Batman Forever?
How Trademarks affect Reuse in the Comics Industry

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Summary

Intellectual property rights (IPRs) introduce a fundamental dynamic trade-off to society. Evidence suggests that patents and copyright provide incentives to innovate (Zhao, 2006; Giorcelli and Moser, 2020), but we also know that patents and copyright substantially limit cumulative innovation and reuse (Williams, 2013; Galasso and Schankerman, 2015; Nagaraj, 2018; Reimers, 2019; Watson et al., 2022; Schankerman and Schuett, 2022).

TMs correspond to the downstream part of the innovation process, but the reasons why firms use TMs are similar to other IPRs, i.e. to secure market positions. TMs not only protect from imitation and competition, they help to appropriate rents either from exploitation of exclusive rights or from engaging in licensing markets and to attract resources such as investors (Castaldi, 2018, 2020; Castaldi et al., 2020; Fisch et al., 2022). What makes TMs special, however, is that they can signal value to consumers, which creates differentiation and can have additional competitive advantages (Ramello and Silva, 2006; Gao and Hitt, 2012). TMs also often overlap with other IPRs. For example, creative products, which are generally governed by copyright, may use trademarked components. While designing and executing a strategy of overlapping IPRs is clearly more complex than only relying on copyright, TMs are especially interesting, because the application process of TMs is much less costly compared to patents. As a consequence, TMs can affect the reuse process even beyond copyright. Despite their high practical relevance, trademarks (TMs) are generally understudied in the literature such that few empirical studies on TMs exist. For example, evidence shows that firms with larger stocks of TMs (in addition to other IPRs) are less likely to release software as open source, which is especially prone to be used by third parties (Fosfuri et al., 2008). However, the societal reach of TMs more generally, and especially concerning how TMs affect reuse, remains largely unknown.

In this paper, we empirically investigate how TMs affect the supply of new products. In particular, we ask how trademarking and licensing decisions affect reuse by TM holders and third parties. Compared to the existing literature that focuses mostly on patents and copyright, our setting lets us study situations where reuse can be blocked or enabled by trademarking and corresponding licensing decisions of the rights holder, and we are not limited to exploit variation from when IP protection is introduced, prolonged or removed by court decisions or law. We can therefore attempt to provide evidence on which mechanism prevails: whether TMs act as a way to exclude third-party reuse or whether TMs enable licensed third-party reuse. Because we have access to a large panel data set that covers almost three decades, we can additionally study how changes in the market environment due to technological advancement afforded by digitization have altered the relationship

between TMs and reuse.

The empirical context of our study is the comic industry, which has some interesting general features. Comics as original expressions naturally fall under copyright law, which has been shown to affect the supply of music and books (Li et al., 2018; Reimers, 2019; Giorcelli and Moser, 2020; Watson et al., 2022). Quite in contrast to other entertainment products, however, comic characters are eligible for other IPRs beyond copyright, in particular TMs (Calboli and Ginsburg, 2020). TMs can therefore make it easier to exclude third-parties from producing derivative works. These limiting effects are further amplified when copyright and TMs apply simultaneously and create high transaction costs and royalty stacking (Farrell et al., 2007; Spulber, 2017; Galetovic and Gupta, 2020). At the same time, effectively advertising and building brand value might require TM protection for characters. A TM can therefore help to improve general appropriability conditions around franchises and merchandising activity, based on these 'ancillary' rights. Furthermore, licensing revenue may be an important source of financing for new derivative productions, in particular in the movie industry (Epstein, 2012; Hart, 2015; Ferrucci et al., 2020). Focusing on the comic industry as a case in point therefore lets us extend the literature by studying the role of TMs in the supply of new products which are built upon cumulative creative efforts.

Our empirical analysis is based on a unique data set collected from a variety of sources. We can follow 49,369 comic characters with respect to TM protection status and reuse in print comic books from 1990 to 2017. We compare reuse across characters that receive a TM versus characters that do not have TMs (yet). While we are careful not to claim causality, we employ recent methods that let us arrive at potentially unbiased estimates of the average treatment effect on the treated (Goodman-Bacon, 2021; Callaway and Sant'Anna, 2021). On average, we find that TMs are associated with about 19% less reuse of protected comic characters in comic books. We further show that the relationship between TMs and reuse varies over time, being stronger (more negative) in periods in which the comic industry is affected by the various changes following digitization. Our estimation strategy makes use of fixed effects that should absorb time-invariant unobserved variation that could bias the results.

Our study contributes to different strands of literature. Naturally, we connect to the literature on the economics of copyright and TMs. Specifically, our results are complementary to work on copyright, reuse and cumulative creativity in the context of music (Gans, 2015; Watson, 2017a,b; Watson et al., 2022), book publishing (Reimers, 2019; Heald, 2014) and online platforms (Nagaraj, 2018). We also add to a literature that discusses the strategic use of TMs (Castaldi, 2018; Castaldi et al., 2020), especially when used in conjunction with other IPRs (Derclaye, 2017; Senftleben, 2021). By highlighting the role of TMs in reuse and derivative work, we add to the literature on the effects of digitization on innovation and supply (Waldfogel, 2017; Aguiar and Waldfogel, 2018; Peukert and Reimers, 2022; Bradley and Kolev, 2023).

Contents

1 Introduction

Intellectual property rights (IPRs) introduce a fundamental dynamic trade-off to society. Evidence suggests that patents and copyright provide incentives to innovate (Zhao, 2006; Giorcelli and Moser, 2020), but we also know that patents and copyright substantially limit cumulative innovation and reuse (Williams, 2013; Galasso and Schankerman, 2015; Nagaraj, 2018; Reimers, 2019; Watson et al., 2022; Schankerman and Schuett, 2022).

TMs correspond to the downstream part of the innovation process, but the reasons why firms use TMs are similar to other IPRs, i.e. to secure market positions. TMs not only protect from imitation and competition, they help to appropriate rents either from exploitation of exclusive rights or from engaging in licensing markets and to attract resources such as investors (Castaldi, 2018, 2020; Castaldi et al., 2020; Fisch et al., 2022). What makes TMs special, however, is that they can signal value to consumers, which creates differentiation and can have additional competitive advantages (Ramello and Silva, 2006; Gao and Hitt, 2012). TMs also often overlap with other IPRs. For example, creative products, which are generally governed by copyright, may use trademarked components. While designing and executing a strategy of overlapping IPRs is clearly more complex than only relying on copyright, TMs are especially interesting, because the application process of TMs is much less costly compared to patents. As a consequence, TMs can affect the reuse process even beyond copyright. Despite their high practical relevance, trademarks (TMs) are generally understudied in the literature such that few empirical studies on TMs exist. For example, evidence shows that firms with larger stocks of TMs (in addition to other IPRs) are less likely to release software as open source, which is especially prone to be used by third parties (Fosfuri et al., 2008). However, the societal reach of TMs more generally, and especially concerning how TMs affect reuse, remains largely unknown.

In this paper, we empirically investigate how TMs affect the supply of new products. In particular, we ask how trademarking and licensing decisions affect reuse by TM holders and third parties. Compared to the existing literature that focuses mostly on patents and copyright, our setting lets us study situations where reuse can be blocked or enabled by trademarking and corresponding licensing decisions of the rights holder, and we are not limited to exploit variation from when IP protection is introduced, prolonged or removed by court decisions or law. We can therefore attempt to provide evidence on which mechanism prevails: whether TMs act as a way to exclude third-party reuse or whether TMs enable licensed third-party reuse. Because we have access to a large panel data set that covers almost three decades, we can additionally study how changes in the market environment due to technological advancement afforded by digitization have altered the relationship between TMs and reuse.

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shown to affect the supply of music and books (Li et al., 2018; Reimers, 2019; Giorcelli and Moser, 2020; Watson et al., 2022). Quite in contrast to other entertainment products, however, comic characters are eligible for other IPRs beyond copyright, in particular TMs (Calboli and Ginsburg, 2020). More specifically, while words, short phrases and titles generally cannot be protected under U.S. copyright law, the brand or character name of a comic can be protected under U.S. trademark law. Logos (design marks) and the visual appearance (trade dress) of a comic character may be protected and eligible under both, U.S. trademark and copyright laws (Wilkof and Basheer, 2012). TMs can therefore make it easier to exclude third-parties from producing derivative works. These limiting effects are further amplified when copyright and TMs apply simultaneously and create high transaction costs and royalty stacking (Farrell et al., 2007; Spulber, 2017; Galetovic and Gupta, 2020). At the same time, effectively advertising and building brand value might require TM protection for characters. A TM can therefore help to improve general appropriability conditions around franchises and merchandising activity, based on these 'ancillary' rights. Furthermore, licensing revenue may be an important source of financing for new derivative productions, in particular in the movie industry (Epstein, 2012; Hart, 2015; Ferrucci et al., 2020). Focusing on the comic industry as a case in point therefore lets us extend the literature by studying the role of TMs in the supply of new products which are built upon cumulative creative efforts.

Since the early 2000's technological advancements have lowered the fixed costs of production, promotion and distribution in the comic industry (Hardy, 2019). Much like in the book industry, digital technologies have enabled high-quality printing at low prices and small scale, and international e-commerce platforms like Amazon along with the arrival of e-reading devices and dedicated (unlicensed and licensed) platforms to download digital comic books have made it easier for consumers to access products (Waldfogel and Reimers, 2015; Reimers, 2016). Online communities and review platforms have created information that both consumers and publishers can use to make better purchase and investment decisions (Reimers and Waldfogel, 2021; Peukert and Reimers, 2022). In addition, lower fixed costs for movies and video games (Waldfogel, 2016) have extended the size of the franchising market for comic characters. Correspondingly, the number of comic books, movies and video games published each year has more than doubled since the early 2000's. Some of the expansive effects of digitization might be driven by the use of IPRs and the corresponding new options for commercialization and efficient licensing, especially of TMs. That is, thanks to the cost advantages of digitization that potentially allows for more reuse of third parties, TMs that can enable reuse may have become more valuable. As a consequence, the expected lifetime licensing income of TMs may have increased. Alternatively, even if we observe a vast increase in the number of products in the market in the digital era, output might have been even higher if IPRs, and specifically TMs, did not limit the reuse of creative content. This could be especially pronounced since digitization and globalization, by creating more information and tighter relationships between countries, may have also made it easier to enforce IPRs

at scale.

Our empirical analysis is based on a unique data set collected from a variety of sources. We can follow 49,369 comic characters with respect to TM protection status and reuse in print comic books from 1990 to 2017. We compare reuse across characters that receive a TM versus characters that do not have TMs (yet). While we are careful not to claim causality, we employ recent methods that let us arrive at potentially unbiased estimates of the average treatment effect on the treated (Goodman-Bacon, 2021; Callaway and Sant'Anna, 2021). On average, we find that TMs are associated with about 19% less reuse of protected comic characters in comic books. We further show that the relationship between TMs and reuse varies over time, being stronger (more negative) in periods in which the comic industry is affected by the various changes following digitization.Our estimation strategy makes use of fixed effects that should absorb time-invariant unobserved variation that could bias the results. Nevertheless, we are careful to acknowledge that both trademarking and licensing decisions are endogenous choices. We provide evidence with the aim to address alternative explanations and reverse causality. In particular, we show that (1) reuse of characters with TMs and characters with no TMs (yet) follow similar trends in the absence of TMs, (2) there are no effects in markets where TMs offer no protection against reuse. Further, our results are in line with theoretical predictions. We show that digitization amplifies third-party reuse of trademarked comic characters, while leaving reuse by the applicant of the TM unaffected.

2 Background

2.1 A Brief history of the comic industry

The comic publishing industry is a fast-growing, multi-billion dollar enterprise within the creative economy. In 2015, it generated total revenues of more than a billion dollars in the U.S. alone, increasingly capitalizing on top titles (Hardy, 2019).

In the last decades, the industry has witnessed several cases of vertical integration of comics publishers, movie and video games producers, as well as online distributors.[1] Some of these mergers raised competition policy concerns about (future) reuses of original characters by other parties than the right holders (Saval, 2013). Between 2005 and 2017, 68% of the total revenue share was maintained by Marvel and DC. Accordingly, Hionis and Ki (2019) show that the U.S. comic book market is highly concentrated.

Much like other entertainment industries, the comic industry has experienced a massive increase in supply since the beginning of the 21st century (Waldfogel, 2017). Before digitization, the annual number of comic book releases did not see many changes and was

[1] Prominent examples are the 2009 Walt Disney and Marvel merger as well as the parent-subsidiary ties established between Time Warner, DC and Warner Bros (Saval, 2013).

ranging at about 10,000 book releases per year. Since the early 2000's, however, the absolute number of published comic books has been on an increasing path, reaching more than 23,000 prints per year in 2017. We see similar patterns in industries that often make use of comic franchises. The digital era has brought more than a twofold increase in the number of video games, as well as in the number of theatrical movie releases.

In particular, there were both demand-side and supply-side changes induced by on-demand printing technology, digital distribution platforms, the new format of e-comic books, as well as increased reuse of comic characters in comic book series or other media such as movies and video games (Hardy, 2019). New digital services such as *ComiXology* and *Marvel Digital Comics* seem to have helped to grow digital channels. However, overall digital comic book consumption in the U.S. is still relatively low compared to other countries, especially Japan (Hionis and Ki, 2019; Tanaka, 2019). Compared to other industries such as music and movies, revenues of books and comic books in particular were not heavily affected by unlicensed consumption through online piracy (Hardy, 2021). Also, there is little evidence for displacement effects between physical and ebook formats (Chen et al., 2019). Indeed, we document that the number of comic books brought to market has more than doubled since the 1990s. However, reuse of creative content, specifically with respect to TMs and overlapping IPRs, has so far not been a focus of the literature.

2.2 Trademarks

2.2.1 The trademark classification system and comic characters

Registering a TM requires the TM applicant to choose from a list of categories, so-called Nice classes, in which the TM should be registered. The Nice Classification is an international system for the classification of goods and services, which was established by the Nice Agreement in 1957. The classification system is administered by the World Intellectual Property Organization (WIPO), where the 89 Members of the Nice Union Assembly meet once a year to discuss updates on the classifications. In total, the classification system currently distinguishes between 45 different Nice classes, ranging from chemicals (e.g. salt) to legal services (e.g. surveillance services).

While jurisdictions differ in as far as they allow for TM registrations of public domain works (Derclaye, 2017), the U.S. system seems more willing to accept and make comic characters eligible for protection in their TM systems (Saval, 2013). Much like the examples of *Mickey Mouse* and *Batman*, prior work suggests that trademarked comic characters are mostly registered in Nice class 16 (paper, cardboard and certain goods made of those materials) and Nice class 9 (audiovisual and information technology such as photography, cinematography and computer software) (Adams, 2019). For this reason, we particularly focus on these two Nice classes in our analysis. We acknowledge that there are additional Nice classes that could be relevant to comic characters (e.g., toys in Nice class 28, or textiles

and clothing in Nice classes 24 and 25), however, we do not have access to the corresponding quantity or revenue data on this type of reuse.

2.2.2 The economics of trademarks

In a well-functioning market, copyright owners may want to use additional TM protection in order to effectively advertise their works or create branding around their creative products. The IP right framework can be a facilitator of trade and licensing in these markets, perhaps creating entrepreneurial opportunities (Lechner et al., 2016). Licensing related to merchandising and franchise products is an important source of income and ex-ante financing of new franchise production, in particular in the movie industry (Epstein, 2012; Hart, 2015; Ferrucci et al., 2020). In that sense, additional TM registration might induce more reuse and it may improve general appropriability conditions around franchises. The situation is slightly more complicated for potential TM applicants in franchise markets. Given that movie and game producers typically do not own the rights to the original stories behind the character, we expect them to incur licensing costs before launching franchise products. In turn, TM licensing generates substantial income for right holders. As we draw on TM assignment data from the USPTO, our results can be interpreted as preliminary evidence on the efficiency of TM licensing.

In addition to their role of potentially creating an increase in the availability of new products and business opportunities (Besen and Raskind, 1991; Lechner et al., 2016), the major societal benefits of TMs include lower search and transaction costs for consumers (Landes and Posner, 1987). TMs as quality indicators for products can be of particular importance in the entertainment industries because of the experience good character of its products. However, TMs as market assets can help firms to differentiate content and demand premium prices (Lunney Jr, 1999), and they can secure incumbent market positions by deterring entry and avoiding imitation (Appelt, 2009; Fosfuri and Giarratana, 2009). Another important characteristic of TMs is that they can prolong other IPRs. This implies that TMs may be filed strategically (WIPO, 2013; Castaldi et al., 2020). Again, this is particularly interesting to the creative and entertainment industries where asset owners might not want to rely on copyright alone because of its (relatively) limited term of protection (Castaldi, 2018). For example, renewal of TMs around comic characters might enable 'perpetual' protection and grant characters like *Batman* "never ending stories". Furthermore, the 'resurrection' of IPRs can bring public domain content back to the rear of formal IP protection (Dusollier, 2010; Senftleben, 2012). Additional TM protection can change the dynamic balance between providing incentive and access to creative works, which was originally intended by the scope and term of copyright. At the same time, 'tie-ins' of comic characters that use both IPRs are common in creative reuses of original works in franchise motion pictures and video games. Complex negotiations around IPRs play an important role when it comes to composing new franchise products including (multiple) comic characters. Our research provides an empirical contribution to this literature as we study the impact of additional TMs on creative

reuse, when works continue to be protected under copyright laws.

3 Data and Methods

3.1 Data

This section includes detailed information on all data sources and how we combine them. We provide an overview of all our data sources in Table 1. We first gather data on fictional characters in comics, including their publishing information, from the *Grand Comics Database*. This is a comprehensive user-generated database including millions of characters created and first published between 1783 and 2019. But due to the fact that multimedia products have only become more and more important over the last decades, we restrict our sample period to 1990–2017.

Second, we add information on TMs and their legal status (including appeals) from the *TM-Link* Database gathered by the Australian IP office in cooperation with the Swinburne University of Technology. For our analysis, we focus on Nice classes 9 and 16, which are especially important when it comes to TMs around comic characters. To get a clean subsample of unique comic characters that receive a TM, we reduce the *TM-Link data* to Nice class 16 (print TMs) (Ferrucci et al., 2020). Then, we merge it with the publishing data from the Grand Comics Database.

Next, we add observations from the initial *TM-Link Database* that have the same family group ID but for which a franchise TM application was filed in Nice class 9, which is associated with video games and motion pictures (Ferrucci et al., 2020). Finally, we add data from the *USPTO Trademark Assignment Database*. This allows us to include licensing deals and transfer of rights around comic characters in our analysis. After limiting the panel to TM registrations at the USPTO, we arrive at 49,369 comic characters, including 1,561 trademarked characters, of which 1,379 are only in Nice class 16 and 530 only in Nice class 9 and 348 in both.

Table 1. Data Sources

Source	Available Information
Grand Comics Database	All comic publishing information, incl. U.S. copyright status
TM-Link data	All trademark information, incl. appeals
USPTO Assignment Database	Licensing information on trademarks

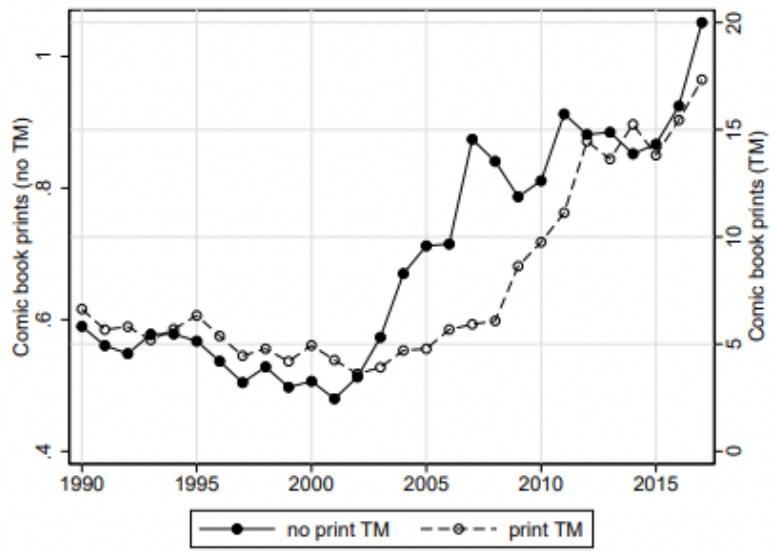
3.2 Estimation and identification

3.2.1 Descriptive evidence

Figure 1 shows the average number of annual releases of print comic books that feature a

particular character. We distinguish between characters that at any point in our observation period receive a print TM (Nice class 16), and between characters that do not receive a print TM during our observation period.

Fig. 1. Average number of annual comic books by print trademark registration status



Note: Plotted data is at the character-level. For example, comic characters for which a print TM (Nice class 16) was registered appeared on average in about 6 printed comic books in 1995, whereas the number was 10 in 2010.

The solid line represents characters without a print TM registration, whereas the dashed line represents characters that receive a print TM. Trends are relatively flat and similar for both types of characters until about 2002. After that, the average number of comic book prints for each group has been on the rise. This means that in the "digital era", we observe a positive trend in comic book prints for the "treatment group" as well as the "control group". This is consistent with the notion that the fixed costs of production, promotion and distribution decreased for any type of comic characters. However, we can see a significant difference in the slope of the two lines. Comic characters with a print TM registration experience a much slower increase in derivative comic book prints than characters that are not protected by a print TM. These descriptive findings, provide the motivation for an estimation strategy that explicitly takes heterogeneous effects over time into account.

3.2.2 Estimation strategy

We can answer slightly different questions, depending on the definition of the dependent variable. In our main specification, we want to analyze the impact of a print TM registration on the probability of the production of at least one comic book per year. Here, our binary dependent variable *Prob. Reuse* takes the value one if the data shows at least one comic print in a certain year for a specific comic character, zero otherwise. This setting allows us to estimate the probability that a comic character survives (reappears in the next calendar year) in case it receives a TM registration. Put differently, this may provide evidence for characters dying out due to the fact that firms invest less as soon as characters are

protected by TMs. On the other hand, we can further look into the exact number of comic books printed per year. In this case, the dependent variable *Num. Reuses* is the logarithmic transformation of a continuous variable that counts the total number of prints of a comic per year.[2] Like this, we can quantify how many more comics would have been printed in the absence of TM protection.

The first specification to run would be the classical two-way fixed effects (TWFE) set up:

$$Y_{ikt} = \alpha + \delta TM_{ijt} + \eta_t + \mu_i + \varepsilon_{ikt}, \quad (1)$$

where Y_{ikt} is a measure of reuse of character i in medium k (comic book) in year t. The main variable of interest is TM_{ijt}, which indicates that comic character i receives a TM of type j (print or franchise, depending on medium k) at time t. Put differently, characters that receive a TM at time t belong to treatment cohort i. The model includes year (η_t) as well as character fixed effects (μ_i) and we report clustered standard errors on the character-level. However, recent literature has shown that the estimate of the average treatment effect on treated can be biased in TWFE models with multiple treatments and heterogeneous effects (Goodman-Bacon, 2021; Baker et al., 2022). Hence, we do not report estimates of the TWFE model specified in equation 1, but use the method of Callaway and Sant'Anna (2021) (from now on CS) to estimate the average treatment effect on the treated (ATT). The method enables a clean comparison of treated characters to not-yet-treated characters or never treated characters. Since we are not so much interested in studying group-specific effects (e.g. how TMs received in 1992 affect reuse), but more in studying the average effect, we report results using the simple aggregation described in equation 3.2 in Callaway and Sant'Anna (2021).

Additionally, to study the mechanisms of how trademarks can affect reuse, we take treatment heterogeneity more explicitly into account. Since the CS method does not allow to aggregate treatment effects for groups of cohorts or groups of time units and test for according differences across, we do so by introducing interaction terms to the TWFE specification:

$$Y_{ikt} = \alpha + \delta TM_{ijt} + \gamma_t TM_{ijt} \times T_{it}(1 + \gamma_c C_i) + \eta_t + \mu_i + \varepsilon_{ikt}, \quad (2)$$

where T_{it} indicates a group of time units (i.e. years after digitization) and C_i indicates a group of cohorts (i.e. TMs of copyright owners, TMs that are licensed to third-parties).

We acknowledge the caveat that this specification does not allow for the same clean

[2] When using the logarithm of our dependent variable, we transform the underlying measure such that our dependent variable becomes *Num.Reuses* = *log*(*prints* + 1). As a robustness check, we go back to the simple specification *log*(*prints*) and do not find a large difference in the effect such that we do not need to explicitly control for the findings of Bellego et al. (2021).

comparison as the CS method. However, since we are more interested in the direction of effects than in a precise measurement of their magnitudes, and given the fact that we find consistent results with both methods, we do not think that this is a cause for major concern in our application.

3.2.3 Note on dynamics and causality

Since TM registration is an endogenous choice, we are aware that it is difficult to draw strong causal conclusions from our analysis. As we will describe in detail below, we provide comparisons among all comic characters and those that receive at least one type of TM. This is a way to narrow down endogeneity concerns that stem from selection issues. Since both estimation strategies (CS and TWFE with interactions) are essentially difference-in-differences approaches, it is important to check whether the common trends assumption holds. We provide the corresponding evidence in Figures 2 and 3.

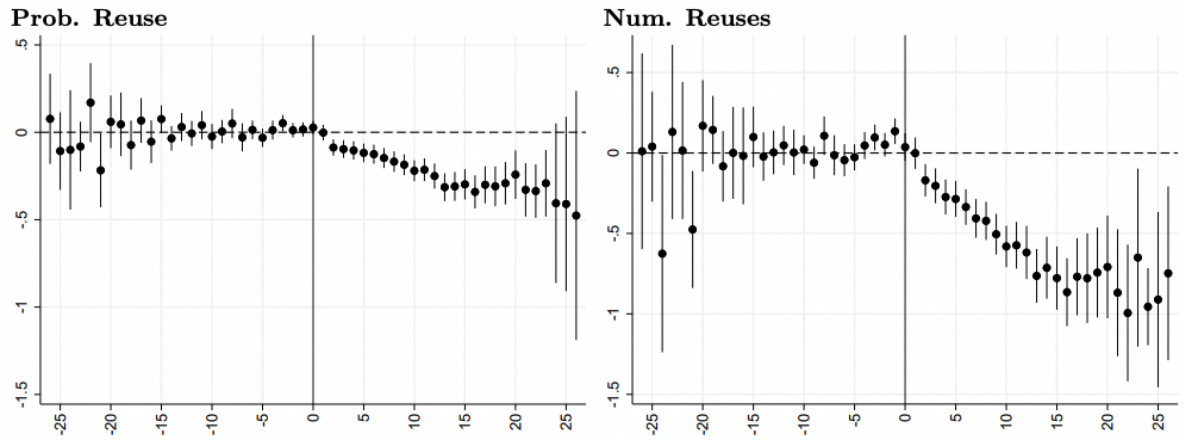
In Figure 2, we plot the ATT as estimated using the CS method, aggregated for each cohort in relative time. That is, for cohort *i*, we plot $-T$ estimates before the cohort received a TM to check for anticipation effects and the parallel trend assumption, and we plot *T* estimates after the cohort received a TM, which lets us investigate relative dynamic effects. The results suggest that the common trend assumption holds. We further see that there is heterogeneity over time. For both dependent variables *Prob. Reuse* and *Num. Reuses*, we see less reuse the more time has passed since the TM registration. The plot shows a non-linearity that seems to coincide with deadlines for filing TM maintenance documents with the USPTO (i.e. 10 and 20 years after initial registration).

In Figure 3, we switch from relative time to calendar time and plot yearly differences between characters that have received TMs and those that have not yet been trademarked, i.e. the $\delta_\tau \gamma_\tau$ coefficients obtained from the following model:

$$Y_{it} = \alpha + \beta\, TM_{it} + \sum_{\tau \in T} \delta\tau\ (\gamma\tau\ \times\ TMit)\ + \mu_i + \varepsilon_{it}, \qquad (3)$$

where we choose 2002 as the reference year in accordance with the discussion of various events that jointly form the period of digitization in the comic industry (and informed by the descriptive analysis in Figure 1). For both dependent variables, the estimates indicate that the parallel trend assumption in the pre-digital era cannot be rejected. After 2002, however, we find a significantly negative effect of a print TM registration on the probability (left panel) as well as the log(+1) number of yearly comic book prints (right panel). Note that this specific date is of course somewhat arbitrary, but as Figure 3 shows, we could also use 2000, 2001, 2003 or 2004 to define the post-digitization period without substantially changing the results reported below.

Fig. 2. Leads and lags: Reuse in comic books, method of Callaway and Sant'Anna (2021)



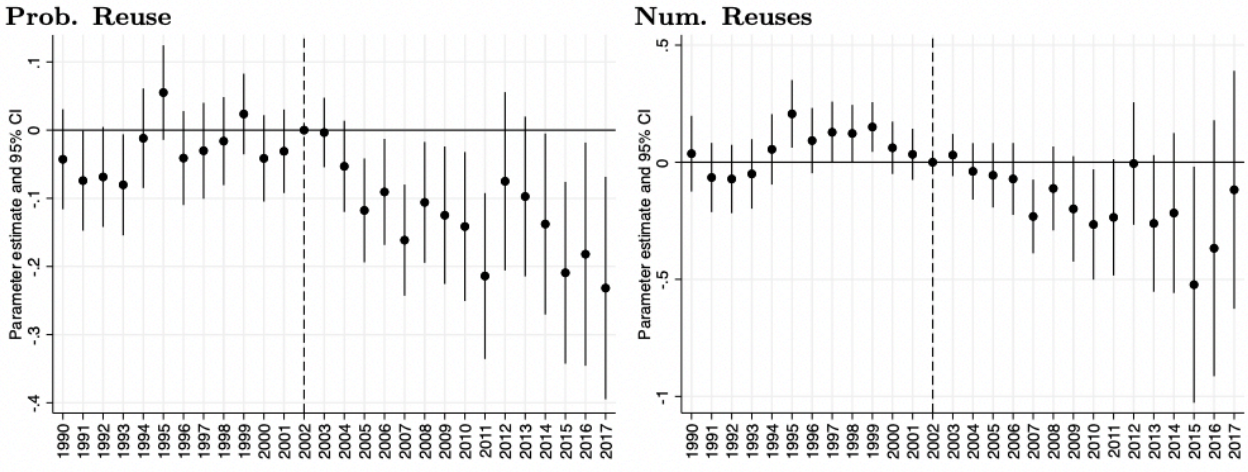
Note: Estimates of dynamic ATTs using the CS method, with an indicator of at least one comic book release per year (left panel) and the log(+1) number of comic book releases per year (right panel) as the dependent variable. The dots reflect cohort- and time-specific point estimates. The horizontal axis gives relative time, i.e. *n* years before/after the TM registration. The comparison is against characters that did not yet receive TMs. Characters that never receive a TM or that receive an additional franchise TM were excluded from the panel. Standard errors are clustered on the character-level and bars indicate 95% confidence bands.

4 Results

4.1 Comic book prints

Initially, we focus on studying how print TM registration affects the reuse of characters in print comic books. We first estimate the ATT average across cohorts (i.e. years in which characters receive TMs) and across time (i.e. calendar years) using the CS method.

Fig. 3. Leads and lags: Reuse in comic books, TWFE with interactions



Note: OLS estimates of the δ_τ coefficients obtained from variants of equation (3), using an indicator of at least one comic book release per year (left panel) and the log(+1) number of comic book releases per year (right panel) as the dependent variable. The omitted year is 2002. The dots reflect year-specific point estimates comparing the trademarked characters to not yet trademarked characters. Characters that never receive a TM or that receive an additional franchise TM were excluded from the panel. Standard errors are clustered on the character-level and bars indicate 95% confidence bands.

We report our baseline estimations in Table 2. The results differ slightly in the way we define our dependent variable and the underlying sample. In columns (1) and (2), the dependent variable is an indicator of whether there is at least one print publication with the character in a given year. In columns (3) and (4), the dependent variable is the (*log* + 1) number of print publications with the character in a given year. With the different sample definitions, we aim to reduce endogeneity concerns due to selection of characters into TM protection. In columns (1) and (3), we base our regression on our full panel (*All*), including all characters that may or may never receive a TM registration (print, franchise or both). Hence, the comparison group consists of characters that have not or have not yet received TMs. This is the same underlying sample as in the plot of raw data in Figure 1. The results in columns (2) and (4) are based on the subsample *Print TM*, which only includes characters that get a print TM at some point in our observation period. Here, the comparison group includes only characters that have not yet received TMs.

Table 2. Baseline results: Reuse in comic books, average

	Prob. Reuse		No. Reuses	
	(1)	(2)	(3)	(4)
	All	Print TM	All	Print TM
ATT	-0.1802***	-0.1949***	-0.3366***	-0.4977***
	(0.0166)	(0.0288)	(0.0358)	(0.0657)
Observations	1363455	18110	1363455	18110
Mean DV	0.1420	0.3614	0.1814	0.7403

Note: Estimates of the *ATT* are based on the CS method. *All* indicates that the comparison group includes characters that never receive a TM, and those that have not yet received a TM. *Print TM* indicates that the comparison group only includes characters that have not yet received a print TM. Character and time fixed-effects in all specifications. Standard errors in parentheses, clustered on the character-level. $^{*}p < 0.10$, $^{**}p < 0.05$ $^{***}p < 0.01$

Across all specifications in Table 2, the results show a consistent and significant negative association of print TMs and comic book releases. The estimates in columns (1) and (2), suggest that, on average, TM registration is associated with an 18–19% lower probability that at least one comic book with the trademarked character is released per year. Looking at the intensive margin, the results in columns (3) and (4) imply that TMs are associated with a 34–50% reduction in the number of released comic books per year.

4.1.1 Changed market environment

As described above, the comic industry saw an intense change in the market environment with the arrival of digital technologies. Lower costs of production, promotion and distribution have enabled more entry, potentially also of third-party reusers. To investigate dynamic effects across cohorts, we estimate a TWFE model with interactions as specified in equation 2.

The results in Figure 3 and Table 3 suggest that the negative association we have documented above is mostly coming from years after 2002. The estimated coefficients of

Print TM in Table 3 are positive and statistically significant across all specifications, whereas those of *Print TM × Post 2002* are negative and statistically significant across all specifications. This is in line with the descriptive evidence in Figure 1. Looking at the total average effect (the linear combination of rows 1 and 2), we see that we mostly get negative but not significant estimates.

Table 3. Mechanisms: Reuse in comic books, changes in market environment

	Prob. Reuse		Num. Reuses	
	(1) All	(2) Print TM	(3) All	(4) Print TM
Print TM	0.0854***	0.1331***	0.2571***	0.3524***
	(0.0121)	(0.0165)	(0.0300)	(0.0425)
Print TM × Post 2002	-0.1427***	-0.1482***	-0.2386***	-0.3988***
	(0.0099)	(0.0206)	(0.0256)	(0.0512)
Lin. Comb. Row 1+2	-0.0573***	-0.0151	0.0185	-0.0464
Observations	1363455	18110	1363455	18110
Mean DV	0.1420	0.3614	0.1814	0.7403

Note: *Post 2002* indicates the beginning of the digital age. *All* indicates that the comparison group includes characters that never receive a TM, and those that have not yet received a TM. *Print TM* indicates that the comparison group only includes characters that have not yet received a print TM. Characters that hold an additional franchise TM were excluded from the panel. Character and time fixed-effects in all specifications. Standard errors in parentheses, clustered on the character-level. * $p < 0.10$, ** $p < 0.05$ *** $p < 0.01$

Our results suggest that even if digitization has led to a vast increase in the production of comic books, there are institutions that have a reverse effect on supply. The implied magnitude of the estimates in Table 3 suggests that 14-40% more comic books would have been printed per year in the digital era in the absence of TMs. However, it remains to note that the TWFE method used here likely yields biased estimates of the ATT, in addition to the issue of endogenous trademarking. Because the results are consistent across sample definitions, we only report results from the *Print TM* sample in the remainder of the paper, essentially doing a within-analysis of trademarked characters.

4.1.2 First-party vs. third-party reuse

Having established that we can only find significantly negative effects of TMs in years after 2002, where lower costs of production, promotion and distribution should enable large scale entry of third-party reusers, we continue to investigate additional mechanisms. First, we test whether the effect differs if the comic book publisher is not the same entity as the TM registrant. The TM holder may choose to block third parties from reuse, or third-party reuse may be discouraged by the transaction costs of engaging in the licensing market. When the TM holder and publisher are the same entity, we should therefore expect that TM registration affects the likelihood or volume of comic book prints to a smaller amount. The binary variable *First-Party* indicates that the TM applicant is the same entity as the comic book publisher.[4] The results reported in columns (1) and (2) of Table 4 suggest that the negative effect of TM registrations on comic book prints is reduced if the TM applicant is

the same as the copyright holder. This becomes evident from the smaller, but still negative point estimates of the linear combination of *Print TM × Post 2001 + Print TM × Post 2001 × First-Party*.

Table 4. Mechanisms: Reuse in comic books, first-party reuse and licensing

	First vs. Third-Party Reuse		Licensed	
	(1) Prob. Reuse	(2) Num. Reuses	(3) Prob. Reuse	(4) Num. Reuses
Print TM × Post 2002	-0.1036***	-0.2163***	-0.0989***	-0.1963***
	(0.0257)	(0.0593)	(0.0205)	(0.0505)
Print TM × Post 2002 × First-Party	0.0622*	0.0825		
	(0.0352)	(0.0984)		
Print TM × Post 2002 × Licensed			0.1192**	0.1698
			(0.0589)	(0.1390)
Lin. Comb. Row 1+2	-0.0414*	-0.1338*		
Lin. Comb. Row 1+3			0.0203	-0.0266
Observations	23699	23699	28062	28062
Mean DV	0.3741	0.7923	0.3383	0.7084

Note: *Post 2002* indicates the digital age beginning in the year 2003. *First-Party* indicates that the TM applicant is the same firm that published the comic character for the first time and is therefore the copyright holder. *Licensed* indicates that the comic character's TM is licensed or the right is transferred at least once in the observation period according to the *USPTO TM Assignment Database*. The estimations are based on the *Print TM* panel, indicating that the comparison group only includes characters that have not yet received a print TM. Character and time fixed-effects in all specifications. Standard errors in parentheses, clustered on the character-level. * $p < 0.10$, ** $p < 0.05$ *** $p < 0.01$

4.1.3 Licensing

In a situation of TM protection, only the right holder(s) can reuse the character in new comic books and license this right to third parties. Our results so far suggest that the supply-limiting effects of TMs outweigh potential supply-enhancing effects. However, if right holders choose to engage in licensing markets, the balance might swing towards more third-party supply. To test this, we draw on the data from the *USPTO Trademark Assignment Database* that includes information on licensing deals around the TM of a comic character.

The time-invariant variable *Licensed* in columns (3) and (4) of Table 4 indicates that the comic character's TM is licensed or transferred at least once in the observation period. The results suggest that comic characters with print TMs but no licensing have a 10% lower probability of print publication, and a 20% lower number of reuses in print publications. As expected, a licensed TM implies no exclusive right to reuse a comic character for the TM registrant, and hence there is relatively more reuse. This indicates that well-working markets for licensing and transferring TMs can moderate some of the negative effects on reuse we observe. Our results suggest a 12% higher likelihood of reuse of licensed vs. not licensed TMs, and a 17% (yet imprecisely estimated) increase in the number of annual reuses. The linear combination of *Print TM × Post 2001 + Print TM × Post 2001 × Licensed* does not yields a significant point estimate, such that the total effect is not distinguishable from zero.

5 Discussion and conclusion

This paper empirically investigates the relationship between TMs and reuse in the comics industry. We use an original combination of data sources on the U.S. comics industry to analyze the relationship between TMs and the reuse of creative works in print. Our results indicate that even if the overall trend of comic production is positive and has experienced massive increases since the beginning of the digital age, IP protection via TMs can limit the production of creative works under certain conditions. We find that the negative relationship between TMs and reuse varies over time. The relationship is most pronounced during the digitization period which impacted the market environment in important ways and led to substantial cost declines in the comics industry.

More specifically, we combine character-level reuse information with U.S. TM records between 1990 and 2017. Our baseline regression results suggest that a TM registration decreases the probability of annual comic book prints by about 19% on average. In the era of digitization, our estimates suggest that the reduction in the average number of yearly comic book releases reaches up to 40%. This is mainly driven by the limitation of third parties to reuse the content. In fact, we find a statistically significant and robust negative effect of TMs on third-party reuse, and much weaker, sometimes even neutral effects on first-party reuse once copyrighted characters are also protected under TM law. This indicates that trademark registrations are strategically used in U.S. comics markets. At the same time, well-working markets for TM transfer and licensing increase reuse and moderate part of the negative relationship with the reuse that we observe. However, overall, our results indicate that the supply-limiting effects of TMs outweigh potential supply-enhancing effects in reprints. We are aware of the fact that TMs are not randomly registered, such that we estimate several models saturated with a range of fixed effects and rule out an important set of alternative explanations for our results.

The goal of our paper is first and foremost to document the relationship between TMs and reuse in the creative industries' growing sector. However, drawing normative policy implications from our results is very difficult. Since we lack access to pricing and demand data in both the licensing and final consumer markets, we cannot attempt a full welfare analysis. Therefore, it remains unclear whether the comic-related products that did not come to market because TM owners blocked third-party reuse would have had a significant impact on consumer welfare. Our results suggest that hypothetical policies banning overlapping IPRs or requiring TM owners to license to third parties could increase output, but we do not know whether such policies would be beneficial for consumers, firms, and the incentives to innovate.

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