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The economic impact of e-lending in public libraries on the consumer book market

Final report

Research project commissioned by the Federal Government Commissioner for Culture and the Media (BKM)

Berlin, 29 August 2024

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Executive Summary

Background

In its coalition agreement, the current German government established the goal of creating "fair framework conditions for e-lending in libraries" (SPD, Bündnis 90/Die Grünen & FDP, 2021). Previous attempts to reach an agreement on the lending of e-books in libraries (hereafter, e-lending) have failed due to insufficient data. At the invitation of the Federal Government Commissioner for Culture and the Media (BKM), the German Publishers and Booksellers Association, the German Library Association, the Association of German Librarians, the Association of German Writers, the Authors' Rights Network, the Association of German-Language Translators of Literary and Scientific Works, publishing house representatives, the Federal Ministry of Justice and the Federal Ministry of Economic Affairs and Climate Action met for an "e-lending round table" and defined joint research questions for a study. DIW Econ GmbH was commissioned to carry out this study.

The study addresses the following four research questions.

1. Is there a difference in the title-specific lending intensity between e-lending and print lending (hereafter, p-lending)?
2. How does e-lending affect the consumer market for e-books and print books? What is the effect of windowing?
3. What are the economic effects of e-lending and windowing on the market participants in the book sector?
4. Comparative analysis of the socio-demographics and buying behaviour of users of e-lending and users of p-lending:
    a. How does the socio-demographic background of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?
    b. How does the buying behaviour of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?
    c. How does the buying behaviour of readers change when they start using e-lending?

Data

To validly analyse the research questions regarding the economic impact of e-lending and windowing on the consumer book market, a comprehensive database of title-specific data on sales, lending and windowing information was collected for 14,347 titles with 30,026 ISBNs. The sample includes new releases between 2017 and 2021 and covers the book genres of fiction, children's and young adult, travel, practical guides, and non-fiction.

For the entire sample, monthly sales volume and prices as well as lending figures and the stock count from public libraries were obtained for the first 36 months after publication of the titles, both for e-books and print books. Information was also collected on whether and for how long e-books were subject to windowing. The title-specific data set comprising sales volume, lending figures and windowing information was used to investigate the first three research questions: comparing the lending intensity, analysing the causal effects of e-lending and windowing on the consumer book market, and the economic impact on the book sector.

The fourth research question on the socio-demographics and buying behaviour of users of e-lending and users of p-lending was analysed on the basis of the GfK Consumer Panel Media*Scope. The GfK Consumer Panel Media*Scope collects panel data on buying behaviour in the consumer book market and the lending behaviour of 20,000 individuals. This is a representative sample of the German population aged 10 and over. The GfK data therefore provides a valid basis for investigating the buying behaviour and socio-demographic background of library users.

The consumer panel data is collected with the assistance of a media diary in which the panel participants continuously record their purchases in the book market. The key advantage of the GfK Consumer Panel data for investigating the buying behaviour of users of e-lending and p-lending lies in its access to *actual buying behaviour* over time. The continuous recording of buying behaviour increases the reliability of the data and minimises the distortion effects compared to the usual retrospective surveys, in which there is a longer period of time between the survey and the buying behaviour.

Results

The results of the study regarding the four research questions are summarised as follows.

1. ***Is there a difference in the title-specific lending intensity between e-lending and p-lending?***

The lending intensity counts how many times a particular book has been lent out per year. With regards to print books, one copy corresponds to one physical copy held by the library. In the

case of e-books, the number of copies available is calculated based on the number of licences purchased. Although in general, e-lending licenses allow only one copy to be borrowed at a time ('one copy, one loan'), other terms of the license often differ (In particular, its duration). The different terms of duration and other licencing conditions were taken into account when calculating the number of copies available for e-lending.

E-books are borrowed much more intensively per copy than print books. While print books are lent out 5.8 times per copy in the year of publication, e-books are lent out 14.1 times. In the second and third year after publication, the gap in the lending intensity is even more pronounced. While the lending intensity of print copies drops significantly in the second and third year after publication to 3.1 and 2.0 loans per copy/title respectively, the lending intensity of e-books drops only slightly to 14.0 and 11.0 loans per copy.

The higher lending intensity of e-books cannot be attributed to a shorter lending period alone. The average lending period is 24 days for print books versus 17 days for e-books. Adjusted to the different lending periods, e-books are lent out 10 times in the year of publication, which is around 70% more often than print books. In the second year after publication, the adjusted lending intensity of e-books remains at 9.9 loans, compared to 3.1 loans for print books. The lending intensity is therefore more than 220% higher for e-books than for print books. The relative difference increases to almost 300% in the third year.

In the case of e-books, windowed titles are lent out more intensively after the windowing period has expired than titles without windowing. For print books, the counterparts of the windowed titles are lent out more intensively in the first year after publication than non-windowed titles and similarly to non-windowed titles in the second and third years after publication.

2. *How does e-lending affect the consumer market for e-books and print books? What is the effect of windowing?*

To study the causal effect of windowing respectively e-lending on the consumer book market for e-books and print books, it was mandatory to address the methodological challenge of publishers often applying a windowing period to titles that hold the potential for a particularly high demand. As a result, there is a risk of overestimating the windowing effect on sales volume. In this study, two econometric methods for estimating the causal effect of windowing were combined (a fixed-effects estimate and a synthetic control method) to eliminate the risk of a positive bias as far as possible.

The econometric analysis shows that windowing has a significant, positive effect on sales volume and sales revenue in the consumer market - both in the e-book and print book markets. Windowing increases the sales revenue of e-books by an estimated 9.9% and the sales revenue of print books by an estimated 3.5%. In addition, the effects are particularly pronounced for bestselling titles and fiction books.

Although the measured effects are subject to statistical uncertainty, there is a 95% probability that the actual effects lie between 6.3% and 13.5% for e-books and between 1.2% and 5.9% for print books.

3. *What are the economic effects of e-lending and windowing on the market participants in the book sector?*

Based on the identified causal effects of windowing on the book market, the study examined the economic impact of removing windowing on the various market participants in the book sector. In the current situation (as of 2022), removing windowing would reduce e-book sales by an estimated -4.6% to -9.2% or -11.1 to -22.5 million euros, while print book sales would fall by an estimated -0.7% to 3.5% or -27.0 to -131.3 million euros. Thus, removing windowing would result in the following losses, respective gain in sales for market participants:

- Authors: -3.2 to -13.6 million euros
- Publishers: -17.6 to -76.2 million euros
- Booksellers: -13.8 to -53.2 million euros
- Aggregators: +0.3 million euros

While authors, publishers and booksellers would record significant losses, the aggregators would benefit from the fact that more e-book licences would be sold as a result of the removal of windowing. However, the additional revenue from the sale of additional e-book licences would not compensate for the overall losses in the e-book and print book market. Consequently, the removal of windowing would result in an overall loss of sales revenue valued between -37.0 million and -152.7 million euros per year for the entire German book market.

In addition, two scenarios were estimated to depict future developments up to the year 2027. In both scenarios, expenditure on e-books and print books are assumed to increase in line with their growth in recent years. Regarding the development of e-lending, two different scenarios were analysed: The first scenario assumes *constant* numbers of e-lending in public libraries and the second scenario assumes an *increasing* number of e-lending in public libraries per year. In both scenarios, sales losses increase compared to the initial scenario. In the first

scenario (constant e-lending), the removal of windowing would lead to a reduction of sales in the e-book market at an estimated value of -11.8 to-23.8 million euros annually, and -28.7 to -139.3 million euros in the print book market per year. This corresponds to an increase in sales losses of slightly more than 6% compared to 2022. Authors record an overall (net) loss of -3.5 to -14.4 million euros, publishers a loss of -18.7 to -80.0 million euros and the book trade between -14.7 and -56.5 million euros.

In the second scenario (increasing e-lending), the revenue losses in the e-book market increase further to an estimated -13.7 to -27.4 million euros, and in the print book market to -33.6 to -161.7 million euros, which corresponds to an increase of losses of approximately 23% compared to the initial scenario in 2022. This increase in revenue losses would affect the market participants as follows: Authors would face revenue losses of -4.0 to -16.9 million euros, publishers would suffer from revenue losses of -21.9 to -92.7 million euros, and booksellers of -17.1 to -65.4 million euros. The aggregators, in contrast, would increase their revenue by 0.3 million euros.

4. ***Comparative analysis of the socio-demographics and buying behaviour of users of e-lending and users of p-lending:***

    a. ***How does the socio-demographic background of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?***

The socio-demographic analysis shows that library users often have an above-average income and a higher level of education compared to the overall German population. While this also applies to buyers on the book market, users of p-lending and especially users of e-lending even more frequently have an above-average income and a high level of education than buyers on the book market. In addition, middle-aged people aged between 30 and 59 are overrepresented among users of e-lending, while young people (under 30) and older people (aged 60 and above) are underrepresented.

    b. ***How does the buying behaviour of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?***

Both users of e-lending (67%) and users of p-lending (56%) are more frequently active in the book market compared to the overall population in Germany (40%). The expenditures of users of e-lending account for about 8% and those of users of p-lending for 20% of the total revenue in the consumer book market. Per buyer, users of e-lending (186 euros) and users of p-lending

(195 euros) spent more in the overall consumer book market in 2022 than the average book buyer (169 euros). A similar pattern is seen when considering the print book market separately: users of e-lending spent 166 euros and users of p-lending 174 euros per buyer in the print book market, compared to 154 euros for average buyers. In the e-book market, however, users of e-lending spent less (68 euros) than average buyers (80 euros), which is due to the tendency of users of e-lending to purchase cheaper e-books. Users of p-lending spent the same amount in the e-book market as average buyers (80 euros per buyer).

c. How does the buying behaviour of readers change when they start using e-lending?

People who started using e-lending in public libraries in 2021 spent 13% less in the consumer book market and bought 10% fewer books than the previous year, 2020, when they had not yet used e-lending. People who started using e-lending in 2022 spent 5% less in the book market and bought 20% fewer books than in 2021, when they had not yet used e-lending.

It should be noted that the results for research question 4c are based on a sample of 74 people regarding the development from 2021 to 2020 and 81 people for the development from 2022 to 2021. Due to the small sample size, the results should only be interpreted with caution, as the calculation of statistical key figures is generally subject to larger fluctuations with small samples. It should also be noted that these changes should not be interpreted as causal effects, as other potentially relevant factors that could also influence buying behaviour cannot be observed and therefore cannot be controlled. For example, it cannot be ruled out that the changes in buying behaviour were also affected by the special circumstances of the COVID-19 pandemic in 2020 and 2021. Nevertheless, these figures provide initial indications that the buying intensity of people who start using e-lending tends to decrease.

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1 Introduction

In recent years, the lending of e-books in public libraries (hereafter, e-lending) has increasingly become the focus of public discussion. Publishers, authors and other market participants fear that the increasing use of e-lending in public libraries will lead to a decline in sales volume on the consumer book market and thus further endanger their already strained financial situation (German Publishers and Booksellers Association, 2021). To mitigate this effect on the book market, many publishers use so-called windowing periods, so that new publications are only made available to public libraries for e-lending after a waiting period of 2 to 12 months after publication. Public libraries, in turn, complain that windowing restricts the libraries' offerings to such an extent that they are no longer up-to-date and contemporary, and such that the libraries are unable to fulfill their role in the local educational infrastructure (German Library Association, 2021).

Against this background, the current federal government established the goal in its coalition agreement of creating "fair framework conditions for e-lending in libraries" (SPD, Bündnis 90/Die Grünen & FDP, 2021). Previous attempts to reach an agreement on e-lending have failed due to insufficient data. At the invitation of the Federal Government Commissioner for Culture and Media (BKM), the German Publishers and Booksellers Association, the German Library Association, the Association of German Librarians, the Association of German Writers, the Authors' Rights Network, the Association of German-language Translators of Literary and Scientific Works, publishing representatives, the Federal Ministry of Justice and the Federal Ministry for Economic Affairs and Climate Protection met for an "e-lending round table" and defined joint research questions for a study. DIW Econ GmbH was commissioned to carry out this study.

The present study addresses the following four research questions.

1. Is there a difference in the title-specific lending intensity between e-lending and print lending (hereafter, p-lending)?
2. How does e-lending affect the consumer market for e-books and print books? What is the effect of windowing?
3. What are the economic effects of e-lending and windowing on the market participants in the book sector?
4. Comparative analysis of the socio-demographics and buying behaviour of users of e-lending and users of p-lending:

a. How does the socio-demographic background of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?

b. How does the buying behaviour of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?

c. How does the buying behaviour of readers change when they start using e-lending?

The second chapter begins with a brief overview of the data. As part of this study, a comprehensive data set with title-specific sales volume, lending figures and windowing information was collected and compiled in order to be able to examine the economic impact of e-lending on the consumer book market as validly as possible. The results for each of the research questions are then presented and discussed. The last chapter draws a conclusion. The data and methodology are described in more detail in the appendix.

2 Data basis

2.1 Title-specific data set with lending figures, sales volume and windowing information

To validly analyse the research questions regarding the economic impact of e-lending and windowing on the consumer book market, a comprehensive database with title-specific information on sales volume, lending figures and windowing information for a sufficiently high number of titles is required. Since no single database currently provides this information at title level, such a data set was collected and compiled from various sources specifically for this research project.[1].

A random sample of 14,347 titles with 30,026 ISBNs was drawn. The sample includes new releases between 2017 and 2021 and covers the genres of fiction, children's and young adult books, travel, practical guides and non-fiction[2]. While the sample was drawn at the ISBN level, it was ensured that for each ISBN drawn, all other ISBNs (both print books and e-books) of the corresponding title were also drawn. This is important when examining the effect of e-lending or windowing both on the e-book and print book market in the empirical analysis.

For the entire sample, monthly sales volume and prices were obtained for the first 36 months after publication, both for e-books and print books. Furthermore, monthly lending figures and stock figures were collected for both e-books and print books for the same titles and the same period. Information was also collected on whether and for how long a title was windowed.

The title-specific data set comprising sales volume, lending figures and windowing information was used to investigate the first three research questions: comparing the lending intensity, analysing the causal effects of e-lending and windowing on the consumer book market, and the economic impact on the book sector.

2.2 Data on the socio-demographic background and buying behaviour of users of e-lending and users of p-lending

The fourth research question on the socio-demographics and buying behaviour of users of e-lending and users of users of p-lending is investigated on the basis of the GfK Consumer Panel Media*Scope. As part of the GfK Consumer Panel Media*Scope, panel data on buying behaviour in the book market and on the lending behavior of 20,000 individuals are collected. This is a representative sample of the total German population aged 10 and over. The GfK data therefore

[1]A detailed description of the data and methodology is provided in Appendix A: Data and Methodology.

[2]The genres are based on the product group system of the German book trade: 1 - fiction, 2 - children and young adult, 3 - travel, 4 - advice and 9 - non-fiction.

provide a valid basis for examining the buying behaviour and socio-demographic background of library users.

The consumer panel data is collected using a media diary in which the panel participants continuously record their purchases in the book market. The key advantage of the GfK Consumer Panel data for examining the buying behaviour of e-lending and users of p-lending is that the data reflects *actual buying behaviour* over time. The continuous recording of buying behaviour increases the reliability of the data and minimises the distortion effects compared to the usual retrospective surveys, in which there is a longer period of time between the survey and the buying behaviour.

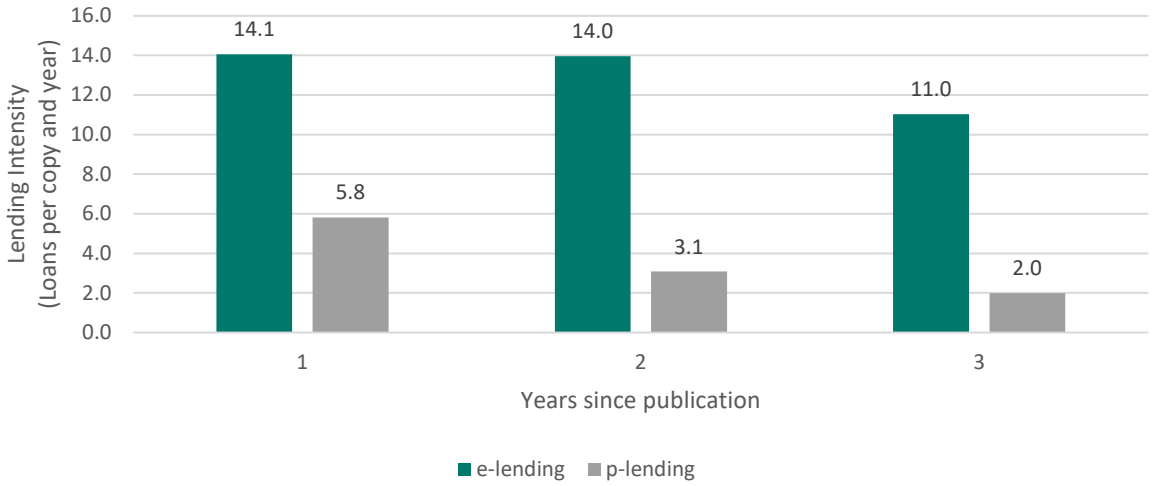
The panel data is also merged with data from ad hoc surveys in which the same individuals as in the panel survey are asked about their use of public libraries. This makes it possible to identify which people have used e-lending or p-lending in public libraries. Both the ad hoc survey and the data from the Media*Scope consumer panel refer to 2022, so that the data on buying and lending behaviour can be merged for the same period.

3 Comparison of the lending intensity of e-lending and p-lending

Research question 1: Is there a difference in the title-specific lending intensity between e-lending and p-lending?

The lending intensity indicates how often a particular copy has been lent out per year. For print books, one copy corresponds to one physical copy that is in the library's stock. For e-books, the number of copies available for e-lending is calculated based on the licenses purchased. While the license models differ (especially in terms of duration), with most licenses - as with print books - only one copy can be lent out at a time. The differences between the licenses are taken into account when calculating the number of copies for e-lending. A detailed description of the methodology for calculating lending intensity is provided in the appendix.

Figure 3-1
Comparison of lending intensity in the first three years since publication



Note: N= 11,751 titles

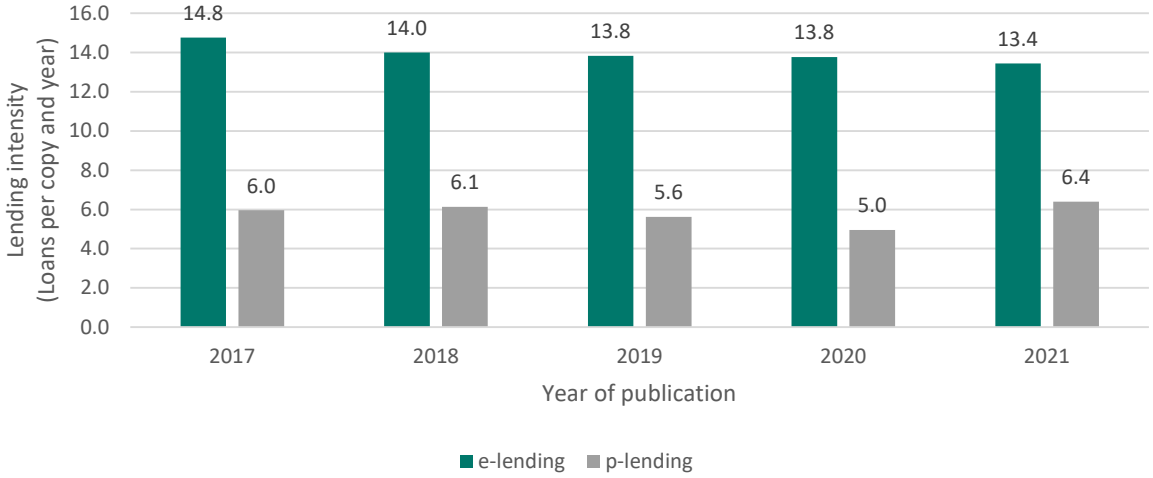
Source: DIW Econ.

Figure 3-1 compares the lending intensity of e-lending and p-lending in the first three years after publication of the titles. E-books are lent out significantly more intensively than print books. In the first year after publication, an e-book is lent out an average of 14.1 times, while a print book is lent out an average of 5.8 times. In the following years, the difference is even greater. While the lending intensity of print books drops significantly in the second and third years after publication to 3.1 and 2.0 loans per copy, respectively, the lending intensity of e-books only drops slightly to 14.0 and 11.0 loans per copy, respectively. Over the first three years after publication, the average lending intensity of e-books is 13.0 loans, compared to 3.6 loans for print books.

These differences in lending intensity have hardly changed in recent years. Figure 3-2 shows the development of the lending intensity of e-lending and p-lending in the first year after

publication over the years in which the titles were newly published. For example, if a title was published in September 2019, the lending intensity is calculated for the first 12 months from September 2019 onwards. Therefore, the lending intensity for publications in the later months of 2019 may be significantly affected by the COVID-19 pandemic that began in 2020. This is particularly evident for p-lending. Compared to the lending intensity of 6.1 loans for publications from 2018, the lending intensity for publications in 2019 and 2020 drops to 5.6 and 5.0 loans respectively in the first 12 months after publication. For publications from 2021, the lending intensity of 6.4 loans per copy is again slightly higher than the pre-pandemic value (2018: 6.1 loans). The lending intensity of e-books, in contrast, remained unchanged during the pandemic at around 14 loans per copy. New publications in 2021 were lent out slightly less frequently in the first year after publication, with 13.4 loans, than new publications from 2017, with 14.8 loans.

Figure 3-2
Development of lending intensity over the years

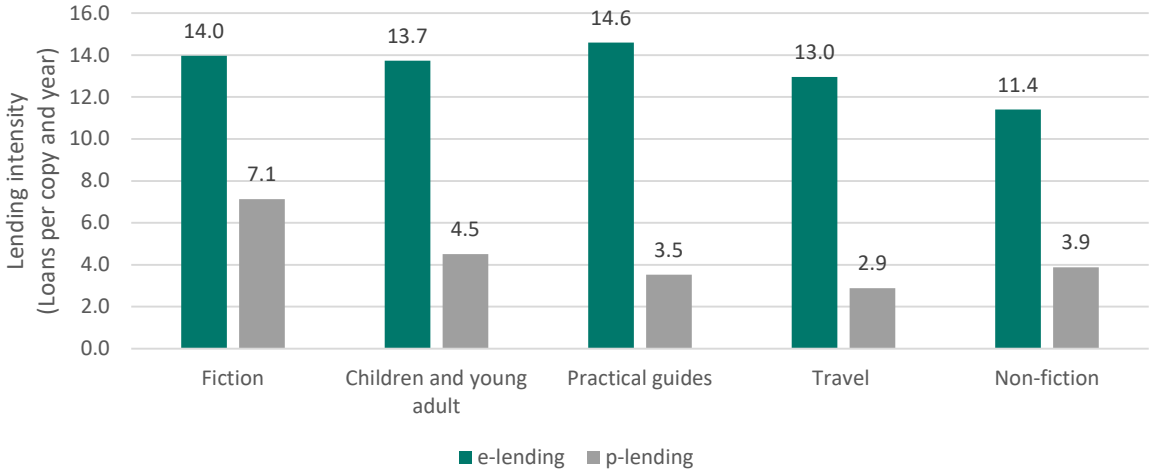


Note: The graph shows the lending intensity in the first year after publication over the years in which the titles were published. For example, if a title was published in September 2018, the lending intensity is calculated for the first 12 months from September 2018 onwards and is included in the average lending intensity for 2018. N= 11,751 titles.

Source: DIW Econ.

Figure 3-3 shows the lending intensity in the first year after publication by genre. In all genres, the lending intensity for e-lending is significantly higher than for p-lending. The lending intensity of e-lending hardly varies across genres. Only for the non-fiction genre, with 11.4 loans per copy in the year of publication, the lending intensity is significantly lower than the lending intensity for the other genres, which is between 13.0 and 14.6 loans per copy. For p-lending, the lending intensity in the fiction genre is by far the highest with 7.1 loans per copy. The lowest lending intensity is measured in the travel genre with 2.9 loans, followed by practical guides with 3.5 and non-fiction with 3.9 loans per copy.

Figure 3-3
Comparison of lending intensity between e-lending and p-lending by genre



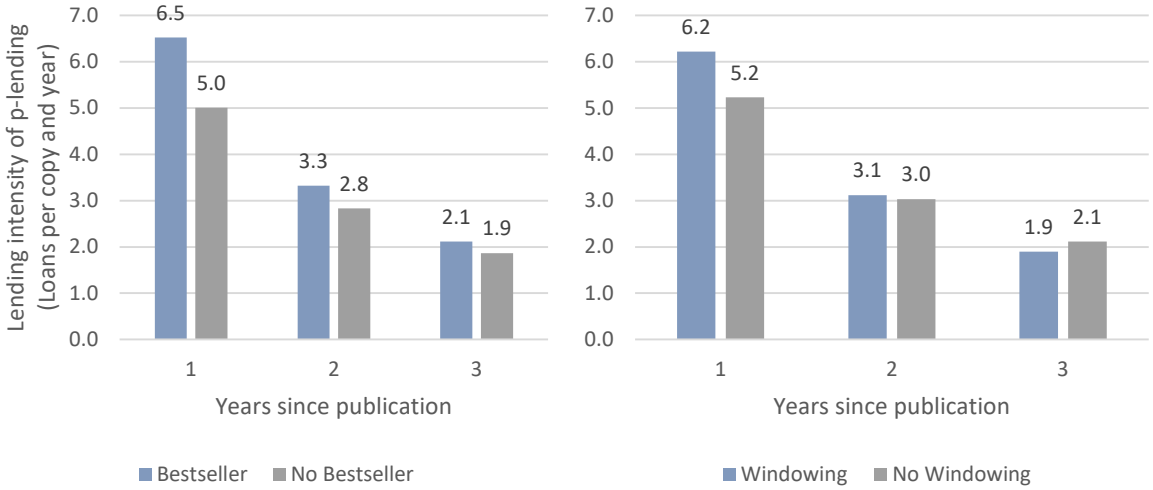
Note: The graph shows the lending intensity in the first year after publication. N= 11,751 titles

Source: DIW Econ.

In addition, the question arises as to how the lending intensity differs between bestsellers and non-bestsellers as well as between titles with and without windowing. Figure 3-4 shows that for p-lending, the lending intensity for bestsellers is slightly higher with 6.5 loans in the first year after publication than for non-bestsellers with 5.0 loans per copy. In the following years, the lending intensity is also slightly higher for bestsellers (3.3 vs. 2.8 loans and 2.1 vs. 1.9 loans). A similar picture emerges when comparing the lending intensity of p-lending between titles whose associated e-book was published with windowing for e-lending and titles without windowing[3]. Print copies of titles with windowing are lent out an average of 6.2 times per copy in p-lending in the first year after publication, compared to 5.2 loans for titles without windowing. The higher lending intensity for titles with windowing is probably at least partly due to the fact that bestsellers are particularly often windowed (see section4.1.1). In the second year after publication, the lending intensity for titles with windowing is only minimally higher than for titles without windowing (3.1 vs. 3.0 loans), while in the third year after publication, the lending intensity for titles without windowing is even higher (1.9 vs. 2.1 loans).

[3] The distinction between titles with windowing and without windowing always refers to whether the e-book of a specific title is published with windowing or not, while the lending intensity can be measured both for e-books and print books of the corresponding title.

Figure 3-4
Lending intensity of p-lending for bestsellers and non-bestsellers and with and without windowing



Note: The lending intensity of p-lending is compared between titles whose associated e-book was windowed for e-lending and titles without windowing. N= 11,751 titles

Source: DIW Econ.

For e-lending, the picture is somewhat different. In the first year after publication, the lending intensity for both bestsellers and non-bestsellers is 13.9 loans per copy. However, in the second and third years after publication, bestsellers are lent out significantly more often than non-bestsellers. This is because bestsellers are particularly often subject to a windowing period. Since titles with windowing cannot be lent out during the windowing period (usually the first 6 or 9 months after publication), the lending intensity for e-books of titles with windowing is significantly lower in the first year after publication at 11.6 loans than for titles without windowing at 16.9 loans. In the second year, the relative position between bestsellers and non-bestsellers is reversed. Titles with windowing are lent out 16.2 times in the second year, compared to 10.7 loans for titles without windowing (12.5 vs. 8.8 loans in the third year).

Figure 3-5
Lending intensity of e-lending for bestsellers and non-bestsellers and with and without windowing

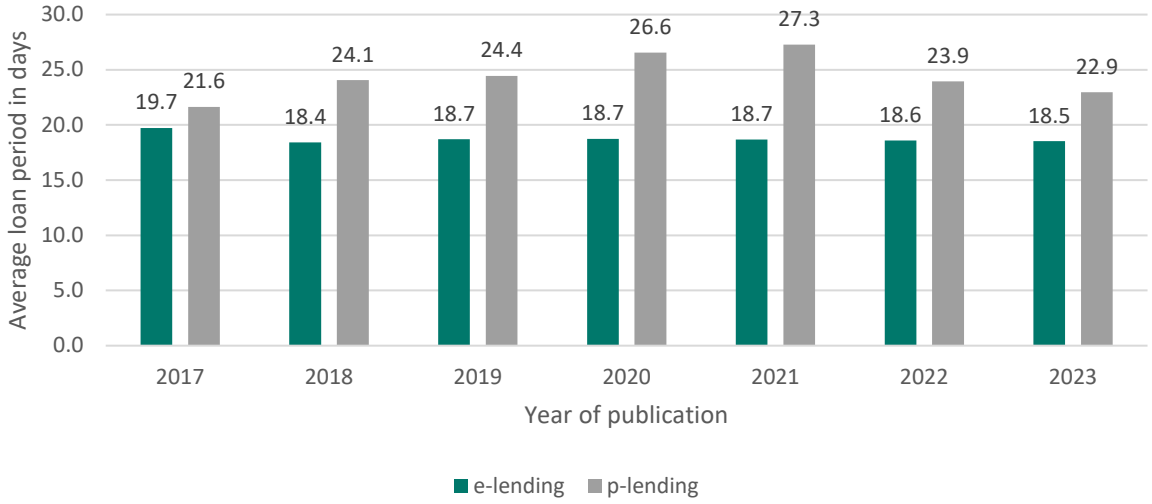
Note: N= 11,751 titles

Source: DIW Econ.

One reason for the significantly higher lending intensity of e-lending could be that the loan period for e-lending is shorter than for p-lending. The average loan period for p-lending is 24.4 days, which is 7 days longer than for e-lending, with an average loan period of 17.4 days. This difference of 7 days is also reflected in the standard loan period, which is usually 28 days for p-lending and 21 days for e-lending. Figure 3-6 also shows the development of the average loan period over the years of publication. While the loan period for e-lending has remained almost constant over the years[4], the loan period for p-lending increased slightly during the pandemic years to around 27 days. After the pandemic, the loan period fell back to pre-pandemic levels.

[4]The values for the loan period of e-lending in the figure are slightly above the average value of 17.4 days. This is because only one of the data providers was able to provide title-specific data on the loan period, while the other provider was able to provide aggregated data on the loan period. The data from both providers was used for the overall average, but only the title-specific data can be used for the development over time. This is why there are slight deviations.

Figure 3-6
Comparison of average loan periods for e-lending and p-lending by year of publication



Note: N= 11,751 titles

Source: DIW Econ.

To examine the extent to which the higher lending intensity of e-lending can be explained by a shorter loan period, the lending intensity is adjusted for the differences in the loan period. To do this, the lending intensity of e-lending is divided by the ratio of the loan periods of p-lending and e-lending. The ratio of the actual loan period and the ratio of the standard loan periods are used. The results in Table 3-1 show that the higher lending intensity of e-lending cannot be explained by a shorter loan period alone. Even after adjusting for different loan periods, the lending intensity is significantly higher for e-lending. This holds true both when the lending intensity is adjusted by actual loan periods and when it is adjusted by standard loan periods. In the first year after publication, the adjusted lending intensity of e-lending is 10.0 loans per copy and thus more than 70% higher than the lending intensity of p-lending (5.8 loans). In the following years, the difference in lending intensity becomes even more pronounced. In the second year after publication, the adjusted lending intensity of e-lending is still 9.9 loans, compared to 3.1 loans for p-lending. The adjusted lending intensity is thus more than 220% higher for e-lending than for p-lending. The relative difference increases to almost 300% in the third year.

Table 3-1
Adjustment of lending intensity by differences in loan periods

	p-lending	e-lending (adjusted by actual loan periods)	e-lending (adjusted by standard loan periods)
1st year after publication	5.8	10.0	10.5
2nd year after publication	3.1	9.9	10.5
3rd year after publication	2.0	7.9	8.3

Source: DIW Econ.

4 Analysis of the causal effects of e-lending and windowing on the consumer book market

Research question 2: How does e-lending affect the consumer market for e-books and print books? What is the effect of windowing?

As a starting point for the causal analysis, a descriptive overview of the data is provided. The distribution and duration of the windowing periods are examined, followed by an overview of the development of sales volumes, revenues and prices. The causal effect of e-lending or windowing on sales revenues and sales volumes on the consumer book market is then analysed using econometric methods[5].

4.1 Descriptive analysis

4.1.1 Windowing

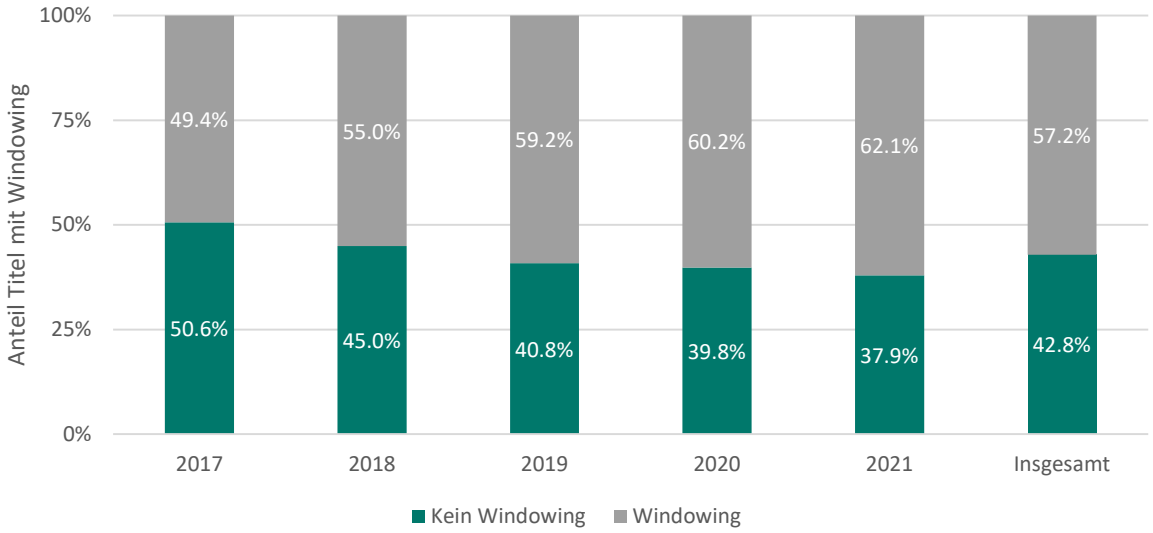
In recent years, new releases have increasingly been subject to a windowing period (see Figure 4-1). The proportion of new releases with windowing has steadily increased from 49.4% to 62.1% between 2017 and 2021. Over the observed period from 2017 to 2021, 57.2% of new releases were published with a windowing period. The windowing share is significantly higher for bestsellers at 67.3% than for non-bestsellers at 52.9%.

The prevalence of windowing also varies between genres (see Figure 4-2). The windowing share is highest in the fiction genre at 63.3%, followed by children and young adult at 56.8%. The windowing share is lowest in the travel genre at 40.2%.

More than 90% of the titles with windowing have a windowing period of 6 or 9 months. The proportion of new releases with a windowing period of 9 months has increased from 44.9% in 2017 to 55.0% in 2021. At the same time, the proportion with a windowing period of 6 months has fallen from 46.4% to 37.6%. Over the entire period, 50.1% of the titles with windowing were published with a windowing period of 9 months, 42.5% with 6 months and 7.4% with 2 months.

[5] Sales volume refers to the number of e-books (or print books) sold per title, while sales revenue is calculated by multiplying the number of e-books (or print books) sold with the corresponding prices.

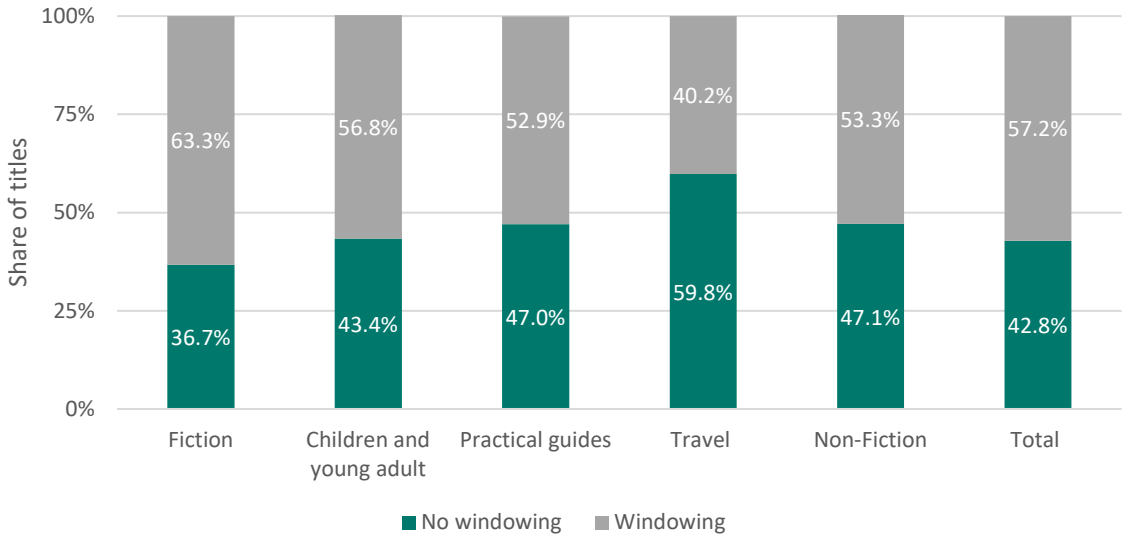
Figure 4-1
Development of windowing in the consumer book market



Note: (N=14,347 titles).

Source: DIW Econ.

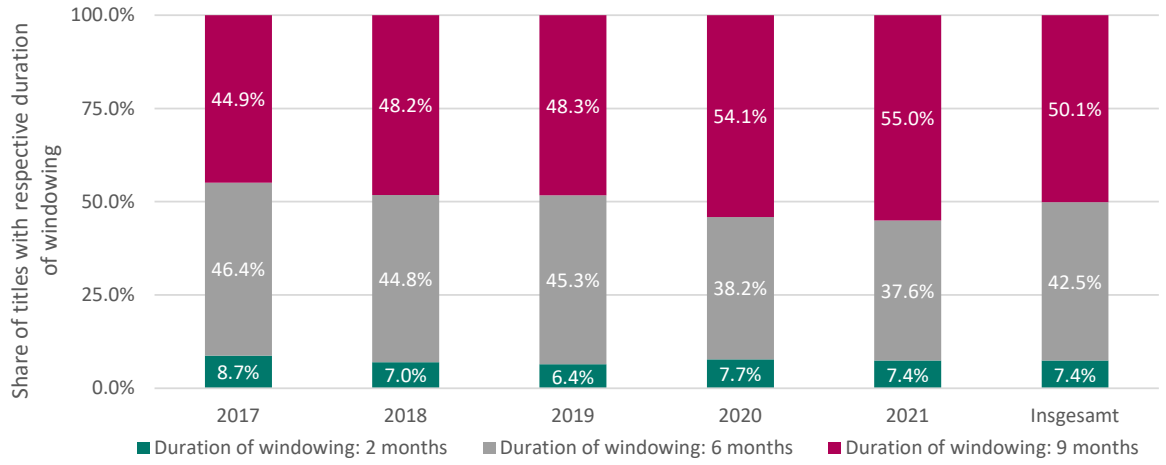
Figure 4-2
Distribution of windowing by genre



Note: N=14,347 titles

Source: DIW Econ.

Figure 4-3
Development of the duration of windowing



Note: N= 8,206 titles

Source: DIW Econ.

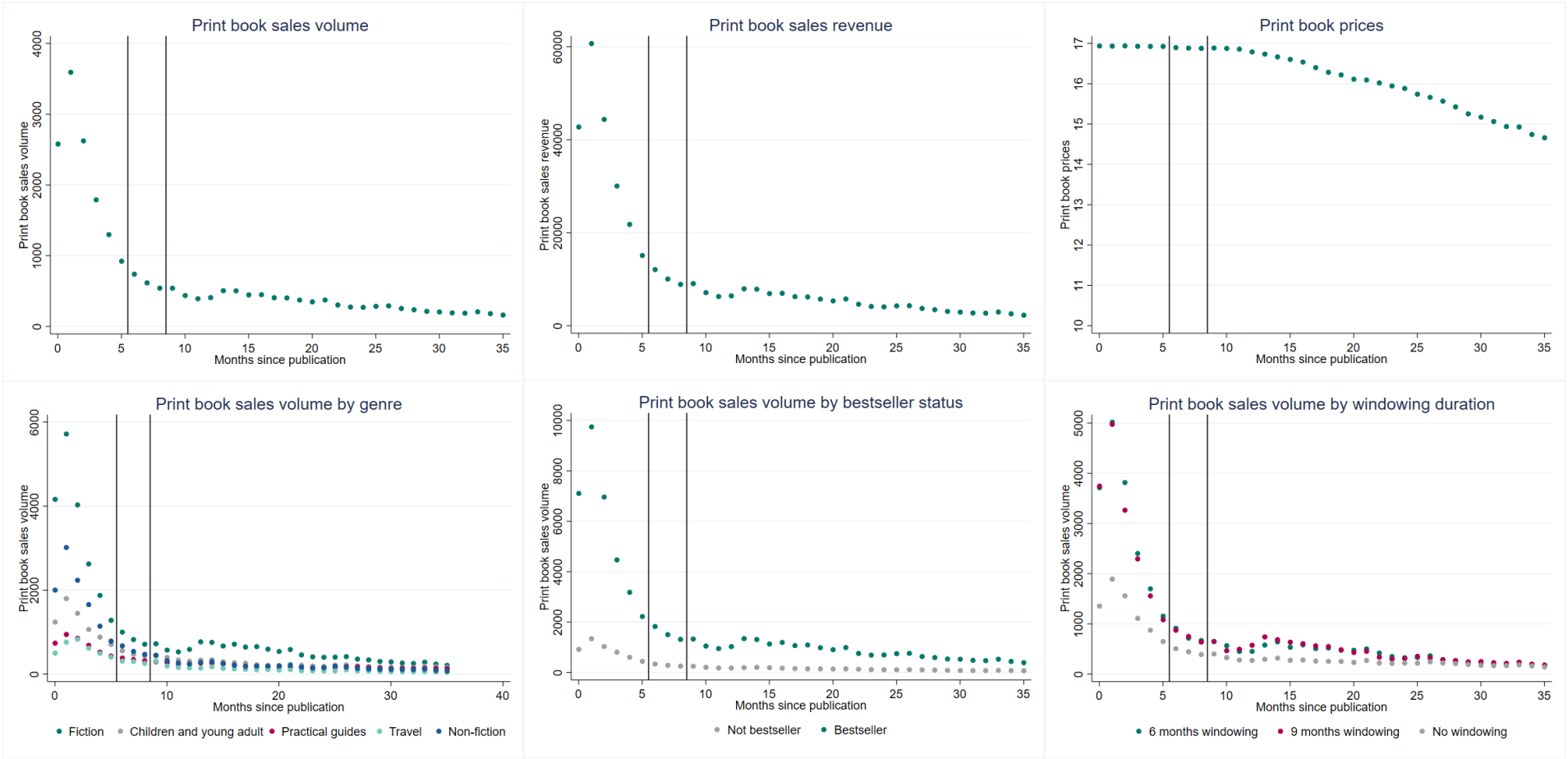
4.1.2 Sales volume, revenue and prices

4.1.2.1 Print book market

Figure 4-4 presents an overview of the development of average sales volume, revenue and prices on the print market per title. The vertical red lines mark the two most common windowing periods of 6 and 9 months. It is remarkable that sales volume within the windowing period of 6 or 9 months is significantly higher than in the following months. Sales volume initially increases in the first two months after publication and then falls rapidly with each month. After 9 months, the decline in sales volume slows down again. In the second and third year after publication, sales volume falls slightly and steadily. In the first 6 months, 56% of all copies sold in the first 36 months are sold, and in the first 9 months, 66%.

A very similar trend can be seen in sales revenue per title, which is calculated by multiplying the monthly sales volume by the average monthly sales price. Average revenue per title also peaks in the second month after release and then declines sharply each month before the decline in revenue slows after the first year. The first 6 months account for 57% of the revenue generated in the first three years after release and the first 9 months for 66%.

Figure 4-4
Overview of the development of sales volume, revenue and prices on the print book market



Source: DIW Econ.

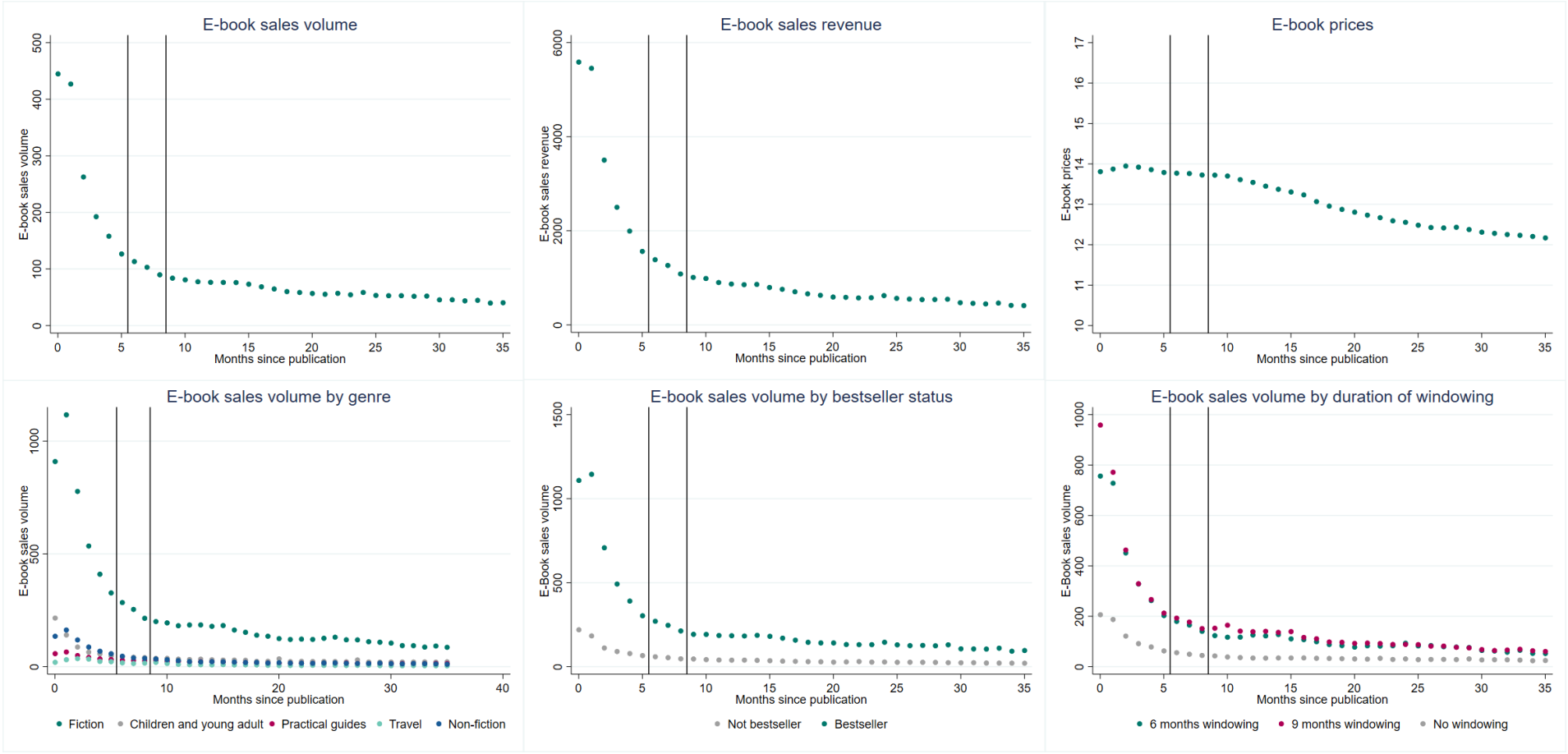
4.1.2.2 E-book market

The e-book market shows similar developments in average sales volume, revenue and prices (see Figure 4-5). Again, sales volume is significantly higher within the windowing period of 6 or 9 months than in the following months. While sales volume is at a similarly high level in the first two months after release, sales volume drops sharply with each month from the third month onwards. After 6 or 9 months, the decline in sales volume slows down significantly. In the second and third years after release, sales volume continues to decline, but at a slower rate. 40% of the total copies sold in the first 36 months are sold in the first 6 months and 51% in the first 9 months.

Generally, e-book sales volume is significantly lower than print sales volume. While a print book is sold an average of 16,097 times in the first year, an e-book is sold an average of 2,164 times.

Similar to the print market, the development of sales revenue per title reflects the development of sales volume in the e-book market. Here too, revenue peaks in the first two months after publication and then falls sharply with each month before the decline slows but continues steadily after the first year. 41% of the revenue of the first three years after publication is generated in the first 6 months and 52% in the first 9 months.

Figure 4-5
Overview of the development of sales volume, revenue and prices on the e-book market



Source: DIW Econ.

4.2 Causal analysis

This section examines the causal effect of e-lending respectively windowing on the consumer book market. Both the e-book market and the print book market are considered.

4.2.1 Methodological challenges

To measure the causal effect of windowing on the consumer book market for e-books and print books, it is mandatory to address the methodological challenge that high sales volume for a particular title are usually accompanied by high lending figures. This is because both sales volume and lending figures depend on the popularity of the title. A simple correlation or regression of the sales volume of a title and e-lending figures would therefore measure a positive relationship between sales volume and e-lending figures. However, it would be wrong to interpret this positive correlation as a causal effect of e-lending on sales volume. The measured positive "effect" is rather an expression of a positive bias that arises from the fact that a relevant variable, the popularity of a title, is omitted from the regression (Wooldridge, 2010).

In econometrics, various methods have been developed to minimize or eliminate such distortions in the estimation of causal effects. These methods aim to measure the effect of a certain variable (here: e-lending) only by the part of the variation in this variable that is not dependent on the unobserved relevant variables (here: popularity of a title). This variation is then referred to as "exogenous". In the present study, windowing is a potentially exogenous variation in e-lending figures. All titles with a windowing period cannot be lent out via e-lending during the windowing period. By comparing the sales volume between titles with windowing and titles without windowing, the effect of windowing on sales volume can be measured. In addition, this windowing effect can also be viewed as an (reversed) effect of e-lending, since the difference between titles with and without windowing is that some titles cannot be lent out via e-lending during the windowing period, while other titles are available for e-lending immediately after publication. The windowing effect can therefore also be interpreted in reverse as an effect of e-lending.

However, when measuring the windowing effect, the methodological challenge is that windowing is not assigned randomly across titles. Section4.1.1 has shown that bestsellers are more often subject to a windowing period than non-bestsellers. This suggests that publishers are more likely to impose a windowing period on titles for which comparatively high demand can be anticipated before publication than on titles with an anticipated lower demand. A simple regression of sales volume against a windowing variable would therefore also lead to an

overestimation of the effect of windowing on sales volume, since the windowing variable is correlated with the anticipated popularity of the title.

In the following empirical analysis, two econometric techniques are used to largely eliminate this bias in the estimation of the windowing effect on sales volume in the book market. First, a fixed effects model is estimated. Then, a synthetic control method is implemented.

4.2.2 Fixed-effects estimation

First, the effect of windowing on the consumer book market is examined using a fixed effects estimation. The following regression is estimated:

$$\ln(Sales\ Revenue_i) = \alpha + \beta \cdot Windowing_i + \mathrm{X} \cdot Control\ Variables_i + \Upsilon \cdot Author\ Fixed\ Effects_i + \varepsilon_i$$

The variable $Windowing_i$ indicates whether a particular title i was subject to a windowing period or not. The outcome variable $Verkaufserlös_i$[6] is the total revenue that a title generated over the first 36 months after publication. The effects on sales revenue on the e-book market and the print book market are examined separately. $Control\ variables_i$ accounts for additional factors, including genre, publisher, year of publication and the average price in the year of publication.

To validly estimate the causal effects of windowing, it is crucial that so-called fixed effects for the authors of the titles are also included as control variables. These author fixed effects control for all unobserved factors that differ between authors and that may affect sales volume. By including author fixed effects, only the books of the same authors are compared with each other to estimate the windowing effect. For each author, we therefore examine the extent to which titles with windowing achieve higher sales volume than titles without windowing. This significantly reduces the potential distortion of the measured windowing effect, since titles by the same authors are more similar in their anticipated popularity, so that publishers have difficulty predicting which title will generate higher demand before publication. Therefore, the fact that a certain title by the same author was windowed and another was not is probably less due to the anticipated popularity of the book. The risk of a positive distortion of the windowing effect can thus be greatly reduced by the fixed effects method.

[6]The outcome variable $Verkaufserlös_i$ is logarithmized for two reasons. First, the sales data are skewed and exhibit heteroscedasticity, that is, the variability of sales increases as the level of sales increases. Applying a logarithmic transformation stabilises the variance and makes the relationship with other variables more linear. Second, this transformation allows the coefficients to be interpreted as percentage changes.

Effect of windowing on the e-book market

First, the effect of windowing on the title-specific sales revenue on the e-book market is examined. It is shown that titles with windowing achieve significantly higher sales revenue over the first 36 months after publication. Windowing increases the sales revenue of a title on the e-book market by an estimated 26.7% (Table 4-1). This effect is statistically significant at a significance level of 1%[7].

In how far do the effects of windowing differ between genres? The strongest effect is measured for the fiction genre. Windowing increases sales revenue for titles in the fiction genre by an estimated 26.1%. In the children and young adult genre, however, no significant effect of windowing on sales revenue is measured. These differences between genres are as expected, since the fiction genre is by far the most popular genre for e-books, while children and young adult books are bought less frequently in e-book format. No significant effect of windowing can be identified for the other genres either. However, this may also be because the coefficients can only be measured imprecisely due to a smaller sample. This can be seen, for example, in the practical guides genre, where a large effect of 23.2% is measured. However, due to the uncertainty with which the effect is measured, which is expressed in a large confidence interval, the effect is not statistically significant. For the practical guides genre, the confidence interval for the effect of windowing on sales revenue ranges from -7.2% to 53.6%. This means that the actual effect lies in this range with a probability of 95%. Due to the smaller samples in the travel and non-fiction genres, the effects are measured so imprecisely that the results are not meaningful. Therefore, the results for these genres are not displayed in Table 4-1.

The windowing effect is particularly strong among bestsellers: Windowing increases the sales revenue of bestsellers by an estimated 30.9%. For non-bestsellers, the windowing effect is estimated at 12.8%. The measured effect is statistically significant for both bestsellers and non-bestsellers.

[7]Any estimate of causal effects is subject to statistical uncertainty due to the random nature of the sample. The significance level indicates how likely it is that the measured effects is a product of the random nature of the sample and that the actual effect is zero. A significance level of 1% means that the actual windowing effect is non-zero or positive with a probability of 99%.

Table 4-1
Results of the fixed-effects estimation of the windowing effect on e-book sales revenue

Outcome variable: sales revenue of e-books						
	Total sample	Bestseller	Non-Bestseller	Fiction	Children and young adult	Practical guides
Windowing effect	26.7%***	30.9%***	12.8%**	26.1%***	-4.60%	23.20%
Confidence interval (95%)	17.0% to 36.5%	9.1% to 52.7%	2.3% to 23.2%	11.4% to 40.9%	-20.6% to 11.4%	-7.2% to 53.6%
Number of observations	4,970	1,274	3.109	2,182	1,440	654

Note: *** significant at significance level 1% ** significant at significance level 5% * significant at significance level 10%

Source: DIW Econ.

Effects of windowing on the print book market

In this section, we further study the effect of windowing on the print book market, i.e. we measure the effect of windowing (in e-lending) on the sales revenue of the print books associated with the windowed titles (see Table 4-2). We find a significant positive effect of windowing on sales revenue in the print book market. Windowing increases the sales revenue in the print book market by an estimated 9.6%. The percentage effect is thus significantly smaller than in the e-book market (26.7%). This was to be expected, as borrowing e-books is a closer substitute for buying an e-book than for buying a print book. In other words: people who would buy an e-book without the option of e-lending are more likely to use e-lending if the book is available for e-lending than people who would buy a print book without e-lending.

The comparison of the windowing effect between genres shows a similar picture to that of the e-book market. Here too, the strongest effect (8.9% increase in sales revenue due to windowing) is measured in the fiction genre. In the children and young adult genre, however, no significant effect of windowing is identified. In addition, different effects are measured for bestsellers and non-bestsellers in the print book market. It is estimated that windowing increases the sales revenue of bestsellers by 4.3%, while windowing reduces the sales revenue of non-bestsellers by -2.1%. However, the effects are not statistically significant. Therefore, the measured negative effect for non-bestsellers may also be due to the statistical uncertainty of the estimate.

Table 4-2
Results of the fixed effects estimation of the windowing effect on sales revenue of print books

Outcome variable: sales revenue of print books						
	Total sample	Bestseller	Non-bestseller	Fiction	Children and young adult	Practical guides
Windowing effect	9.6%***	4.30%	-2.10%	8.9%*	-0.30%	4.70%
Confidence interval (95%)	3.1% to 16.0%	-7.5 to 16.1%	-8.1% to 3.9%	-0.6% to 18.5%	-11.0% to 10.4%	-15.3 to 24.7%
Number of observations	6,143	1,489	3,952	2,768	1,597	941

Note: *** significant at significance level 1% ** significant at significance level 5% * significant at significance level 10%

Source: DIW Econ.

Conclusion of the fixed effects estimation

Based on fixed effects estimations, significant effects of windowing on sales revenue are identified in both the e-book and the print book market. The effect is significantly higher in the e-book market at 26.7% than in the print book market at 9.6%. The strongest effects are measured in the fiction genre and among bestsellers.

In an alternative estimate, sales volume, i.e. the number of copies sold per title, is used as the outcome variable (instead of sales revenue). The results are very similar. In the e-book market, windowing increased sales volumes by an estimated 21.6% in the first 36 months, compared to an effect of 8.8% in the print market (see Table 4-3). The strongest effects on sales volume are measured in the fiction genre and among bestsellers - both in the e-book and print book.

Further, the effects of windowing on sales prices are examined. No significant effect of windowing on sales prices is found here. It is therefore not surprising that the effects on sales revenue and sales volume are so similar. Since sales revenue is given by multiplying sales volume and prices and since windowing has no effect on prices, the effect on sales revenue is determined solely by the effect on sales volume.

Table 4-3
Results of the alternative fixed effects estimation of the windowing effect on sales volume

Outcome variable: sales volume of e-books						
	Total sample	Bestseller	Non-Bestseller	Fiction	Children and young adult	Practical guides
Windowing effect	21.6%***	19.8%*	9.2%*	24.0%***	-7.60%	-4.60%
Confidence interval (95%)	12.0% to 31.2%	-0.7 to 40.2%	-1.2% to 19.6%	9.2% to 38.7%	-23.6% to 8.3%	-30.6 to 21.3%
Number of observations	5,183	1,308	3,269	2,182	1,440	837

Outcome variable: sales volume of print books						
	Total sample	Bestseller	Non-Bestseller	Fiction	Children and young adult	Practical guides
Windowing effect	8.8%***	4.10%	-2.70%	8.8%*	-0.80%	3.50%
Confidence interval (95%)	2.4% to 15.2%	-7.7 to 15.9%	-8.7% to 3.3%	-0.8% to 18.3%	-11.5% to 9.9%	-16.2 to 23.2%
Number of observations	6,143	1,489	3,952	2,768	1,597	941

Note: *** significant at significance level 1% ** significant at significance level 5% * significant at significance level 10%

Source: DIW Econ.

By including author fixed effects, a potential positive bias in the estimated effects can be greatly reduced, since only titles by the same authors are compared. However, a bias cannot be completely ruled out even in the fixed effects model. In particular, a bias could arise if a publisher anticipates that a certain title will achieve high sales volume and therefore imposes a windowing period on this title, while another title by the same author is not windowed because it is anticipated that this title will be less popular. In the following section, another estimation method is therefore used that can identify the causal effects of windowing even more stringently and conservatively and largely eliminates any potential bias.

4.2.3 Synthetic control method

The synthetic control method is a statistical method for estimating causal effects (Abadie, Diamond, & Hainmueller, 2010). It is similar to a difference-in-differences approach in that it compares the development of an outcome variable (here: sales revenue) over time in a treatment

group (here: titles with windowing) with a control group (here: titles without windowing) in order to estimate the causal effect[8].

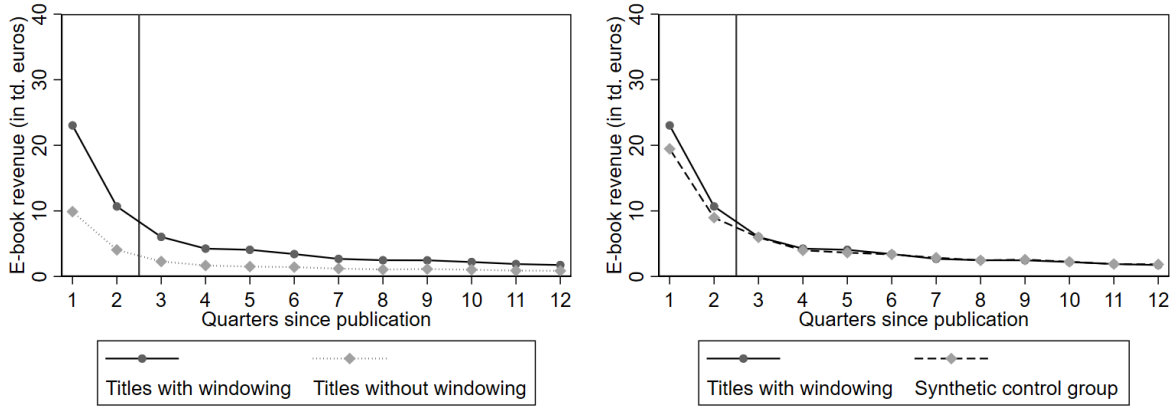
The method is based on constructing a synthetic version of the windowed titles by selecting a specific weighted average of the non-windowed titles that is most similar to the windowed titles in terms of the development of sales volume or sales revenue after the windowing period and in terms of other variables (covariates). The synthetic control group then provides the counterfactual path without windowing for the windowed titles during the windowing period, and the difference between the actual and counterfactual development of sales revenue can be considered as the effect of windowing.

Figure 4-6 presents a graphical representation of the synthetic control method[9]. The left graph (a) shows the actual development of the sales revenue of the titles with windowing and the titles without windowing. The difference between the two lines cannot be interpreted as a causal windowing effect, since the books without windowing are also sold less often in the period after the windowing period, when books in both groups are available for e-lending. A simple difference-in-differences comparison would also be problematic, since the two groups of books clearly show different trends.

[8]Because the control group is constructed to match the trend of the treated units, the synthetic control method is particularly well suited to situations where trends would otherwise not be parallel.

[9]To estimate the synthetic control method, sales revenue is aggregated quarterly. This reduces the random variation in sales revenue across months and improves the selection of non-windowed titles with a similar sales trend to windowed titles in the period after the windowing period.

Figure 4-6
Graphical representation of the synthetic control method



Note: The left graph shows the actual development of average sales revenue for e-books with and without windowing. The right graph shows the actual development of sales revenue for e-books with windowing compared to the counterfactual development of the synthetic control group.

Source: DIW Econ.

The right graph shows the synthetic control method, which addresses the problem of different trends in estimating causal effects by selecting only those titles that are similar to the windowed titles in terms of sales in the non-windowing period and the specified covariates[10]. This selection means that the synthetic control group has similar sales volume after the windowing period as the windowed titles (to the right of the vertical line). The synthetic control group and the windowed titles are also similar in terms of other relevant characteristics such as number of pages, initial price of the e-book and average sales volume after windowing. A successful construction of a synthetic control group means that the difference between the sales revenue of the windowed titles and the synthetic control group during the windowing period can be interpreted as a causal effect of windowing.

The synthetic control method is carried out separately for e-books with a windowing period of 6 months and e-books with a windowing period of 9 months. E-books with a 6-month windowing period are estimated to generate 7.5% higher sales revenue than in the counterfactual scenario without windowing (synthetic control group). E-books with a 9-month windowing period are estimated to achieve 11.7% higher sales revenue than in the counterfactual scenario without windowing. The total causal effect of windowing is calculated as the average of

[10]285 titles out of a total of 2,836 titles without windowing are selected for the synthetic control group. The 2,836 titles without windowing from which the selection is made are all titles without windowing for which all necessary information is available (data on monthly sales volume and on covariates, e.g. number of pages, price in the first month of publication).

these two effects and amounts to approximately 9.9%.[11]In an alternative estimation, sales volume is used as the outcome variable, with the measured effects of windowing being very similar at 10.3%. This robustness of the results across different specifications reinforces the validity of the identified effects.

The 9.9% effect of windowing measured with the synthetic control method is thus significantly lower than the 26.7% effect estimated with the fixed effects method. This supports the assumption that the fixed effects method cannot fully eliminate the positive bias arising from the fact that publishers sometimes base their decision to publish titles by the same authors with or without windowing on the expected demand for those titles. The fixed effects method therefore probably overestimates the causal effect of windowing on sales revenue.

The fixed effects method has the advantage over the synthetic control method that effects can also be calculated for individual genres as well as for bestsellers and non-bestsellers. The synthetic control group places greater demands on the size of the sample and the nature of the data, so that this method cannot be validly applied to smaller samples. This also applies to sales revenues in the print book market, where no valid synthetic control group can be formed.

4.2.4 Result: Combination of estimation methods to identify the causal windowing effect

The estimates of the fixed effects method and the synthetic control method are combined to eliminate the potential distortions as best as possible and to identify the causal effect of windowing. In particular, the ratio of the effects of the fixed effects method and the synthetic control method, i.e. 26.7% / 9.9% = 2.7, is used as a measure of the distortion of the fixed effects estimate. The effects measured with the fixed effects method on the e-book and print book market are then adjusted for this distortion factor by dividing the coefficients and confidence intervals by the factor (Oster, 2019).

Table 4-4 shows the results of this bias correction. On the e-book market, windowing increases the sales revenue of a title by an estimated 9.9%. However, since the estimation of causal effects is fundamentally subject to statistical uncertainty, the limits of the 95% confidence interval are also presented for each effect. This confidence interval consists of a lower and upper limit, with the actual effect of windowing lying between these two limits with a probability of 95%. The effect of windowing on sales revenue on the e-book market is thus between 6.3% and

[11]The average is weighted according to the average sales revenue of e-books with 6 months windowing (60,594 euros) and 9 months windowing (77,422 euros).

13.5% with a probability of 95%. The effect is particularly strong for bestsellers on the e-book market. Here, an effect of 11.4% is estimated, with an upper limit of 19.5% and a lower limit of 3.4%. Across genres, the strongest effect is measured at 9.7% (statistically significant at 1% significance level) in the fiction genre.

A similar picture emerges in the print book market. However, the percentage effects are significantly smaller. Overall, windowing increases sales revenue in the print market by an estimated 3.5%, while the actual effect lies between 1.2% and 5.9% with a probability of 95%. In the fiction genre, increases sales revenue by an estimated 3.3%, while no significant effect can be measured in the other genres.

Table 4-4
Results of estimation of windowing effects on e-books and print books

	Total sample	Bestseller	Non-Bestseller	Fiction	Children and young adult	Practical guides
Outcome variable: sales revenue of e-books						
Estimated effect	**9.9%*** **	**11.4%*** **	**4.7%** **	**9.7%*** **	**-1.7%**	**8.6%**
Upper limit	13.5%	19.5%	8.6%	15.1%	4.2%	19.8%
Lower limit	6.3%	3.4%	0.9%	4.2%	-7.6%	-8.0%
Outcome variable: sales revenue of print books						
Estimated effect	**3.5%*** **	**1.6%**	**-0.8%**	**3.3%***	**-0.1%**	**1.7%**
Upper limit	5.9%	6.0%	1.4%	6.8%	3.9%	9.1%
Lower limit	1.2%	-2.8%	-3.0%	-0.2%	-4.1%	-5.6%

Note: *** significant at significance level 1% ** significant at significance level 5%* significant at significance level 10%

Source: DIW Econ.

5 The economic effects of e-lending on the market participants in the book sector

Research question 3: What are the economic effects of e-lending and windowing on the market participants in the book sector?

This chapter analyses the economic impact of e-lending and windowing on the various market participants in the consumer book market. Building on the causal effects of windowing estimated above, the effects on authors, publishers, book retailers and aggregators are estimated.

5.1 Methodology

The economic impact of e-lending is measured using the causal effect of windowing identified above. In particular, we analyse the effect of fully removing windowing on e-lending. First, a scenario based on current data from 2022 is analyzed. In addition, two future scenarios up to 2027 are developed.

The impact assessment in all scenarios is based on two steps.

1. *Step: Effect of removing windowing on the consumer book market*

In the first step, the effect of the removal of windowing on the consumer book market is estimated separately for the e-book and print book markets.

For the e-book market, the percentage effect of the removal of windowing on the sales revenue of an e-book is multiplied by the total revenue of e-books that are currently subject to a windowing period. For the print book market, the effect is estimated in a similar way. As discussed in the previous chapter, the estimation of causal effects is fundamentally subject to statistical uncertainty. This uncertainty should also be taken into account when analysing the economic impact. Therefore, in each scenario, a lower and upper limit of the economic impact is calculated according to the 95% confidence interval of the estimated causal effects.

2. *Step: Effect on market participants in the book sector*

In the second step, we calculate how the effects on the consumer book market (e-book and print book) affect the various market participants.

On the one hand, the removal of windowing leads to a loss of sales revenue for market participants due to the negative effect on the sales volume of e-books and print books. The magnitude of the loss for authors, publishers and book retailers is proportional to their

respective share of the sales price of a print book or the sales revenue of an e-book. The following distribution is used as a basis:

Table 5-1
Market participants' shares in the sales price of print books and sales revenue from e-books

	Print books	E-Books
	Share of sales price	Share of sales revenue
Authors	9%	9%
Publishers	51%	40%
Booksellers	33%	44%
VAT	7%	7%

Source: Kurt Wolff Foundation (2023), DIW Econ (2024).

On the other hand, removing windowing would increase the sale of e-lending licenses. This additional revenue is estimated by first calculating an implicit remuneration per e-lending by dividing the average license price by the average number of loans per license. The remuneration per loan is then multiplied by the estimated increase in e-lending as a result of removing windowing to calculate the increase in sales revenue of e-book licenses.[12] Finally, this total increase in sales revenue is distributed among the market participants according to their respective share of the sales price of the e-book licenses. It is assumed that the aggregators buy the licenses from the publishers at an average price of 1.5 times the e-book sales price and sell them to the libraries with a premium of 30%. The publishers in turn pay an amount to the authors that equals 25% of their share of the net proceeds (DIW Econ, 2024; Netzwerk Autorenrechte, 2021).

5.2 Results

5.2.1 Current scenario (2022)

First, the effects of removing windowing are calculated in a current scenario based on data from 2022. Removing windowing is found to reduce e-book sales by an estimated -4.6% to -9.2%, which amounts to a decline in sales revenue of -11.1 to -22.5 million euros annually. In the print book market, sales revenue is estimated to decline by -0.7% to -3.5% or -27.0 to -131.3 million euros annually. While the percentage effect on the print book market is smaller than on the e-

[12]The increase in e-loans is calculated in two steps. First, the synthetic control method is used to estimate the percentage increase in e-loans for windowed titles in the counterfactual scenario where these titles are published without windowing. Second, the percentage effect is multiplied by the current number of e-loans for windowed titles to calculate the absolute increase in e-loans.

book market, the absolute effect is larger on the print book market. This is because the print book market, with total sales of 3,705 million euros in 2022, is more than 10 times larger than the e-book market at 245 million euros. Therefore, even a relatively small percentage effect on the print market has larger absolute effects. However, this also means that the statistical uncertainty in estimating the percentage effects results in a larger range (-27.0 to -131.1 million euros) of the economic impact.

The impacts of removing windowing on market participants in the markets for e-books and print books are shown in Table 5-2. Authors would face estimated losses in sales revenue of -1.0 to -2.0 million euros on the e-book market and estimated losses of -2.4 to -11.8 million euros on the print book market. Publishers would lose sales revenues of -4.5 to -9.5 million euros on the e-book market and -13.8 to -67.0 million euros on the print market. Booksellers would record losses of -4.9 to -9.9 million euros on the e-book market and -8.9 to -43.4 million euros on the print market.

Market participants further benefit from income from the additional sale of e-book licences. Authors receive an estimated 0.2 million euros, publishers 0.6 million euros and aggregators 0.3 million euros. However, the loss of sales on the e-book and print book market far outweighs the additional income from the e-book licenses.

Overall, the removal of windowing would confront authors with revenue losses of between -3.2 and -13.6 million euros. The publishers' revenue losses are estimated at between -17.7 and -75.4 million euros, while booksellers would face losses of between -13.8 and -53.3 million euros. The aggregators would generate additional sales of 0.3 million euros through the additional e-book licenses sold. For consumer book market in total, revenue losses would range between -37.0 and -152.7 million euros.

Table 5-2
Economic impact: current scenario (2022)

	Revenue loss in e-book market	Revenue loss in print market	Revenue from additional e-book licenses	Total (etn) effect
Authors	-1.0 to -2.0 million €	-2.4 to -11.8 million €	+0.2 million €	-3.2 to -13.6 million €
Publishers	-4.5 to -9.0 million €	-13.8 to -67.0 million €	+0.6 million €	-17.7 to -75.4 million €
Booksellers	-4.9 to -9.9 million €	-8.9 to -43.4 million €	-	-13.8 to -53.3 million €
Aggregators	-	-	+0.3 million €	+0.3 million €
VAT	-0.8 to -1.6 million €	-1.9 to -9.2 million €	+0.1 million €	-2.6 to -10.7 million €

Consumer book market in total	-11.1 to -22.5 million euros	-27.0 to -131.3 million €	+1.1 million €	-37.0 to -152.7 million €

Source: DIW Econ.

5.2.2 Future scenarios (2027)

In addition, two future scenarios are analysed for the next 5 years up to 2027 (based on the current scenario in 2022). Firstly, both scenarios assume that spending on e-books and print books will continue to grow in line with their growth in recent years. Based on GfK data on annual spending on e-books and print books from 2018 to 2022, a linear projection is used to estimate that spending on e-books will increase by 1.5% annually up to 2027 and spending on print books by 0.9%. Two different scenarios are analysed for the development of e-lending: a scenario with constant e-lending and a scenario with increasing e-lending (according to the average growth of e-lending transactions in the German Library Statistics (DBS) in the years 2019 to 2022, an annual growth rate of 3.2% is assumed).

Table 5-3 shows the results of the two scenarios. In both future scenarios, the revenue losses increase compared to the current scenario. In the first scenario (constant e-lending), the removal of windowing would lead to a drop in revenue in the e-book market of an estimated -11.8 to -23.8 million euros and in the print book market of an estimated -28.7 to -139.3 million euros. This corresponds to an increase in revenue losses compared to 2022 of around 6%. The larger loss in revenue results from the projected growth in both the e-book and print book markets. In a larger market, the removal of windowing leads to higher losses because there is more to lose. The losses of market participants also increase in proportion to the loss of revenue in the overall market. Authors would record a total (net) loss of -3.5 to -14.4 million euros, publishers a loss of -18.7 to -80.0 million euros and booksellers a loss of -14.7 to -56.5 million euros.

In the second scenario (increasing e-lending), revenue losses increase even further because it is also assumed that e-lending will be used more frequently. Higher use of e-lending would increase the effect of removing windowing, as more people would use e-lending if windowing were removed. Revenue losses in the e-book market would increase to an estimated -13.7 to -27.4 million euros and in the print book market to an estimated -33.6 to -161.7 million euros, which corresponds to an increase of around 23% compared to the current scenario in 2022. This increase in revenue losses would also affect market participants: authors would

confront revenue losses of -4.0 to -16.9 million euros, publishers would record revenue losses of -21.9 to -92.7 million euros and booksellers from -17.1 to -65.4 million euros.

Table 5-3
Economic impacts: future scenarios 2027

	Revenue loss in the e-book market	Revenue loss in the print book market	Revenue from e-book licenses	Total (net) effect
Authors				
Scenario I	-1.1 to -2.1 million €	-2.6 to -12.5 million €	0.2 million €	-3.5 to -14.4 million €
Scenario II	-1.2 to -2.5 million €	-3.0 to -14.6 million €	0.2 million €	-4.0 to -16.9 million €
Publishers				
Scenario I	-4.7 to -9.5 million €	-14.6 to -71.1 million €	0.6 million €	-18.7 to -80.0 million €
Scenario II	-5.5 to -10.9 million €	-17.1 to -82.5 million €	0.7 million €	-21.9 to -92.7 million €
Booksellers				
Scenario I	-5.2 to -10.5 million €	-9.5 to -46.0 million €	-	-14.7 to -56.5 million €
Scenario II	-6.0 to -12.0 million €	-11.1 to -53.4 million €	-	-17.1 to -65.4 million €
Aggregators				
Scenario I	-	-	0.3 million €	0.3 million €
Scenario II	-	-	0.3 million €	0.3 million €
VAT				
Scenario I	-0.8 to -1.7 million €	-2.0 to -9.8 million €	0.1 million €	-2.7 million to -11.4 million €
Scenario II	-1.0 to -1.9 million €	-2.4 to -11.3 million €	0.1 million €	-3.3 million to -13.1 million €
Consumer book market in total				
Scenario I	-11.8 to -23.8 million euros	-28.7 to -139.3 million €	1.2 million €	-39.3 to -161.9 million €
Scenario II	-13.7 to -27.4 million €	-33.6 to -161.7 million €	1.3 million €	-46.0 to -187.8 million €

Note: Scenario I: E-book spending and print book spending increase annually at the average growth rate of recent years. E-lending is constant. Scenario II: E-book spending and print book spending increase annually at the average growth rate of recent years. E-lending also increases at the average growth rate of recent years.

Source: DIW Econ.

5.2.3 Impact on the e-book subscription market

In addition to the market for e-book purchases, the market for e-book subscriptions (flat rates) has grown significantly in recent years. Data from GfK shows that spending on e-book

subscriptions rose from 161 million euros in 2018 to 191 million euros in 2022. This raises the question of how the removal of windowing would affect the e-book subscription market.

A study of the economic impact on the subscription market must take into account the heterogeneous structures of the subscription market. The conditions under which individual titles are included in subcriptions or not are usually negotiated between publishers and subscription providers. As a result, the conditions and remuneration structures differ significantly across titles, publishers and subscription providers. In addition, some titles - similar to e-lending in public libraries - are only offered in subscriptions after a windowing period. According to industry experts, the title-specific windowing conditions of subscriptions and e-lending in public libraries are often similar, so it is likely that a title that is windowed or e-lending in libraries is also subject to a similar windowing period in subscriptions. In addition, the range of e-books in subscriptions is generally smaller than the range of e-books in public libraries and contains more backlist titles[13]and self-published titles.

A valid study of the economic impact on the subscription market that takes into account these various structures therefore requires a title-specific data set that shows which titles are included in the various subscriptions under which conditions (including windowing and remuneration) and how often these titles are used within the subscriptions. Since such a data set could not be collected as part of this study, the economic impact on the subscription market cannot be quantified.

However, it can be assumed that removing windowing for e-lending in public libraries – while maintaining the option of windowing in subscriptions – would make subscriptions less attractive than e-lending in libraries and would thus lead to a loss of sales revenue on the e-book subscription market.

[13]The backlist refers to all available books from a publisher that have not been recently published.

6 The socio-demographic background of users of e-lending and users of users of p-lending

Research question 4a: How does the socio-demographic background of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?

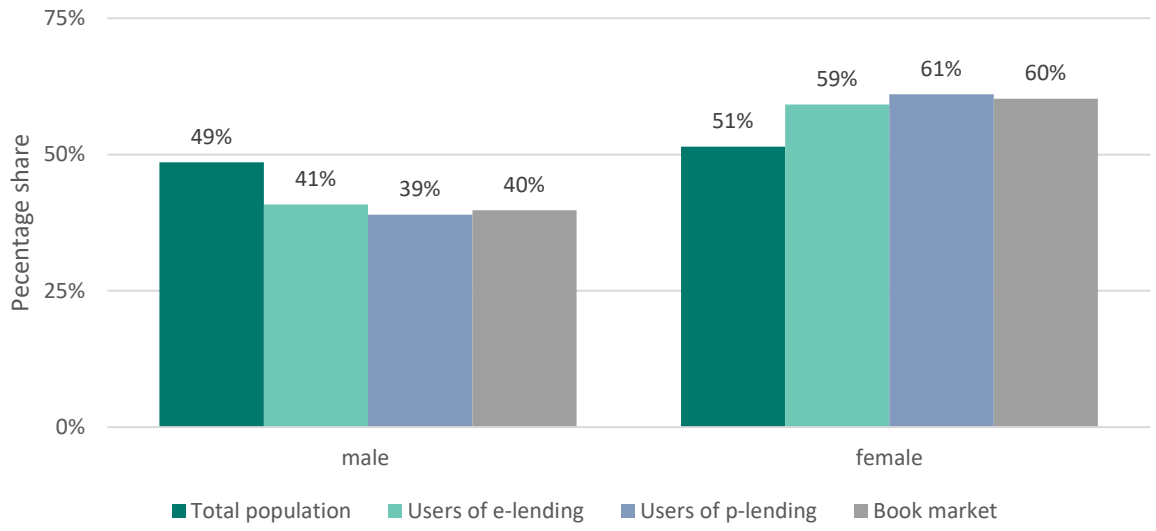
Based on data from the GfK Consumer Panel Media*Scope, the socio-demographic background of users of e-lending is analysed below and compared with the overall German population as well as with users of p-lending and buyers on the consumer book market.

In 2022, 3.0 million people used e-lending. P-lending, on the other hand, was used by significantly more people, with 8.4 million users in 2022. The number of users of e-lending in 2022 and 2021 decreased compared to 2020. In 2020, 4.4 million people used e-lending, compared to 3.1 million in 2021 and 3.0 million in 2022. However, it must be noted that the number of users of e-lending rose rapidly from 2.6 million to 4.4 million users from 2019 to 2020 with the outbreak of the COVID-19 pandemic. The number of users of e-lending in 2021 (3.1 million) and 2022 (3.0 million) was thus still above the pre-pandemic level (2.6 million). In addition, the borrowing intensity of users of e-lending has increased. While an average of 7.1 e-books were borrowed per person in 2020, the number of e-books borrowed per user rose to 16.5 in 2021 and 19.3 in 2022.

Gender:

Library users, like buyers in the book market, are predominantly female. The share of women among users of e-lending, users of p-lending and book buyers is around 60% each, compared to 51% in the overall German population.

Figure 6-1
Sociodemographics – Gender



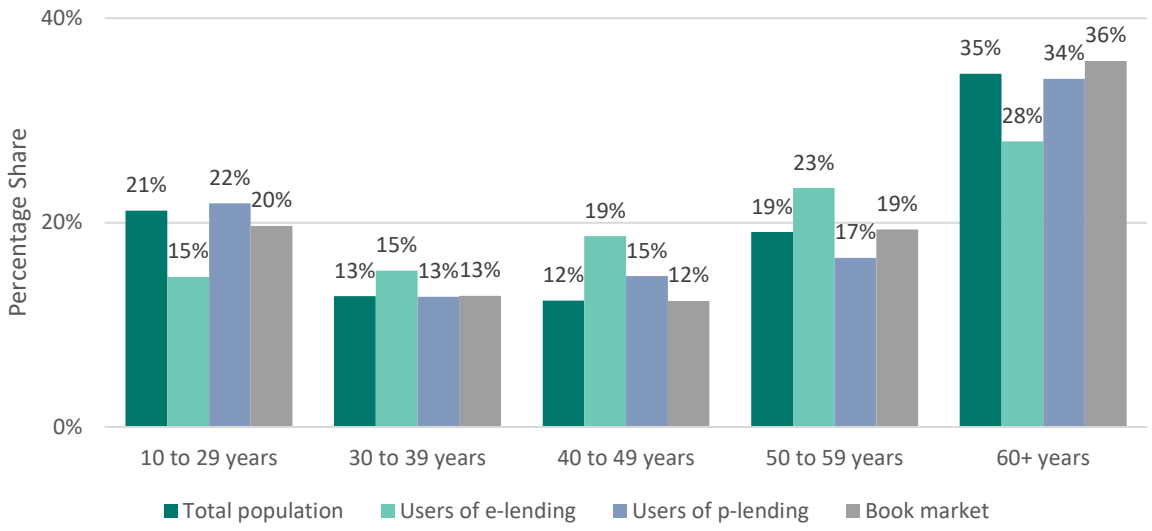
Example interpretation: 41% of users of e-lending are male and 59% of users of e-lending are female. In the total population, 49% are male and 51% are female. Women are therefore overrepresented among users of e-lending.

Source: DIW Econ based on GfK (2023).

Age:

The age structure of users of e-lending differs significantly from the overall German population and from that of buyers on the book market. Younger people (up to 29 years old) are underrepresented among users of e-lending and make up only 15% of users of e-lending, compared to a population share of 21%. People in the middle age group of 30 to 59 years, on the other hand, are significantly overrepresented. People aged 30 to 59 make up 57% of users of e-lending, compared to a share of 44% in the total population. Older people aged 60 and over are underrepresented, with a share of 28% among users of e-lending and a share of 35% in the population. The age structure of users of p-lending is overall closer to the age structure of the total population and the book market. Younger people (up to 29 years old) and people between 40 and 49 years old are slightly overrepresented, while people between 50 and 59 years old are slightly underrepresented.

Figure 6-2
Sociodemographics – Age



Example interpretation: 19% of users of e-lending are between 40 and 49 years old. In the total population, 12% of people are between 40 and 49 years old. Therefore, people aged 40 to 49 are overrepresented among users of e-lending.

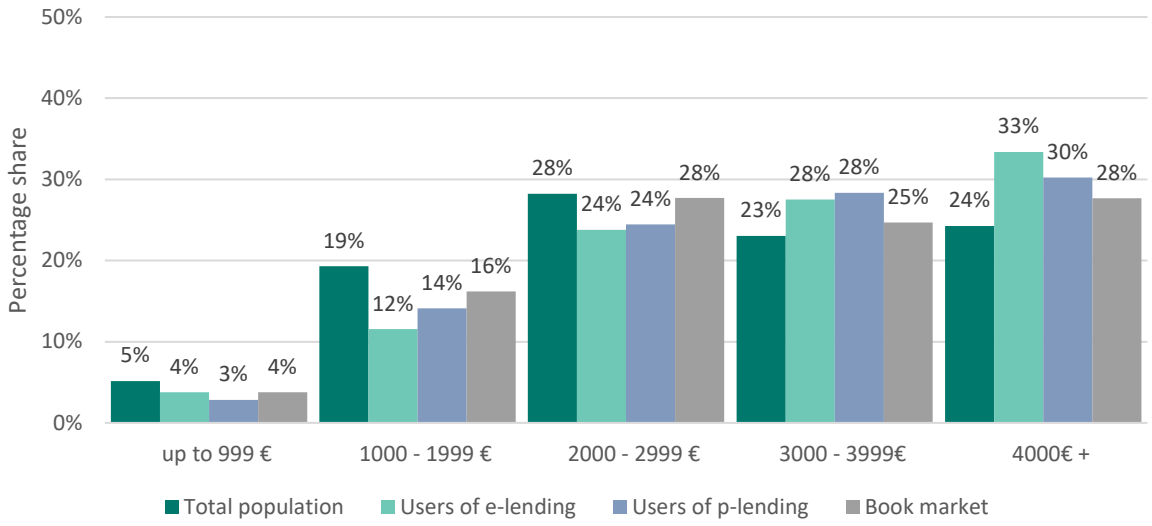
Source: DIW Econ based on GfK (2023).

Income:

The income distribution of users of e-lending and users of p-lending differs from the income distribution in the overall German population: higher income groups are overrepresented among users of e-lending and users of p-lending. 28% of users of e-lending and users of p-lending have a net household income between 3,000 and 3,999 euros, compared to 23% in the total population. In the top group of people with a net income of 4,000 euros or more, the difference is even more pronounced: 33% of users of e-lending and 30% of users of p-lending have a net household income of 4,000 euros or more, compared to 24% in the total population. People with lower income are, in contrast, underrepresented among library users. 16% of the users of e-lending and 17% of the users of p-lending have a household income of up to 2,000 euros, compared to 24% in the overall population.

This means that people with higher incomes borrow e-books or print books from public libraries more often than people with low incomes. Higher income groups are also overrepresented among buyers in the book market, although not as strongly as among users of e-lending and users of p-lending. For example, the proportion of people with a net household income of over 3,000 euros among buyers in the book market is 53%, compared to 61% among users of e-lending.

Figure 6-3
Sociodemographics – Net household income



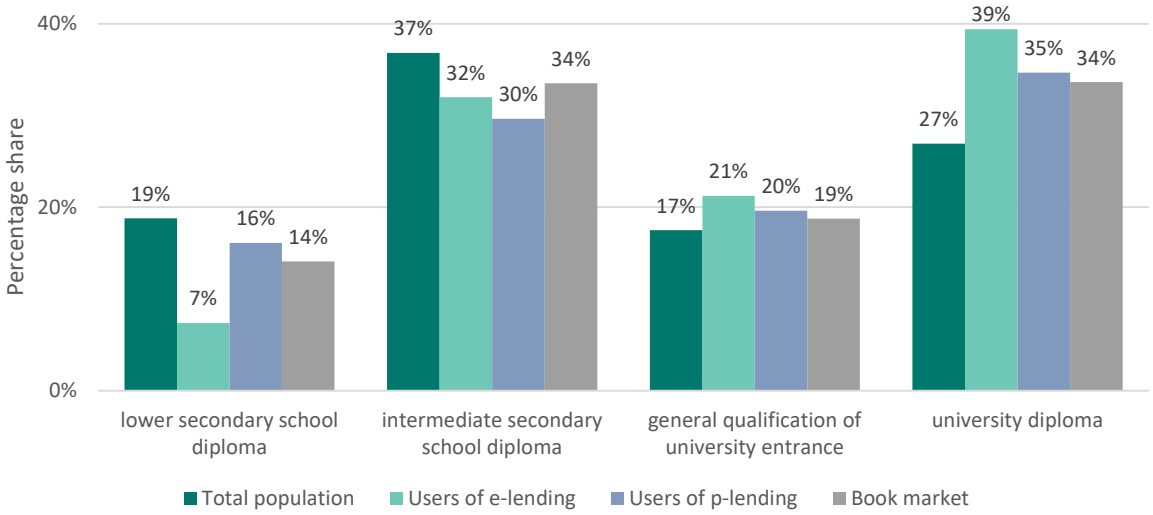
Example interpretation: 33% of users of e-lending have a net household income of at least 4,000 euros. In the total German population, 24% have a net household income of 4,000 euros or more. Therefore, people with a high income are overrepresented among users of e-lending.

Source: DIW Econ based on GfK (2023).

Education:

Users of e-lending tend to have a higher level of education. Among users of e-lending, the share of people with a general qualification for university entrance (21%) and a university degree (39%) is significantly higher than in the overall population with 17% and 27% respectively. People with an intermediate secondary school diploma or lower secondary school diploma, on the other hand, are underrepresented. Among users of e-lending, only 7% have a lower secondary school diploma, compared to 19% in the population. A similar picture emerges for users of p-lending. Here, too, people with a higher level of education are overrepresented, although this effect is more pronounced among users of e-lending. Similar to income, the distribution of educational qualifications among library users partly reflects the distribution of educational qualifications of buyers in the book market. However, here too this tendency for people with a higher level of education to be overrepresented is more pronounced among library users than in the book market. While the share of people with a general qualification for university entrance or university degree among users of e-lending is 60% and among users of p-lending 55%, the share among book buyers is 53%.

Figure 6-4
Sociodemographics – educational attainment



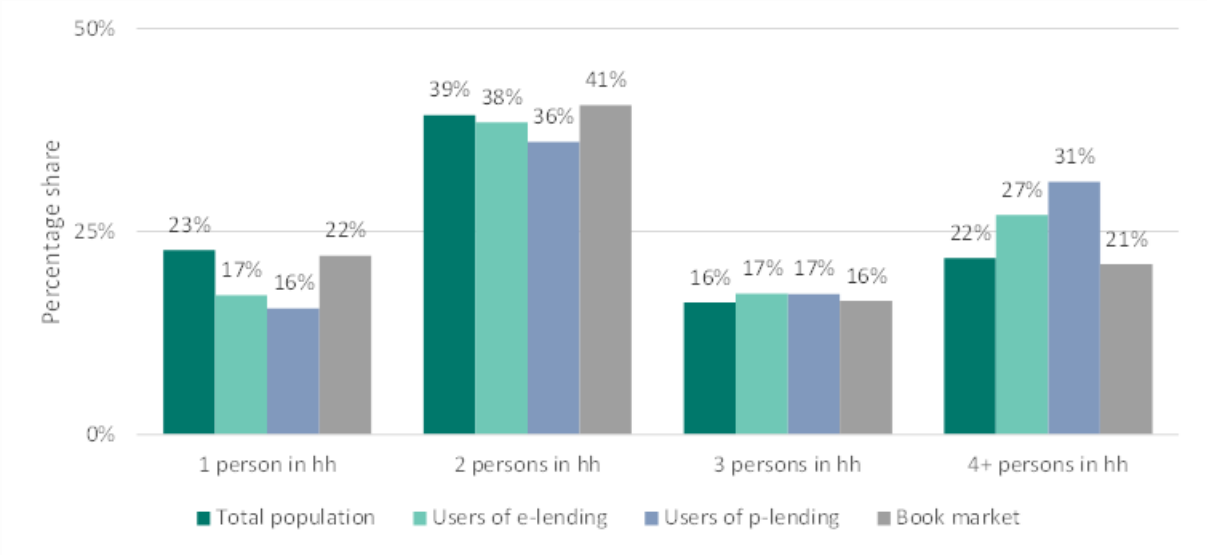
Example interpretation: 39% of users of e-lending have a university degree. In the general population, 27% have a university degree. This means that people with a university degree are overrepresented among users of e-lending.

Source: DIW Econ based on GfK (2023).

Household size:

Library users increasingly come from multi-person households. In particular, households with at least four people are overrepresented among library users, with a share of 27% among users of e-lending and 31% among users of p-lending, compared to a population share of 22%. Single-person households are underrepresented, with a share of 17% among users of e-lending and 16% among users of p-lending, compared to a population share of 23%.

Figure 6-5
Sociodemographics – household size



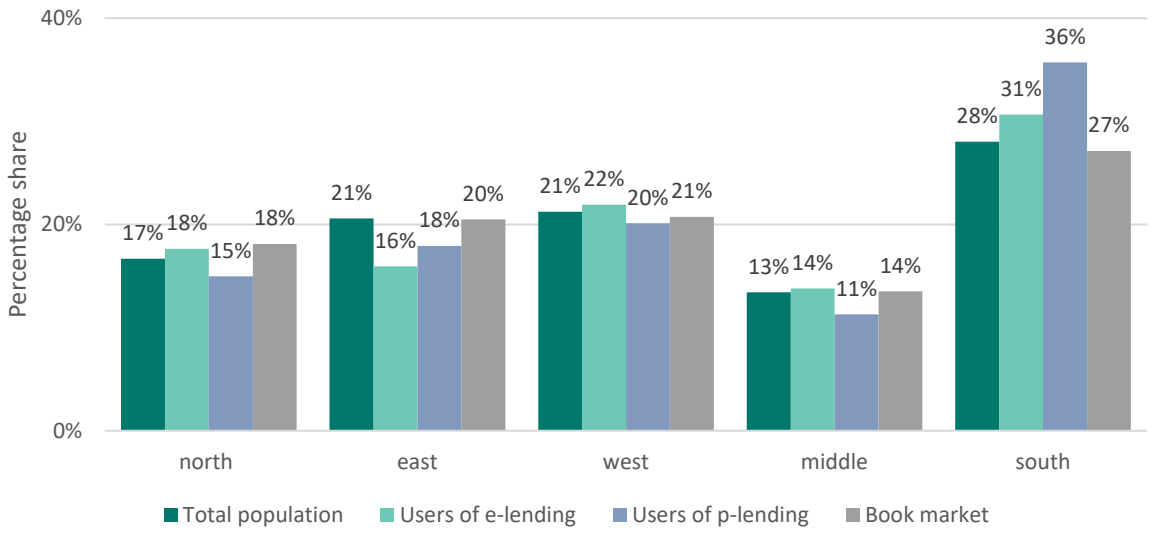
Example interpretation: Among users of e-lending, 27% come from households with at least 4 people. In the total population, 22% of people come from households with at least 4 people. Therefore, people from households with at least 4 people are overrepresented among users of e-lending.

Source: DIW Econ based on GfK (2023).

Region:

Figure 6-6 shows the regional distribution of library users in comparison to the population. Library users in the south of Germany are overrepresented. 31% of users of e-lending and 36% of users of p-lending come from the south of Germany, compared to a population share of 28%. The share of library users in the east of Germany, with 16% for e-lending and 18% for p-lending, is below the corresponding population share of 21%.

Figure 6-6
Sociodemographics – Regions



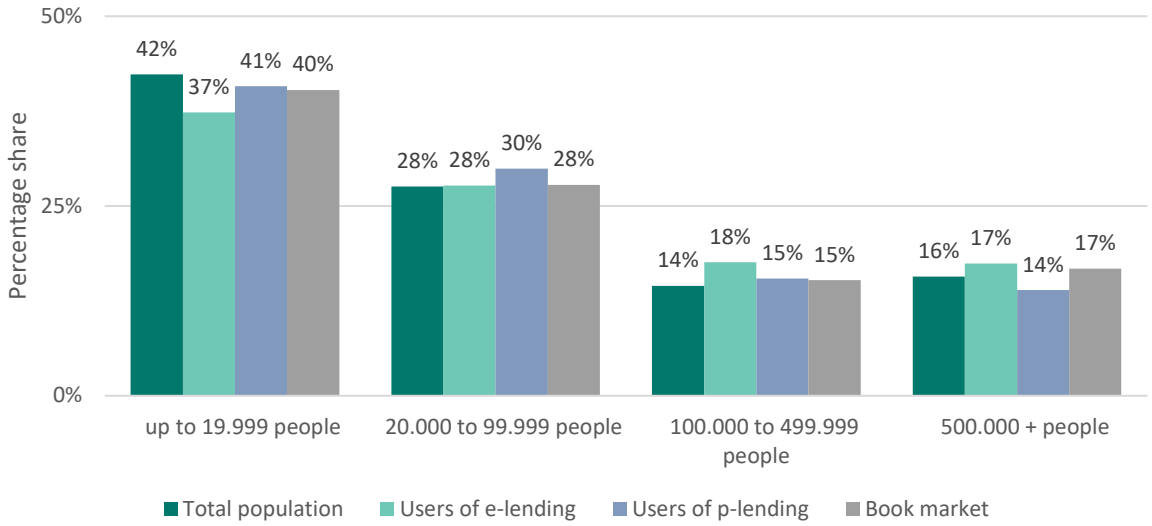
Example interpretation: 31% of users of e-lending come from southern Germany. The population share of people in southern Germany is 28%. This means that people from southern Germany are overrepresented among users of e-lending.

Source: DIW Econ based on GfK (2023).

Place of residence:

The distribution of library users according to the size of their place of residence shows only slight differences compared to the overall population. Users of e-lending in small places of residence with fewer than 20,000 inhabitants are slightly underrepresented at 37% compared to a population share of 42%, while users of e-lending in places of residence with more than 100,000 inhabitants are overrepresented at 35% compared to a population share of 30%.

Figure 6-7
Sociodemographics – Place of residence



Example interpretation: Among users of e-lending, 37% live in places of residence with up to 19,999 inhabitants. In the overall population of Germany, 42% live in places of residence with up to 19,999 inhabitants. This means that users of e-lending are underrepresented among people who live in places of residence with up to 19,999 inhabitants.

Source: DIW Econ based on GfK (2023).

7 The buying behaviour of users of e-lending and users of p-lending

Research question 4b: How does the buying behaviour of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?

The following analysis of the buying behaviour of users of e-lending and users of p-lending in comparison to the overall German population and buyers on the consumer book market is based on data from the GfK Consumer Panel Media*Scope. The panel data is collected using a media diary in which the survey participants continuously record their purchases in the book market. The key advantage of the data from the GfK Consumer Panel in answering the current research question is that the data reflects *actual buying behaviour* over time. The continuous recording of buying behaviour increases the reliability of the data and minimises the distortion effects compared to the usual retrospective surveys, in which there is a longer period of time between the survey and the buying behaviour.

7.1 Buying behaviour of users of e-lending

Most users of e-lending were active in the book market in 2022: 67% of users of e-lending bought at least one book. In the overall population, almost 40% of people in Germany bought at least one book in 2022. Library users are therefore more active than average on the book market. 46% of users of e-lending bought print books, 14% e-books and 27% e-book flat rates.

In total, users of e-lending spent 373 million euros in the consumer book market in 2022. This corresponds to approximately 8.4% of the total revenue in the consumer book market of 4,434 million euros. In 2022, users of e-lending spent an average of 186 euros per buyer in the book market, 10% more than the average buyer in the book market at 169 euros. This also applies to the years 2020 and 2021, in which users of e-lending also spent approximately 10% more in the book market than average buyers.

A similar picture emerges in the print market. Here, too, users of e-lending spend more in 2022, at 166 euros per person, than average buyers in the print book market at 154 euros. The highest share of spending by users of e-lending in the print book market was spent in the fiction genre at 36%, with average buyers in the book market spending an even higher share in the fiction genre at 47%. Users of e-lending, on the other hand, have a higher share in the children and young adult books genre at 24% than average buyers at 17%.

When it comes to spending on e-books, however, the opposite can be observed: the average spending of users of e-lending is 68 euros in 2022, below the average of around 80 euros

per e-book buyer. This is mainly because users of e-lending buy cheaper e-books. Users of e-lending spent an average of 5.50 euros per e-book in 2022, compared to 6.60 euros in the total e-book market. The largest share of spending on e-books, around 90%, is on the fiction genre, both for users of e-lending and e-book buyers overall.

7.2 Buying behaviour of users of p-lending

Users of p-lending are also more active in the book market than average. 56% of users of p-lending made at least one purchase on the book market in 2022, compared to 40% of the overall German population. 53% of users of p-lending bought print books, 5% e-books and 8% e-book flat rates.

Users of p-lending spent a total of 921 million euros in the book market in 2022. This corresponds to approximately 20.8% of the total revenue in the book market of 4,434 million euros. Per buyer, users of p-lending spent an average of 195 euros in the book market, 13% more than the average buyer in the book market at 169 euros.

In the print book market, users of p-lending spent 174 euros per buyer, compared to 154 euros for average buyers in the print book market. Users of p-lending spent a similarly high share of their total spending on the fiction genre (44%) to average buyers (47%). The expenditure share of children's and young adult books is significantly higher among users of p-lending (27%) than among average buyers (17%).

Users of p-lending spent an average of 80 euros on e-books, just as much as the average e-book buyer. Similar to users of e-lending, around 90% of e-book purchases of users of p-lending fell into the fiction genre.

Table 7-1
Overview of annual spending in the book market per buyer

	Users of e-lending	Users of p-lending	Buyers in the book market
Total consumer book market	186 €	195 €	169 €
Print Books	166 €	174 €	154 €
E-Books	68 €	80 €	80 €

Note: The average expenditure per person is calculated for the people who have bought at least one print book (or e-book). The average expenditure in the total book market does not correspond to the sum of the expenditure on print books and e-books, since, for example, the average for print books only includes people who have bought at least one print book, while the total book market includes all people who have bought at least one print book or e-book.

Source: Own figure based on GfK (2023).

8 Change in buying behaviour with the start of use of e-lending

Research question 4c: How does the buying behaviour of readers change when they start using e-lending?

The previous analysis of buying behaviour has shown that users of e-lending are more active in the book market than the overall German population and spend more per person than average book buyers (except for e-books). Nevertheless, the question arises as to what extent the buying behaviour of users of e-lending changes when they start using e-lending. The panel structure of the GfK Consumer Panel Media*Scope can be used to investigate this question. The GfK data continuously records the actual buying behavior in the book market of a representative sample of survey participants. The change in buying behaviour with the start of use of e-lending can therefore be measured by comparing the buying behaviour of people who have used e-lending from a certain point in time before and after they start using it.

In particular, two groups of people are considered. Firstly, people who used e-lending in 2021 and not yet in 2020. Secondly, people who used e-lending in 2022 and not yet in 2021. Table 8-1 shows the extent to which the buying behaviour has changed in the first year of use compared to the previous year. People who started using e-lending in 2021 spent 13% less in the book market and bought 10% fewer books than in the previous year 2020, when they had not yet used e-lending. People who started using e-lending in 2022 spent 5% less in the book market and bought 20% fewer books than in the previous year 2021, when they had not yet used e-lending.

It should be noted that these results are based on a sample of 74 people for the change from 2021 to 2020 and 81 people for the change from 2022 to 2021. Due to the small sample size, the results should be interpreted with caution, as statistical analysis based on small samples is generally generally subject to greater fluctuations. It should also be noted that these changes cannot be interpreted as causal effects, as other potentially relevant factors that could also affect buying behaviour cannot be observed and therefore cannot be controlled. For example, it cannot be ruled out that the changes in buying behaviour were also affected by the special circumstances of the COVID-19 pandemic in 2020 and 2021. Nevertheless, these figures provide initial indications that the buying intensity of people who start using e-lending tends to decrease.

Table 8-1
Change in buying behaviour with the start of use of e-lending

	Expenditure in million €	Quantity in million books	Average intensity in books per buyer
People who used e-lending in 2021 and not in 2020.			
Buying behavior in 2020	117.5	10.6	16.5
Buying behavior in 2021	101.9	9.5	14.8
Rate of change	-13%	-10%	-10%
People who used e-lending in 2022 and not yet in 2021.			
Buying behavior in 2021	96.2	7.7	12.6
Buying behavior in 2022	91.3	6.2	10.1
Rate of change	-5%	-20%	-20%

Note: The sample is 74 people for the change between 2021 and 2020 and 81 people for the change between 2022 and 2021. Due to the limited sample size, the results should be interpreted with caution, as statistical analysis based on small samples is generally generally subject to greater fluctuations. It must also be noted that these changes must not be interpreted as causal effects, as other potentially relevant factors that could also influence buying behaviour cannot be observed and therefore cannot be controlled. The figures only provide initial indications that the buying intensity of people who start using e-lending tends to decrease.

Source: Own figure based on GfK (2023).

9 Conclusion

The results of the study regarding the four research questions are summarised as follows.

1. ***Is there a difference in the title-specific lending intensity between e-lending and p-lending?***

E-books are lent out much more intensively per copy than print books. While print books are lent out 5.8 times per copy in the year of publication, e-books are lent out 14.1 times. In the second and third years after publication, the difference in lending intensity is even more pronounced. While the lending intensity of print books drops significantly in the second and third years after publication to 3.1 and 2.0 loans per copy, respectively, the lending intensity of e-books only drops slightly to 14.0 and 11.0 loans per copy, respectively.

The higher lending intensity of e-loans cannot be attributed to a shorter loan period alone. The average loan period is 24 days for p-lending and 17 days for e-lending. Adjusted for the different loan periods, e-books are lent out 10 times in the year of publication, which is around 70% more often than print books. In the second year after publication, the adjusted lending intensity of e-lending is still 9.9 loans, compared to 3.1 loans for p-lending. The lending intensity is thus more than 220% higher for e-lending than for p-lending. The relative difference increases to almost 300% in the third year.

In the case of e-books, windowed titles are lent out more intensively after the windowing period has expired than titles without windowing. For print books, the counterparts of the windowed titles are lent out more intensively in the first year after publication than non-windowed titles and similarly to non-windowed titles in the second and third years after publication.

2. ***How does e-lending affect the consumer market for e-books and print books? What is the effect of windowing?***

The econometric analysis has shown that windowing has a significant, positive effect on sales volume and sales revenue in the consumer book market - both in the e-book and the print market. By combining various econometric approaches, the risk of a positive distortion of the effects could be largely eliminated.

Windowing increases sales revenue for e-books by an estimated 9.9% and sales revenue for print books by an estimated 3.5%. The effects are particularly strong for bestsellers and in the fiction genre.

Although the measured effects are subject to statistical uncertainty, this uncertainty can be limited to the extent that the actual effects are between 6.3% and 13.5% for e-books and 1.2% and 5.9% for print books with a probability of 95%.

3. What are the economic effects of e-lending and windowing on the market participants in the book sector?

Based on the identified causal effects of windowing on the book market, the study examined the economic impact of removing windowing on the various market participants in the book sector. In the current situation (as of 2022), removing windowing would reduce e-book sales by an estimated -4.6% to -9.2% or -11.1 to -22.5 million euros, while print book sales would fall by an estimated -0.7% to 3.5% or -27.0 to -131.3 million euros. Thus, removing windowing would result in the following losses, respective gain in sales for market participants:

- Authors: -3.2 to -13.6 million euros
- Publishers: -17.6 to -76.2 million euros
- Booksellers: -13.8 to -53.2 million euros
- Aggregators: +0.3 million euros

While authors, publishers and book retailers would record significant losses, the aggregators would benefit from the fact that more e-book licenses would be sold as a result of the removal of windowing. However, the additional revenue from the sale of additional e-book licences would not compensate for the overall losses in the e-book and print book market. Consequently, the removal of windowing would result in an overall loss of sales revenue valued between -37.0 million and -152.7 million euros per year for the entire German book market.

In addition, two scenarios were estimated to depict future developments up to the year 2027. In both scenarios, expenditure on e-books and print books are assumed to increase in line with their growth in recent years. Regarding the development of e-lending, two different scenarios were analysed: The first scenario assumes *constant* numbers of e-lending in public libraries and the second scenario assumes an *increasing* number of e-lending in public libraries per year. In both scenarios, sales losses increase compared to the initial scenario. In the first scenario (constant e-lending), the removal of windowing would lead to a reduction of sales in the e-book market at an estimated value of -11.8 to-23.8 million euros annually, and -28.7 to -139.3 million euros in the print book market per year. This corresponds to an increase in sales

losses of slightly more than 6% compared to 2022. Authors record an overall (net) loss of -3.5 to -14.4 million euros, publishers a loss of -18.7 to -80.0 million euros and the book trade between -14.7 and -56.5 million euros.

In the second scenario (increasing e-lending), the revenue losses in the e-book market increase further to an estimated -13.7 to -27.4 million euros, and in the print book market to -33.6 to -161.7 million euros, which corresponds to an increase of losses of approximately 23% compared to the initial scenario in 2022. This increase in revenue losses would affect the market participants as follows: Authors would face revenue losses of -4.0 to -16.9 million euros, publishers would suffer from revenue losses of -21.9 to -92.7 million euros, and booksellers of -17.1 to -65.4 million euros. The aggregators, in contrast, would increase their revenue by 0.3 million euros.

4. ***Comparative analysis of the socio-demographics and buying behaviour of users of e-lending and users of p-lending:***

    a. ***How does the socio-demographic background of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?***

The socio-demographic analysis shows that library users often have an above-average income and a higher level of education compared to the overall German population. While this also applies to buyers on the book market, users of p-lending and especially users of e-lending even more frequently have an above-average income and a high level of education than buyers on the book market. In addition, middle-aged people aged between 30 and 59 are overrepresented among users of e-lending, while young people (under 30) and older people (aged 60 and above) are underrepresented.

    b. ***How does the buying behaviour of users of e-lending and users of p-lending differ from that of the overall population and from that of the buyers on the consumer book market?***

Both users of e-lending (67%) and users of p-lending (56%) are more frequently active in the book market compared to the overall population in Germany (40%). The expenditures of users of e-lending account for about 8% and those of users of p-lending for 20% of the total revenue in the consumer book market. Per buyer, users of e-lending (186 euros) and users of p-lending (195 euros) spent more in the overall consumer book market in 2022 than the average book buyer

(169 euros). A similar pattern is seen when considering the print book market separately: users of e-lending spent 166 euros and users of p-lending 174 euros per buyer in the print book market, compared to 154 euros for average buyers. In the e-book market, however, users of e-lending spent less (68 euros) than average buyers (80 euros), which is due to the tendency of users of e-lending to purchase cheaper e-books. Users of p-lending spent the same amount in the e-book market as average buyers (80 euros per buyer).

c. How does the buying behaviour of readers change when they start using e-lending?

People who started using e-lending in public libraries in 2021 spent 13% less in the consumer book market and bought 10% fewer books than the previous year, 2020, when they had not yet used e-lending. People who started using e-lending in 2022 spent 5% less in the book market and bought 20% fewer books than in 2021, when they had not yet used e-lending.

It should be noted that the results for research question 4c are based on a sample of 74 people regarding the development from 2021 to 2020 and 81 people for the development from 2022 to 2021. Due to the small sample size, the results should only be interpreted with caution, as the calculation of statistical key figures is generally subject to larger fluctuations with small samples. It should also be noted that these changes should not be interpreted as causal effects, as other potentially relevant factors that could also influence buying behaviour cannot be observed and therefore cannot be controlled. For example, it cannot be ruled out that the changes in buying behaviour were also affected by the special circumstances of the COVID-19 pandemic in 2020 and 2021. Nevertheless, these figures provide initial indications that the buying intensity of people who start using e-lending tends to decrease.

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11 Appendix: Data and methodology

The first part of the methodological appendix describes the data basis. Two data sets were collected and compiled to investigate specific research questions.

The first three research questions (comparison of lending intensity, causal effects of e-lending and windowing on the consumer book market and economic effects on market participants) are examined using a title-specific data set with lending figures, windowing information and sales figures in the print book and e-book market. The fourth research question on the socio-demographics and buying behaviour of users of e-lending and users of p-lending is analysed on the basis of the GfK Consumer Panel Media*Scope.

11.1 Title-specific data set with lending figures, sales figures and windowing information

To validly study the effects of e-lending and windowing on the consumer book market, a comprehensive data set with title-specific data on sales volume, lending figures and windowing was required. Since no single data source offers such a data set, data from various sources were collected and combined specifically for this research project.

11.1.1 Drawing the sample

The basis for drawing the sample of new publications, for which the respective sales figures and lending figures were subsequently obtained, was a complete ISBN list of new publications on the consumer market in the genres 1 - fiction, 2 - children and young adult, 3 travel, 4 – practical gudies & 9 - non-fiction, which were published between 2017 and 2021. This list was provided by Media Control. On the one hand, the Media Control data contains the same meta information on the new publications as the Directory of Available Books (Verzeichnis Lieferbarer Bücher - VLB), but also provides information on the ISBN-specific sales volume and prices paid over time. This has the advantage that the random sampling could be limited to those ISBNs or titles that achieved a certain minimum turnover. Titles with very low sales could therefore be excluded from the sampling. Since these titles are often self-published and much less frequently affected by windowing, these titles are not the focus of this study. More precisely, the sampling was limited to the titles with the highest sales volume, which together account for 80% of the total sales of new releases on the consumer book market per year of publication.

To obtain a representative sample of titles from the various genres and years of publication as well as bestsellers and non-bestsellers, the random sample was stratified by genre, year of publication and bestseller status. This means that a certain number of titles or ISBNs

were drawn from the various genres, years of publication as well as a certain number of bestsellers and non-bestsellers. The number of titles drawn per genre was based on the revenue share of the individual genres. This means that significantly more titles were drawn from the fiction genre than from the travel and practical guides genres.

While the sample was drawn at the ISBN level, it was ensured that for each ISBN drawn, all other ISBNs (both print and e-books) of the corresponding title were also drawn. This is important when examining the effect of e-lending or windowing both on the e-book and print book market in the empirical analysis. Table 11-1

shows an overview of the sample. A total of 14,347 titles were drawn. A total of 30,026 ISBNs were drawn for these titles, of which 14,329 ISBNs refer to e-books and 16,498 ISBNs to print books. Most titles and ISBNs were drawn in the fiction genre with 4,863 titles and 11,325 ISBNs. 11,751 titles were published with at least one e-book and print book. 1,167 titles were published only as e-books and 1,364 titles only as print books.

Table 11-1
Overview of the sample of new releases

	Title	ISBN	E-ISBN	Print ISBN
Total sample	14,347	30,827	14,329	16,498
Fiction	4,863	11,325	4,874	6,451
Children and young adult	2,884	5,722	2,355	3,367
Practical guides	3,066	6,794	3,458	3,336
Travel	771	1,579	649	930
Non-fiction	1,962	4,606	2,192	2,414
Bestseller	3,229	7,664	3,188	4,468
Non-Bestseller	9,951	21,996	9,974	12,022

Note: For 801 titles that were only published as e-books, no information on the genre is available. Therefore, the total number of the sample does not correspond to the sum across genres.

Source: DIW Econ.

Subsequently, the sales volume (e-book and print book), the lending figures (e-lending and p-lending) as well as the windowing information for the ISBN of the sample drawn were obtained and combined.

11.1.2 Title-specific sales volume and windowing information

E-book sales volume and windowing information

First, windowing information and sales volume for the e-book ISBN in the sample were obtained from the publishers. Data were provided by Bastei-Lübbe, DTV, Hanser, Holtzbrinck, Penguin Random House and the publishing service provider Bookwire. In total, these publishers and publishing groups cover an estimated 80-90% of the e-book sales of the German book market and thus form a comprehensive basis for examining the research questions.

Print sales volume

Second, the sales volume for the print ISBN was provided by Media Control. For each ISBN, the monthly sales volume for the first 36 months after publication were recorded. In addition, the monthly average prices of the ISBN were provided by Media Control and the publishers. In addition, all meta information about the titles or ISBNs (e.g. author, title, genre, publisher, number of pages, publication date, etc.) was taken from Media Control. The bestseller status of a title was also determined based on the sales volume from Media Control. A particular title is defined as a bestseller if the title is among the 100 best-selling titles in the respective genre in at least one month. The exception is the travel genre, in which only the top 50 are considered bestsellers.

11.1.3 Title-specific lending figures, stocks and loan duration

P-lending

There is currently no database in Germany that records title-specific information on stock and lending by public libraries. The German Library Statistics (Deutsche Bibliotheksstatistik - DBS) does contain comprehensive data for a large number of public libraries. However, this data is only available in aggregate form and is not title-specific. (Hochschulbibliothekszentrum des Landes Nordrhein-Westfalen, 2023).[14] To address the research questions with a title-specific analysis, we obtained title-specific lending data from two providers of library management systems, aStec and datronicsoft, as part of this study.

Both software providers have each provided title-specific lending data for the libraries they manage. This made it possible to obtain lending data from a total of 178 public libraries. In addition, all three size classes (1, 2 and 3 according to the classification of the German Library

[14] While the study focuses on the consumer book market (fiction, children and young adult, practical guides, travel and non-fiction) and examines new releases, the DBS covers all print media (non-fiction, fiction, children's and young adult literature, magazines in print form, etc.) of libraries.

Association) were covered.[15] Data was obtained from 5 libraries in Section 1, 12 libraries in Section 2 and 161 libraries in Section 3. This is the first time that title-specific lending figures were collected from a comprehensive number of libraries of all sizes, which significantly increased the validity of the data. For comparison: the surveys used to calculate the library royalties are based on just 5 - 12 libraries.

P-lending data was obtained from each of the 178 libraries for the sample of new publications between 2017 and 2021. In particular, data were collected on the number of monthly (primary) loans per ISBN and the number of copies per ISBN that were in the libraries' inventory in a given month. The lending figures for new publications were recorded from publication until 2023. However, since the two providers only cover a portion of the libraries in Germany, the p-lending figures were extrapolated to obtain lending figures for all public libraries in Germany, which can be compared to the lending figures for e-lending. The methodology for extrapolating the lending figures and lending intensity for p-lending is described in more detail below.

Extrapolation of p-lending figures

The extrapolation of the title-specific p-lending figures collected in the 178 libraries to the total of all public libraries in Germany is based on the size classes of the German Library Association, which are divided into three sections:

- Section 1: Service areas of over 400,000 inhabitants
- Section 2: Service areas between 100,000 and 400,000 inhabitants
- Section 3: Service areas of up to 100,000 inhabitants

Of a total of 5,878 libraries, 5,283 libraries fall into section 3, 406 libraries into section 2 and 189 libraries into section 1.

In the first step, the average number of loans per ISBN per section is calculated by summing the number of loans per ISBN in the sample across all libraries in a section and then dividing it by the number of libraries in a section in the sample. In the second step, the average number of loans per section is multiplied by the total number of libraries per section in Germany to calculate the total number of loans per ISBN and per section. In the third step, the

[15]See the section on extrapolating print lending figures for a definition of the sections.

extrapolated lending figures per section are added across the sections to calculate the total title-specific number of loans in Germany per month.

Extrapolation of lending intensities

The title-specific lending intensity is calculated by dividing the number of loans per year and per title by the number of copies per title. In addition to the monthly lending data, data on the number of copies in stock is also required. While the lending data is available for all 178 libraries observed, the stock data could be recorded for 162 libraries. This is because only one of the two software providers was able to provide stock data. Of the 162 libraries where stock data is available, 161 libraries belong to section 3 and one library to section 2.

This raises the question of whether the lending intensity is higher in larger libraries than in smaller libraries. Since the 162 libraries observed are almost exclusively small libraries (section 3), there is a risk that the lending intensity will be underestimated with our sample of libraries. To counteract this potential distortion, data from the German Library Statistics (DBS) are used to estimate the lending intensity for the non-observed section 2 and 1 libraries and then extrapolated to obtain a valid picture of the title-specific lending intensity in all public libraries in Germany.

The German Library Statistics (DBS) collect aggregated data on the number of loans per year and the number of copies in the collection per year. This data is used to calculate an aggregated lending intensity per section by dividing the number of loans by the number of copies. The aggregated lending intensity increases with the size of the library. While the aggregated lending intensity in section 3 is 1.61 loans per copy per year, this value increases to 2.18 for section 2 libraries and to 3.51 for section 1 libraries.

These aggregated lending intensities per section are used to extrapolate the observed title-specific lending intensities, which are mainly based on section 3 libraries, to all sections. For example, to calculate the title-specific lending intensity for section 1, the observed title-specific lending intensity of 4.5 (which is mainly based on section 3 libraries) is divided by the ratio of the aggregated lending intensity of section 3 to section 1 (1.61 / 3.51). Finally, the overall lending intensity is estimated by computing a weighted average of the estimated lending intensities for sections 1 and 2 and the observed lending intensity of section 3, where the weights are given by the sections' share of the fo the total stock of all libraries. The aggregated lending intensities and shares of the total stock are recalculated annually for the relevant period from

2017 to 2023, using the number of loans and the number of copies per section from the respective year.

The extrapolation is thus carried out according to the following formula:

$$Lending\ intensity\ = title\ specific\ intensity_{Sec\ 3}^{Sample} \times \left(\sum_{i=1}^{3} \frac{\frac{stock\ section_{Sec\ i}^{DBS}}{Total\ stock^{DBS}}}{\frac{Aggr.intensity_{Sec\ 3}^{DBS}}{Aggr.intensity_{Sec\ i}^{DBS}}} \right)$$

Table 11-2 shows an example for the extrapolation of the lending intensity for the year 2021. The observed lending intensity for section 3 libraries in 2021 is 5.20 loans per copy. The extrapolated lending intensity for all libraries is 6.39 loans per copy.

Table 11-2
Extrapolation of lending intensity across size classes

Section	Number of copies in stock (DBS)	Share of total stock – DBS	Aggregated lending intensity – DBS	Ratio of lending intensity of section 3 to the respective section
Section 1	9,381,503	0.1456	3.51	0.4585
Section 2	10,099,393	0.1567	2.18	0.7370
Section 3	44,950,561	0.6976	1.61	1
Extrapolation factor 2021 = $\frac{0,1456}{0,4585}+\frac{0,1567}{0,7370}+\frac{0,6976}{1}$ = 1,2282				
Overall (extrapolated) lending intensity 2021 = 5,20 × 1,2282 = 6,39				

Note: The DBS key figures are based on an evaluation of the DBS database.

Source: DIW Econ.

E-lending

Title-specific data on e-lending for the e-ISBN in the sample were obtained from the two aggregators Divibib and Overdrive. In each case, title-specific data on monthly (primary) loans, monthly stock and loan duration were provided. Divibib and Overdrive are currently the two relevant providers of e-book licenses for libraries in Germany, such that the e-lending data provide full coverage of e-lending in Germany. Therefore, no extrapolation of the e-lending figures is necessary.

The lending intensity is calculated in the same way as for p-lending, by dividing the number of lendings per year and per title by the number of copies per title. Differences between the various license models are taken into account. Furthermore, the comparability of e-lending

and p-lending is made easier by the fact that for more than 90% of the e-licenses sold - just like with p-lending - only one copy can be borrowed at a time.

11.2 GfK data on the socio-demographic background and buying behaviour of users of e-lending and users of p-lending

To study the research question of how the buying behaviour and socio-demographic background of users of e-lending and users of p-lending differ from the overall German population and from that of average buyers on the book market, data from the market research institute GfK are used.

The GfK Consumer Panel Media*Scope Media*Scope collects panel data on buying behaviour in the consumer book market and on the borrowing behavior of 20,000 individuals. This means that the same people are surveyed several times over the years. It is a representative sample of the total German population aged 10 and over. The GfK data therefore provide a valid basis for examining the buying behaviour and socio-demographic background of library users.

The consumer panel data is collected using a media diary in which the people surveyed continuously record their purchases on the book market. The key advantage of the GfK Consumer Panel data for examining the buying behaviour of e-lending and users of p-lending is that the data reflects actual buying behaviour over time. The continuous recording of buying behaviour increases the reliability of the data and minimises the distortion effects compared to the usual retrospective surveys, in which there is a longer period of time between the survey and the buying behaviour.

The panel data is also merged with data from ad hoc surveys in which the same people as in the panel survey are asked about their use of public libraries. This makes it possible to identify which people have used e-lending or p-lending in public libraries. Both the ad hoc survey and the data on buying behaviour from the Media*Scope consumer panel refer to 2022, so that the data on buying behaviour and borrowing behavior can be merged for the same period.

11.2.1 Definition of users of p-lending and users of e-lending

As part of the ad hoc survey, people were asked whether they had borrowed physical media (e.g. print books, audio book CDs, print newspapers/magazines, music CDs or DVDs) from a public library in the last 12 months. For the sake of simplicity, these people are referred to as users of p-lending in this study. This is justified by the fact that more than 90% of the people who borrowed physical media borrowed at least one printed book. (GfK, 2019)Therefore, the groups of people who use physical lending and p-lending are almost identical.

The users of e-lending were identified via a quarterly ad hoc survey within the Media*Scope panel. The people were asked whether they had borrowed digital media (e.g. e-books, digital audio books, e-newspapers/e-magazines) via the public library's online portal in the last 12 months. These people are considered users of e-lending in the study. Here too, the synonymous use is justified by the fact that most people (72%) who use digital lending borrow at least one e-book within 12 months (GfK, 2019).

The users of p-lending and users of e-lending can be compared with the overall German population and with average buyers on the book market. The buyers on the book market refer to the people who have bought at least one print book, e-book or audio book in a given year.