intl	Professional and scientific goods wholesaling	Machinery and equipment wholesaling	37
Electrolux Home Products	Other electrical and electronic goods wholesaling	Machinery and equipment wholesaling	37
Hunter Pacific Intl	Other electrical and electronic goods wholesaling	Machinery and equipment wholesaling	37
Holster Fashion	Clothing and footwear wholesaling	Other goods wholesaling	35
Dorma Door Controls	Other hardware goods wholesaling	Basic material wholesaling	34
Container	Other goods wholesaling n.e.c.	Other goods wholesaling	34
Automatic Tech Australia	Other hardware goods wholesaling	Basic material wholesaling	33
Multisteps	Industrial and agricultural chemical product wholesaling	Basic material wholesaling	33
Ansell	Clothing and footwear wholesaling	Other goods wholesaling	31
Australian Brushware	Other hardware goods wholesaling	Basic material wholesaling	31
Trio Brothers Trading	Other goods wholesaling n.e.c.	Other goods wholesaling	30
Ark	Trailer and other motor vehicle wholesaling	Motor vehicle and motor vehicle parts wholesaling	30
Eglo Lighting Australia	Other electrical and electronic goods wholesaling	Machinery and equipment wholesaling	29
Cable Accessories Australia	Other electrical and electronic goods wholesaling	Machinery and equipment wholesaling	29
SS Inductions	Motor vehicle new parts wholesaling	Motor vehicle and motor vehicle parts wholesaling	28
Bromic	Other hardware goods wholesaling	Basic material wholesaling	28
Hager B & R	Professional and scientific goods wholesaling	Machinery and equipment wholesaling	27
Shriro Australia	Other electrical and electronic goods wholesaling	Machinery and equipment wholesaling	26
Metlam Australia	Plumbing goods wholesaling	Basic material wholesaling	26

Land & Sea Sports	Toy and sporting goods wholesaling	Other goods wholesaling	26
Afi Wa	Furniture and floor covering wholesaling	Other goods wholesaling	25
Zetco Valves	Plumbing goods wholesaling	Basic material wholesaling	25
Tristar Houseware Australia	Kitchen and diningware wholesaling	Other goods wholesaling	25
Primus Australia	Other machinery and equipment wholesaling n.e.c.	Machinery and equipment wholesaling	24
Fackelmann Housewares IP	Kitchen and diningware wholesaling	Other goods wholesaling	24
Evolve Lifewares	Other goods wholesaling n.e.c.	Other goods wholesaling	24

Note: n.e.c. means 'not elsewhere classified'.

Appendix C: Determinants of design innovation

Managerial practices

For design-intensive firms, managerial practices for attracting, retaining and coordinating knowledge workers have been shown to be important for design innovation. Management studies set in the global fashion industry show that, for design-intensive firms:

- Design innovation, in 270 fashion houses over the period 2000 to 2010, is affected by key designers' depth and breadth of foreign experience (Godart, Maddux and Shipilov, 2015).
- Mobility of key employees to foreign competitors may increase the former firm's design innovation performance by enabling it to capture creative spillovers (Shipilov, Godart and Clement, 2017). This study was based on 261 fashion houses over the period 2000 to 2010.

Business structure

Innovation research suggests that inter-organisational collaborations such as alliances and joint ventures can provide effective vehicles for innovation. In design industries (e.g. fashion) such arrangements are rare; but to capture creative spillovers, firms organise themselves into larger business groups and conglomerates. A study by Rawley, Godart and Shipilov (2018), focused on 251 fashion houses, found that the creative ratings of one subsidiary tended to increase with the ratings of other subsidiaries within the same conglomerate.

In sum, these studies suggest that the prominence given to design stems from work culture and that collaboration and the exchange of personnel is an important channel for the transmission of new work practices.

Technological and market characteristics

Several studies have suggested that design innovation varies over the industry life cycle. The introduction of radically new technologies often requires radical innovation, in the form of related products, to allow producers and consumers to create a common understanding of the new technology (Rindova and Petkova, 2007).

Design innovation is also often required in mature or saturated markets. Changes to the form of a mature product may entice users to replace older models with newer ones in the absence of substantive functional improvements. Through design innovations, producers may be able to reach new segments of consumers with specialised preferences and needs (Eisenman, 2013). Chan, Mihm and Sosa (2018) show, by analysing 30,000 US design patents, that change in product form is associated both with the rate of change in a

product's function and with the absence of such change. The size and growth rate of the market that a business serves may thus be an important driver of its design activity (Dan, Spaid and Noble, 2018).

However, there is no clear consensus regarding the differential use of design over the industry life cycle. Gemser and Leenders (2001), for example, found in a study of 47 firms in the Dutch furniture and precision instrument industries that there was not differential use of designs according to the life cycle.

The above stream of studies emphasises design's communication role. A successful design sends out strong messages about values and lifestyle. Producers use these messages to market goods and, after purchase, consumers use designs to advertise who they are.

During the emergence of new industries, design can help to build market acceptance for new technologies and products by rendering them more meaningful. In mature markets, where product functionality is interchangeable, design changes enable firms to reach and develop new consumer segments. However, these studies do not indicate which firms, in a given market context, are more intensive users of design.

Local clusters / ecosystem

Design innovation occurs in the context of networked relationships of producers and consumers that usually transcend the business (Verganti, 2003). Research on the global fashion industry suggests that leading firms rely for their creative performance on the socialisation of their designers within urban and professional communities. For example, in a study of 248 fashion houses, Godot (2012) has found that urban proximity of design teams from different fashion houses affects their ability to create within a given trend in style.

Institutional setting

Marketing studies provide mixed evidence on the likely effects of strengthening design rights. These studies show that imitation/copying has three effects on the revenues of original designs: (1) a positive 'advertising effect', in that the introduction of copies can lead to greater consumer adoption of the original design, (2) a negative 'substitution effect', in that imitations may be consumed in place of the original design, and (3) a negative 'overexposure effect', in that beyond a threshold, overconsumption may reduce the propensity of some consumers ('snobs') to adopt. Imitation usually leads to overconsumption.

- Appel et al. (2018) use data on 20 original fashion designs to show that the different effects dominate at different stages of a design's life cycle. The advertising effect dominates when a design is first introduced to the market. The overexposure effect dominates during later stages. Both these effects outweigh the substitution effect (i.e. that imitators directly steal customers from originators). The implication is that short-term design protection may damage the performance of originals by stalling the initial adoption of the design without limiting its later overexposure. With longer-term

protection, the positive monetary effect from limiting overexposure is found to outweigh the negative policy effect from reducing initial adoption.

- In a study of China's fashion industry, Qian (2014) finds that the advertising effect from copying outweighs the substitution effect, particularly in the case of higher-quality goods. The result is that firms exposed to high levels of copying tend to innovate more and upgrade the quality of their products more than less exposed firms.

Appendix D: Change in the terms of protection for designs under the Designs Act 2003

Table D1: Comparison of the 1906 and 2003 Designs Acts in respect of nine key legal standards

	Designs Act 1906	**Designs Act 2003**
Reducing the term	Registration up to **16 years**.	Registration up to **10 years**.
Raising the eligibility/threshold requirements	Design must be **new or original**.	Design must be **new and distinctive**.
	Prior art base consists of documents published **in Australia and acts done in Australia** publicly disclosing the design.	Prior art base consists of documents published **anywhere in the world and acts done in Australia** publicly disclosing the design.
	Eligibility of a design is considered in the light of **differences** between the design and the prior art base.	Eligibility of a design is considered in the light of **similarities** between the design and the prior art base.
Streamlining the registration process	Application is **fully examined** before being registered.	Application is registered following a formalities check **without substantive examination**.
	Only **one design** per registration.	Possible to have **more than one design** per application.
	The owner of a design may bring an action for infringement **once the design is registered**.	The owner of the design may bring an action for infringement **only after the registration has been examined** and a Certificate of Examination issued.
		Higher fees for registration.[xx]
Expanding the scope of rights	For infringement, a design needs to be an **obvious or fraudulent imitation** of a registered design.	For infringement, a design must be **identical or have a similar overall impression** to a registered design.
	There is **no defence** in relation to manufacture of spare parts, meaning spare parts must be produced with permission from the holder of the design right.	**Defence** for the manufacture of spare parts, meaning spare parts can be produced without permission from the holder of the design right.

Endnotes

[i] Heikkilä and Peltoniemi (2019) describe how, with the birth of a new product segment in the Finnish sauna heater industry, the incumbent developed a portfolio of design rights in the belief that this would protect its new business from imitators. In this case, the authors argue, businesses and entrepreneurs closely monitored granted design rights and related course decisions and learned the boundaries of what was protected in existing designs. This learning process may have resulted in increased product variety, as competitors were successful in designing around the registered designs.

[ii] The damages were ultimately revised downward. Reuters. 2020. 'Jury awards Apple $539 million in Samsung patent case'. *New York Times*. Available at https://www.nytimes.com/2018/05/24/business/apple-samsung-patent-trial.html. Accessed 19 February 2020. Randall, Joshua. 2018. 'The rise of design patents: Insights from the Apple v. Samsung battle'. *Lexology*. Available at https://www.lexology.com/library/detail.aspx?g=bd796b2e-c0a0-409a-b0f0-ed8570418401. Accessed 19 February 2020.

[iii] Munari and Santoni (2010), in a study of about 400 Italian businesses, found that those that operate at greater geographic distance from their suppliers or rely on small numbers of suppliers will tend to combine the use of patents and designs to compensate for monitoring challenges.

[iv] Based on the definition from the Intellectual Property Longitudinal Research Data module within BLADE.

[v] The field in BLADE used for design rights (active) is d_active, which is the number of design applications still active (including those that have been certified). The field for design rights (certified) is d_alive.

[vi] Bascavusoglu-Moreau and Tether (2011) use a matched-pair research design to compare the performance (sales per employee) of businesses that do or do not hold registered designs but operate in 'design-intensive' sectors in the United Kingdom. The study finds an average 17 per cent performance benefit associated with holding a registered design in the late 1990s and early 2000s. However, in the late 2000s, companies with registered designs were characterised by poorer performance than the control group. The authors were unable to infer a clear causal relationship between design rights and performance and suggest there is a missing confounding factor in the statistical analysis. Griffiths and Webster (2006) modelled intangible assets using a market value equation and found design rights to have a positive effect, using data on 300 Australian companies from 1989 to 2002. However, when Griffiths, Jensen and Webster (2011) estimated the contribution of IP rights to intangible assets within a profits model, using data on 2689 Australian companies from 1990 to 2006, they found no effect from design rights.

[vii] Another economic rationale for the design rights system is to protect consumers from confusion caused by rampant copying of original product shapes (Kur et al., 2019). No studies (to our knowledge) have addressed the potential impact of design rights in enabling businesses to differentiate and build their reputations.

[viii] We employ the standard augmented Cobb-Douglas production function:

$y_{it} = \alpha k_{it} + \beta l_{it} + \gamma m_{it} + \delta p_{it} + \pi s_{it} + \theta d_{it}^{c} + \omega d_{it}^{a} + \tau_i + a_t + u_{it}$ (1) where the variables (in logs) are y_{it}, the turnover of each business i in year t; k_{it}, the accounting value of the tangible capital stock (total assets); l_{it}, the level of employment (FTE); m_{it}, materials (other accounting expenditures); p_{it}, the business's stock of patents in force; s_{it}, the business's stock of trade marks in force; d_{it}^{c}, a measure of certified designs in force; d_{it}^{a}, a measure of active (i.e. registered) design rights; τ_i, which captures all unobserved time-invariant business-specific factors such as slowly changing managerial and worker skills; u_{it}, which represents all other factors affecting turnover; and a_t, a series of year dummy variables to capture macroeconomic factors that affect all businesses. To adjust for both inflation and industry-level accounting conventions, we have normalised value measures by four-digit industry and year (using the usual method of dividing each business by year value by the mean value for that industry and year).

[ix] A fixed effects estimator nets out any factors contributing to turnover that are present for the duration of the time period. This might be business-level factors such as the strategic posture of the business, or the type of market in which the business operates.

[x] We cannot see a clear reason why a time-varying confounding factor, due perhaps to a change in managerial skill, would exist and therefore cause the coefficients on our explanatory variables to be biased. Regardless, even if there

was a clear case of this type of endogeneity, we would need good instrumental variables to employ a method such as Olley-Pakes.

[xi] In estimating the effect of having *one more* design right on turnover, we utilise (1) the values of Y (turnover) for businesses in design rights-intensive industries presented in column 2 of Table 5, (2) D^a and D^c (stock levels of active and certified design rights) from columns 4 and 5 of Table 6, and (3) the coefficients θ and ω from column 3 in Table 8.

[xii] We employ the standard augmented Cobb-Douglas production function:
$x_{it} = \alpha k_{it} + \beta l_{it} + \delta p_{it} + \pi s_{it} + \theta d_{it}^{c} + \omega d_{it}^{a} + \tau_i + a_t + u_{it}$ (2) where x_{it} measures export adjusted for both inflation and industry-level accounting conventions. We have normalised it by four-digit industry and year (using the usual method of dividing each business by year value by the mean value for that industry and year).

[xiii] We use the standard augmented Cobb-Douglas production function:
$r_{it} = \alpha k_{it} + \beta l_{it} + \delta p_{it} + \pi s_{it} + \theta d_{it}^{c} + \omega d_{it}^{a} + \tau_i + a_t + u_{it}$ (3) where r_{it} measures R&D spending adjusted for both inflation and industry-level accounting conventions. We have normalised it by four-digit industry and year (using the usual method of dividing each business by year value by the mean value for that industry and year).

[xiv] The survey portion of the BLADE dataset has a rich set of business characteristics. As the characteristics are binary variables that vary little over time, the data are only suitable for the descriptive (cross-sectional) analysis.

[xv] 2005 is the first year for which data on R&D spending is available in BLADE.

[xvi] $d_{it}^{f} = \alpha r_{it} + \beta e_{it} + \gamma x_{it} + \delta pa_{it-1} + \theta sa_{it-1} + \vartheta p_{it-1} + \sigma s_{it-1} + \tau_i + u_{it} + a_t$ (4) where d_{it}^{f} is the log of the number of design rights applications filed by business i. To adjust for idiosyncratic factors, this number is calculated as a forward moving average for the years t, $t+1$ and $t+2$; r is the log of R&D spending by the business; e is employees (EFT); and x is log of export income. To adjust for both inflation and industry-level accounting conventions, we have normalised these value measures by four-digit industry and year. Variables pa and sa are log of the number of patent and trade mark applications, which represent new-to-the-world inventions and new-to-market product launches respectively; p and t are patent and trade mark stocks (in force) and represent the accumulation of successful new-to-the-world inventions and new-to-market products; τ is a business fixed effect to capture all factors that are time invariant and specific to business i; u are all other explanatory factors that are uncorrelated with the above nominated explanatory variables; a_t are a series of time variables to capture macroeconomic factors. To adjust for both inflation and industry-level accounting conventions, we have normalised value measures by four-digit industry and year (using the usual method of dividing each business by year value by the mean value for that industry and year).

[xvii] Using the following estimating equation: $\tau_i = X_i \omega + e_i$ where X_i is a vector of time-invariant characteristics and e_i represents all other explanatory items that are not correlated with X_i.

[xviii] Kleespies, M., and Barragán Zapirain, L. Design rights: European Union. *World Trademark Review.* Available at https://www.worldtrademarkreview.com/brand-management/design-rights-european-union. Accessed 29 April 2020.

[xix] The *Designs (Consequential Amendments) Act 2003*, which come into force in June 2004, amended the designs/copyright overlap provisions contained in sections 74 to 77 of the *Copyright Act 1968*.

[xx] Fees: 1906 Act (post 1981) 1998–2003: $90 lodgement (to 1 year) including exam, $55/$90/$135 renewals of + 5 years / + 5 years / + 5 years (total 16 years); 2003 Act from 2004: $200 lodgement (to 5 years), $360 exam, $275 renewal + 5 years; 2003 Act from December 2012 to current: $250 lodgement (to 5 years), $420 exam, $320 renewal + 5 years.