ABSTRACT

Title of Dissertation: READING ANALYSES WITH CHILEAN CHILDREN

Montserrat Cubillos Guzmán, Doctor of Philosophy, 2021

Language, Literacy, and Social Inquiry

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Chilean data show that a large reading-proficiency gap exists between students with high and low socioeconomic status (SES), that most children do not see themselves as readers, and that half of adolescents read below grade level (Agencia de Calidad de la Educación, 2019; Consejo Nacional de la Cultura y las Artes, 2014). To understand the reasons behind these phenomena, I conducted three complementary studies on reading comprehension, motivation, and literacy-related home practices with over 800,000 Chilean students, using nation-wide secondary data analysis.

In the first study, I examined the association between the frequency of early literacy parent-children interactions (e.g., reading together, reading labels and signs, singing songs, etc.) before they entered first grade and students' reading scores in fourth grade, while accounting for their second-grade proficiency. I observed that parents frequently engaged in literacy interactions with their children, that those interactions significantly predicted students' later reading

proficiency, and that the effect was steeper for families with high SES than for those with low SES.

In the second study, I explored the association between parents' reading motivation and frequency and their children's. I examined data of students from sixth, eight, and tenth grade. I found that adolescents were more likely to be motivated and frequent readers if their parents were also keen readers. I also found that SES was a powerful predictor of the likelihood of being a keen reader, and that the effect of having a keen-reading parent was more positively pronounced for adolescents with low SES than for those with high SES.

In the third study, I explored whether tenth graders' reading motivation and frequency was associated to their reading scores. I observed that a large percentage of students who were proficient readers in fourth grade failed to achieve proficiency in tenth grade and that the odds of achieving proficiency in tenth grade increased when students were motivated and frequent readers. Furthermore, students' odds of being proficient readers increased when their classmates reported high levels of reading motivation and frequency of reading. I discuss the implications of this and my other two studies.

READING ANALYSES WITH CHILEAN CHILDREN

by

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Table of Contents

Introduction to the Dissertation

Reading with understanding is a fundamental skill required for daily tasks and workplaces. However, reading does not come naturally to the brain (Wolf, 2016). Instead, we need explicit instruction to learn to read. Thus, educational systems across the globe strive to train their youth in the skill of reading. The Chilean educational system is no exception, as its national curriculum includes the teaching of reading, starting from its foundations in early childhood to its refinement in high school.

Results obtained from the National System for the Measurement of Educational Quality (SIMCE, in Spanish) show that, despite our efforts, Chilean reading instruction is falling short in quality and equality. According to results from the 2018 SIMCE reading test, 49% of all Chilean tenth graders read below grade level. Furthermore, while the gap between students with high and low socioeconomic status (SES) has decreased since 2008, students who attend schools classified as high SES scored significantly higher than their peers in 2018. On average, students who attend high SES schools score 50 points above their peers who attend low SES schools, which means that high SES students tend to obtain scores about 21% higher than low SES students (Agencia de Calidad de la Educación, 2019). Moreover, only 13% of Chilean students between nine and seventeen years old who participated in a nationally representative survey regarded themselves as frequent readers. On average, they had read only two books for pleasure the previous year (Consejo Nacional de la Cultura y las Artes, 2014). Thus, available data show that a large gap in reading proficiency exists between students of different SES backgrounds, that most Chilean children do not see themselves as readers, and that half of Chilean adolescents are not able to read as well as they should.

The Chilean government has launched many initiatives to promote reading. For example, in 1993, the Ministry of Arts and Culture created the Book and Reading Fund, which is granted yearly to projects that promote the book industry, the development of reading habits in the population, and the training of reading mediators. Many valuable projects (most of them listed in http://plandelectura.gob.cl/listado-iniciativas/) have been developed thanks to that fund. In 2015, the government launched the national campaign "Here We Read" ("Aquí se lee", in Spanish), which included a five-year-long national reading plan that included a diagnosis of the reading situation in each geographic region and region-specific programs to target each of the identified problems. These initiatives show that there is a growing awareness and concern about reading in Chile and a welcoming environment to ideas that might help develop avid and competent readers.

I am Chilean and I want to contribute with my dissertation to these efforts. I was privileged to receive an outstanding education both at home and at school, which allowed me to complete undergraduate and graduate studies. Before starting my graduate studies, I worked as a high school teacher in an urban school in Santiago, where I saw firsthand how students' reading motivation could be fostered to boost their reading comprehension. Those teaching years moved me to explore how reading motivation and comprehension worked together in order to find ways to promote positive classroom experiences. Fueled by these personal circumstances, I have dedicated the past five years to study reading comprehension and motivation both in theory and in practice.

My research can shed light on factors that could be included in Chilean national reading campaigns and the implementation of our national reading curriculum. Specifically, my dissertation includes three complementary articles on reading comprehension, motivation, and

home practices of Chilean students: 1) early literacy interactions between caregivers and children before they enter school, 2) parents' reading motivation and frequency, and 3) students' own reading motivation and frequency.

To carry out these three studies, I conducted secondary data analyses of 2015 SIMCE data. The SIMCE assessment consists of four standardized tests (math, reading, social sciences, and natural sciences) administered to all Chilean students in selected cohorts by the Agency for Educational Quality, a government agency. Researchers may request access to the SIMCE datasets using a web portal administered by the same agency.

In 2015, students and parents answered a questionnaire that asked about their reading motivation and frequency. Parents' questionnaires also included questions about their demographic characteristics (e.g., income, level of education, ethnicity, etc.). The dataset included over 900,000 students in second, fourth, sixth, eighth, and tenth grade. For some of my analyses, I also included students' reading scores in other years as control variables.

In the first study, I examined the association between the frequency of early literacy interactions between parents and their children before they entered first grade and students' reading scores in fourth grade, while accounting for their second-grade reading scores. These interactions refer to jointly done activities like reading books, telling stories, playing with letter toys, singing songs, reading labels and signs, etc. I also analyzed the role of families' SES in this association, to see if the size and/or direction of the correlation varied as a function of families' education, income, and number of books at home. Previous studies have shown that early literacy interactions can be directly associated to children's reading skills in first grade, but there is not enough evidence about the lasting nature of their effect in later elementary grades. If the effect of early literacy interactions at home remained beyond first grade, then this construct

could be an important source of variation in the reading skills displayed by children in later grades. Furthermore, if the effect of literacy interactions differed according to children's SES, they could partially explain SES achievement gaps. Thus, the examination of the association between early literacy interactions and reading scores in fourth grade can help improve learning outcomes in elementary grades and reduce reading disparities.

In the second study, I explored the association between parents' reading motivation and reading frequency and their children's. I examined data of students in sixth, eight, and tenth grade, aiming to see if parents' habits can influence their children's even during adolescence. Parents who love to read and who read frequently might engage in routines that promote reading, like reading in front of their children, reading daily to/with their children, recommending them books, taking them to libraries and bookstores, talking about books they have read, showing interest about their children's readings, etc. Thus, parents who like to read and who read frequently might be more likely than non-reading parents to have children who also like to read and who read frequently. Like in the first paper, I also examined whether this association varied as a function of families' SES.

In the third study, I continued to explore reading motivation and frequency, but this time from the students' perspective, to see the extent to which these variables were associated to tenth graders' reading scores. Data has shown that a strong continuity in students' reading skills exists, which means that students who read with high levels of comprehension in early elementary grades usually continue to read ahead of their peers in upper elementary grades (Stanovich, 1986). However, such strong continuity is often interrupted when students hit adolescence. Indeed, the Chilean national data show that about 70% of all students achieved reading proficiency in fourth grade, but only 48% of that same cohort achieved reading proficiency in

tenth grade. I explored whether students' reading motivation might prevent that discontinuity, as international literature has demonstrated that students' reading motivation, reading frequency, and reading achievement are highly correlated (Froiland & Oros, 2014; OECD, 2010; Wang & Guthrie, 2004). Knowing that during adolescence peers have an important role as points of reference for behavior, I also explored whether peers' reading motivation and frequency might be associated to each students' own reading scores. If the association between students' own reading motivation and frequency and their reading scores was significant, then that insight could make educators and policy makers design ways in which to foster reading motivation among adolescents, knowing that such efforts are likely to result in enhanced reading skills, too.

It is my hope that the findings of these three papers can inform policies that help foster reading in homes and schools. I contribute to the discussion by analyzing a large sample of Chilean children and adolescents, aiming to paint a representative picture of their reading habits and skills. I describe and discuss the studies I previously outlined, in the same order. First, I analyze the association between early literacy interactions and students' reading scores in fourth grade, in the paper "You Reap What You Sow". Then, I study the association between parents' reading frequency and motivation and their children's in the paper "A Chip Off the Old Block". Finally, I examine the association between tenth-graders' own reading motivation and frequency and their reading scores in the paper "A Diamond in the Rough". I end these analyses with a general discussion of implications and next steps.

Study 1: You Reap What You Sow: Benefits of Early Literacy Interactions

Children who enter first grade display a wide range of pre-reading abilities (Stanovich, 1986). This phenomenon has been amply studied in the United States, some students enter kindergarten (or first grade) with strong foundational skills needed, for example, to learn to read and write. Researchers have found that reading skills displayed as early as first grade can predict achievement in later elementary grades (Foster & Miller, 2007) and even in high school (Francis et al., 1996).

National data on Chilean second graders suggest that Chilean students, too, enter school displaying a wide range of reading skills. Results from the 2017 national reading assessment show that 38% of second graders read as was expected for their age, 38% partially met expectations, and 24% read below their grade level. The data also show a big gap between the average score obtained by students who attend schools classified at high and low SES[1]. Students at the highest quintile, on average, scored 285 points, while students at the lowest quintile scored 232 points.

Empirical evidence suggests that the types and frequency of early literacy-related interactions between parents and children before they enter school can explain these individual differences (Tabors et al., 2001). In some households, parents read to their children every day, take their children frequently to libraries, and talk with them for long periods of time using

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[1] Researchers from the Chilean Ministry of Education classify all schools into five socioeconomic categories: low, medium low, medium, medium high, and high. To classify schools, they consider students' household income, their parents' level of education, and the percentage of students who are classified at the two most vulnerable categories in the vulnerability index. The Chilean vulnerability index is a composite variable calculated by the National Board of School Assistance and Scholarships (JUNAEB, in Spanish) which considers students' and their families' participation in social services, public health insurance, and scholarships; as well as students' school attendance and academic achievement. They classify all students into four categories: first priority (for those most vulnerable), second priority, third priority, and non-priority. See this document for more details: http://archivos.agenciaeducacion.cl/Metodologia_de_Construccion_de_Grupos_Socioeconomicos_Simce_2013.pdf

sophisticated words. In other families, these kinds of interactions are less frequent or non-existent.

The purpose of this study was to examine the effect of early literacy interactions on children's reading achievement in fourth grade using Chilean data. Specifically, I examined whether the frequency of early literacy interactions (e.g., playing with letters, reading to children, and reading signs and labels) between Chilean parents and their preschool-aged children predicted students' reading achievement in fourth grade, while controlling for their reading achievement in second grade.

My research questions were:

1. How frequently do Chilean parents engage in early literacy interactions with their children before they enter first grade? Are there differences in the frequency of engagement by families' SES?

2. What is the association between parents' early literacy interactions before children enter first grade and their children's fourth-grade reading scores, when controlling for children's second-grade reading scores?

3. Does the association between parents' early literacy interactions and their children's reading scores vary as a function of SES?

To answer the research questions of this study, I first describe the concept of parent-child literacy interactions and their impact on children's reading skills. Then, I examine findings about two kinds of early literacy interactions: shared book reading and literacy instruction at home. Next, I discuss the effect of families' SES on the likelihood of engaging in early literacy interactions. After that, I explain the conceptual model that guided this study and describe its methods and results. I finish by discussing main findings, implications, and limitations.

Skills Required for Reading with Comprehension

Among other things, learning to read with understanding requires the development of code-related skills and comprehension-related skills. Skills related to children's ability to decode refer to those needed to translate print into sounds (Whitehurst & Lonigan, 1998). These include skills such as the understanding of print, knowledge of the alphabet letters and their sounds, and the ability to manipulate sounds in words (phonological awareness). Comprehension-related skills, on the other hand, are those required to make sense of what is decoded from a text: vocabulary, oral language ability, and understanding of text structures (Whitehurst & Lonigan, 1998). Research has consistently shown that proficiency in decoding and comprehension skills is correlated to later reading proficiency, as these skills are needed to achieve fluency and reading comprehension and might explain individual differences in reading achievement (Lonigan et al., 2000; National Early Literacy Panel & National Center for Family Literacy, 2008; Stanovich, 1986; Storch & Whitehurst, 2002).

Scholars have long believed that these skills and knowledge begin to develop before children enter school, and many decades of research have been dedicated to exploring how to foster those skills at home in preschool children. Researchers have found that literacy-related interactions between children and their caregivers before they enter school can help foster children's decoding and comprehension skills (Burgess et al., 2002; Purcell-Gates, 1996; Purcell-Gates et al., 1995; Tabors et al., 2001).

The Effect of Early Literacy Interactions on Reading Skills

Parent-child early literacy interactions can refer to a wide range of behaviors. For the purposes of this study, I refer to "early literacy interactions" as all actions jointly done by parents (or other main caregivers) and children that involve engaging with print, words, letters, or their

sounds. These actions include talking to children about daily activities, singing songs, reading to children, listening to children read, teaching letters to children, playing with letters with children, playing word games, etc.

Although many actions can be regarded as "early literacy interactions", two of them have been examined in depth: shared book reading and explicit teaching of reading and writing. Strong evidence exists to claim that both shared book reading and the explicit teaching of reading and writing at home are positively correlated to children's reading skills, at least in kindergarten and first grade (Burgess et al., 2002; Mendive et al., 2017; Sénéchal & LeFevre, 2002, 2014; Sénéchal & Young, 2008). More research is needed to examine whether the correlation between these variables differs across SES and/or persists beyond first grade.

Shared Book Reading

Early research on home-literacy interactions has examined whether shared book reading impacted children's reading skills. This research usually compared the reading performance of children whose parents read to them every day before they enter school with the achievement of children who were not read to as often. While early research suggested that shared book reading was only weakly correlated to children's reading-related skills (Scarborough, 1994), most research conducted from 1995 and onward suggests that shared book reading's correlation to reading proficiency is medium to strong (Bus et al., 1995; Sénéchal & Young, 2008; Strasser et al., 2017).

Studies conducted with children between four and five years old suggest that shared book reading positively predicts children's code-related skills (e.g., phonological awareness, letter identification, letter-sound correspondence, etc.). For example, Burgess et al. (2002) followed 97 four- and five-year-old children from Florida for one year and measured their emergent literacy

skills (e.g., letter-sound knowledge, word reading, phonological sensitivity, receptive vocabulary) at the beginning and at the end of the year. Even when using measures collected at the beginning of the year as control variables, they found that the age at which parents began reading to their children significantly predicted children's end-of-the-year measures in letter-sound knowledge, phonological sensitivity, and word decoding skills.

Furthermore, Mendive et al. (2017) found that shared book reading correlated not only to young children's decoding skills, but also to their comprehension skills. After studying 989 Chilean, low-income preschoolers, they observed that mothers' report of reading to their children positively and significantly predicted children's vocabulary, letter and word identification, and ability to write letters in pre-kindergarten.

In studies with children in early elementary grades, though, the effect of shared book reading on students' reading-related skills tended to disappear, when previous measures of the same skill were included in the analyses. Strasser and Lissi (2009) followed 126 Chilean children from economically diverse backgrounds from the fall of kindergarten to the spring of first grade. In the fall and spring of kindergarten, they measured students' alphabet knowledge, phonemic awareness, emergent writing kills, and receptive vocabulary. In the fall of kindergarten, they also constructed a home-literacy composite measure by asking parents how frequently they read to their children, at what age they began reading to them, how many books they had at home, and from where did they obtain books. They found that measures of book exposure collected at the fall of kindergarten did not significantly predict kindergarteners' spring measures on alphabet knowledge, vocabulary, and phonemic awareness when controlling for the same variables measured in the fall.

Obtaining similar results, Sénéchal and LeFevre (2002) followed 66 Canadian children from kindergarten to third grade to analyze the predictive power of book exposure. Book exposure is often regarded as a proxy measure of shared book reading, assuming that children who recognize book covers and/or recall book titles have listened to or read those books. For this study, children were asked to look at 37 popular children's books covers and to provide their titles. In previous studies, this measure had proved to be consistent and reliable (Spearman-Brown coefficient = 0.88). They found that the kindergarten measure of book exposure was not significantly associated to children's reading skills in spring of fist grade when fall first-grade measures were included in the model. Similarly, by the end of third grade the relationship between home book exposure measured in kindergarten and children's third-grade reading achievement was mediated by their receptive vocabulary in first grade.

In a follow-up study including 110 Canadian children from kindergarten to second grade, Sénéchal and LeFevre (2014) expanded their previous results. They found that no measure of parent-child literacy interactions collected in kindergarten significantly correlated to spring measures of reading in second grade, after controlling for reading measures in first grade.

The same conclusion reached Strasser et al. (2017). They studied 281 Chilean upper-middle class students to examine whether children's book exposure contributed to their expressive vocabulary, listening comprehension, word reading, and reading comprehension. They found that book exposure directly affected all first-grade outcomes. Yet, book exposure had no direct effect on second-grade reading comprehension, when controlling for first-grade outcomes. Thus, like Sénéchal and LeFevre (2014) had concluded, print exposure seemed to only have an indirect effect on children's second-grade reading scores.

In sum, researchers who have studied the effect of shared book reading seem to agree that it has a direct effect over young children's reading skills, and an indirect effect over older children's reading skills.

Reading Instruction at Home

Besides studying the practice of shared book reading, several researchers have examined how children's skills are affected by the frequency with which their parents provide literacy instruction at home, such as teaching children to write letters and words, listening to children read to their parents aloud, and teaching children about letters' sounds. Research has demonstrated that these activities positively predict children's reading-related skills in first grade. Some scholars have found that literacy instruction at home directly correlates to reading skills up to first grade (Sénéchal & LeFevre, 2002, 2014) while other have found that this correlation is mediated by children's reading skills before they enter first grade (Stephenson et al., 2008; Strasser & Lissi, 2009).

Sénéchal and LeFevre (2002, 2014) conducted studies with homogeneous middle-upper SES samples of Canadian children from kindergarten to third grade. They found that measures of formal home reading instruction collected in kindergarten directly influenced children's end-of-first-grade achievement, even when considering children's kindergarten reading-related skills. On the other hand, Stephenson et al. (2008) found a direct effect between parents' report of literacy teaching and their children's literacy skills in kindergarten. Yet, when they included children's kindergarten literacy skills to predict children's first grade achievement, the frequency of literacy teaching at home was no longer significant. Thus, Stephenson et al. (2008) concluded that the effect of teaching at home on reading achievement was indirect, mediated by children's literacy skills before they enter first grade. Similarly, Strasser and Lissi (2009) found that the

frequency with which parents taught their children letters had a direct effect over kindergarteners' writing skills in spring, even when controlling for the same skills measured in fall. However, the effect of this type of home instruction was not significant in first grade, when accounting for measures collected in kindergarten.

The length of the effect of literacy teaching at home as portrayed by these studies may vary due to differences in the control variables included by scholars. For example, Sénéchal and LeFevre (2002, 2014) incorporated a measure of parents' knowledge of adult literature and Stephenson et al. (2008) included measures of parents' beliefs around literacy. The differences between these variables hampers the comparison of their findings.

The Effect of Families' SES on Early Literacy Interactions

Families' socioeconomic status (SES) might play a role in influencing parent-children interactions in early literacy activities (Neuman & Celano, 2012; Purcell-Gates, 1996; Rush, 1999). Researchers from the United States have concluded that the relationship between literacy interactions at home and families' SES is not linear as some would have imagined. Phillips and Lonigan (2009) studied over 1,000 economically diverse families in the United States to understand the role that SES played in the way that families interacted with their children in early literacy activities. As expected, they found that variables like income, parents' educational attainment, and ethnicity partially predicted families' interactions with print. For example, parents from high SES tended to read more frequently and from an earlier age to their children than other parents. Yet, after conducting confirmatory analysis, they found that about 27% of low-SES families were clustered alongside high-SES families, which suggests that some economically diverse families share similar home literacy practices, and that SES is not the only factor that determines how families interact with print.

In Chile, data have shown that early literacy interactions—as self-reported in standardized surveys—are infrequent, regardless of parents' level of education. Indeed, in a study with low-income Chilean parents who, on average, had not completed high school, the percentage who reported reading daily to their children ranged from 2.6% to 5.6% (Guardia & Mendive, 2016). Similarly, Strasser and Lissi (2009) found that only 3.7% of Chilean mothers with at least some post-secondary education reported reading daily to their children in the previous week. Also, the engagement in reading to children among highly educated Chileans is much lower than that of parents with similar levels of education in other counties. For example, studies report that 54% of parents in the United States and 60% of parents in the United Kingdom with post-secondary education read daily to their children who are five years old and younger (Strasser & Lissi, 2009). Strasser and Lissi (2009) suggested that the low levels of reading to children in Chile might be a consequence of a low value of reading, as evidenced in the infrequent reading habits of Chilean adults, as well (Consejo Nacional de la Cultura y las Artes, 2014). The high costs of books in Chile might also contribute to this low frequency.

Based on the measures commonly utilized to gather information about reading practices, Chilean families might seem "deficient" in fostering children's reading skills. Surveys like those used by Strasser and Lissi (2009) and Guardia and Mendive (2016) ask parents about certain practices which have been found to influence the acquisition of reading skills, yet they might not represent the totality of practices that could potentially affect children's reading skills. Indeed, the picture those measures paint is unlikely to be a comprehensive representation of Chilean families' language-related funds of knowledge (Moll et al., 1992). For example, some studies suggest that Latin American families have richer conversations about food than about books

(Leyva & Skorb, 2017; Melzi et al., 2011), a richness that would not have been captured by surveys like the one used in this dataset.

Thus, although SES seems to play a role in predicting families' interactions with literacy, these findings suggest that there might be other variables—e.g., culture, time, and stress management, parental beliefs, knowledge about child development—that also explain how families interact with literacy.

The Present Study

In this study, I explored the frequency with which Chilean parents interacted with their children in literacy activities before children entered first grade. Specifically, I described parent-child early literacy interactions across different socioeconomic quintiles. Given the findings reported in previous Chilean studies (Strasser & Lissi, 2009; Susperreguy et al., 2007), I hypothesized that families from lower socioeconomic quintiles would engage in these types of activities less frequently than economically advantaged families.

I also analyzed whether the frequency of engaging in early literacy interactions before children began first grade predicted students' fourth-grade reading scores in a nationally standardized reading test. I included demographic and SES covariates, as well as students' second-grade reading scores. Based on previous literature, I hypothesized that parent-child early literacy interactions would not be a significant predictor of students' fourth-grade achievement, after controlling for their second-grade reading scores.

Finally, I explored whether the effects of early literacy interactions on fourth-grade reading achievement varied across children's SES. I hypothesized that children from lower-income families would benefit more from engaging frequently in home-literacy interactions than

their affluent peers. A visual representation of my conceptual framework is illustrated in Figure 1.

Figure 1

Conceptual Model
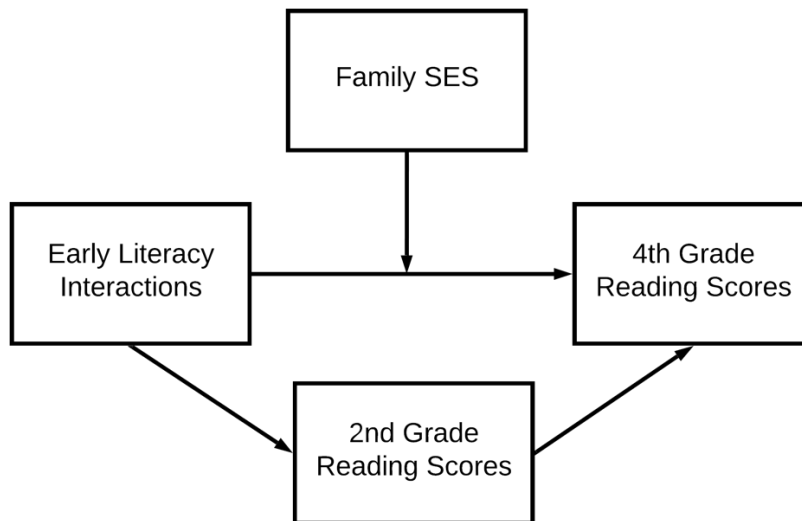
Methods

Data

I used census datasets collected by the Chilean Department of Education in 2015 and 2017, resulting from yearly processes of standardized assessment: the Chilean System for Measurement of Educational Quality (SIMCE; acronym in Spanish). Researchers may request access to these data through the Agency for Educational Quality (www.agenciaeducacion.cl). The SIMCE assessment is a series of four standardized tests (usually math, reading, social sciences and natural sciences), administered by the Agency of Educational Quality during two consecutive days in late spring. All students in the selected cohorts are required to take the tests (regardless of the type of school they attend), which are aligned to the national curriculum.

Additionally, students, parents, and teachers respond questionnaires that ask about families'

socioeconomic backgrounds, teachers' instructional practices, and additional topics that vary

each year (i.e., bullying, physical health, substance abuse, etc.).

For this study, I used data from the 2015 and 2017 SIMCE datasets. I used students'

fourth-grade reading score (in 2017), second-grade reading scores (in 2015), and their parents'

answers to the 2015 parent questionnaire. Parents' questionnaires in 2015 included nine items

identical to those used in the 2011 Progress in International Reading Literacy Study (PIRLS)

assessment to measure the Early Literacy Activities Before Beginning Primary School Scale

(Martin & Mullis, 2012). Parents reported the frequency (1 = "Never"; 4 = "Always") with

which they interacted with their children in nine early literacy activities before the children

entered first grade: reading books, telling stories, singing songs, playing with alphabet toys,

talking about things parents had done, talking about what parents had read, playing word games,

writing letters or sounds, and reading aloud sign and labels.

A total of 232,305 students attended fourth grade in 2017, 48.72% of whom were female.

According to their parents, 12.37% of students had indigenous origins—either the mother or the

father declared belonging to an indigenous group (e.g., Aymara, Rapa Nui, Quechua, Mapuche,

Atacameño, Coya, Kawéskar, Diaguita or Yagán). Students attended three types of schools,

classified according to the source of their funding: public schools, schools with both private and

public funding, and private schools. Nearly 36% of all fourth-graders attended public schools,

55% attended schools with private and public funding, and 9% attended private schools. Schools

in Chile are also classified according to the SES of the families they serve: 10.5% of fourth-

grade students attended schools classified as low, 32% attended schools classified as medium

low, 33% attended schools classified as medium, 15.5% schools classified as medium high, and 9% schools classified as high.

Missing Values

To deal with missing values (see Table 1) I used multiple imputation. Multiple imputation (MI) consists in the prediction of 5 to 25 values, for each missing value. MI allows for complete-data analyses through inferences, based on the combination of imputed datasets which, as a set, "validly reflect sampling variability due to missing values" (Little & Rubin, 2002, p. 85). I used the Stata commands "mi impute chained" to impute 25 datasets with 10 iterations to predict values in all variables that had missing values (StataCorp, 2017). I also included variables with no missing values in the imputation model, like students' gender, type of school, schools' SES, and schools' location.

All models in my study were conducted using these 25 imputed datasets. The Stata commands "mi estimate" (StataCorp, 2017) estimate models using the imputed data and adjusting coefficients and standard errors for the variability between imputations, according to Rubin's combination rules (Rubin, 1987).

Variables

All variables included in my analyses are summarized in Tables 1 and 2. Significant correlations between variables can be found in Table 3 (all shown correlations significant at $p < 0.05$).

Outcome Variable. I used students' fourth-grade reading scores in the SIMCE assessment in 2017 as the outcome variable for all models in this study. Scores ranged from 122 to 400 points (mean = 271.02, SD = 53.19, missing before MI= 19%). This reading assessment tests students' ability to understand literary and non-literary texts. Students are considered

proficient readers if they score over 241 points. Proficient readers are expected to be able to locate explicit information, interpret and relate information to identify main ideas, sequence events in chronological order, make inferences about meanings of words and figurative language, and apply and express opinions based on texts **(Establece estándares de aprendizaje para 4to y 8vo año básico en asignaturas que indica, Decreto 129, 2013/2019)**.

Student-Level Predictors. In October of 2015, parents rated the approximate frequency (1 = "Never", 4 = "Always") with which they engaged with their children in nine early literacy activities before the children began first grade (i.e., before March of 2014): reading books, telling stories, singing songs, playing with alphabet toys, talking about things parents had done, talking about what parents had read, playing word games, writing letters or words, and reading aloud sign and labels. These items were identical to those included in the 2011 PIRLS Home Questionnaire, developed by a team of experts as the "Early Literacy Activities Before Beginning Primary School Scale" (Martin & Mullis, 2012). In models two and three, I included the mean of these items as a scale (mean = 2.92, SD = 0.55) after confirming through factor analysis that all nine items loaded to a single factor. The scale showed strong reliability (Cronbach's alpha = 0.84).

Student-Level Control Variables. I used students' second-grade scores in the SIMCE reading assessment in 2015 as a control variable for all models in this study (mean = 253.85, SD = 48.76, missing before MI= 12%). Models also included binary variables for students' gender (females = 1) and ethnicity (indigenous = 1). I coded students' as having indigenous origin if either their mother or their father identified as part of an indigenous group (e.g., Aymara, Rapa Nui, Quechua, Mapuche, Atacameño, Coya, Kawéskar, Diaguita or Yagán). Additionally, I included a count of the people living in each household, which was reported by parents as

ordinal choices. I recoded this variable as interval ratio (e.g., "2 people" = 2, "10 or more people" = 10). Parents also reported the highest educational level they expected their children to attain (1 = "I don't think she/he will complete high school", 6 = "Postgraduate studies"). Less than 1% of the parents believed that their children would not complete high school, 8% believed that their children would earn a high school degree, 13% believed children would earn a technical degree, 56% believed they would earn a university degree, and 22% believed they would complete postgraduate studies (missing before MI = 18%). In all multilevel models, the variable for parental expectations was treated as interval-ratio.

To depict families' socioeconomic status, I developed a composite variable using parents' level of education, household income, and number of books at home. In the parent questionnaire, parents or caregivers reported mothers' and fathers' level of education (1= "Did not study", 20 = "Doctorate degree"). Mothers' mean number of years of education was 13.37 (SD = 3.39, missing before MI= 17%), while fathers' mean number of years of education was 13.27 (SD = 3.54, missing before MI= 20%). These two variables were significantly correlated at 0.65. Parents also reported their total household income (1= "Less than CLP$100.000, 15 = "More than CLP$2.200.000") and the number of books they had at home (1= "None", 5 = "More than 100"). I explored the relationship between these four variables using factor analysis with orthogonal rotation. This analysis showed that all variables loaded to a single factor, suggesting that, combined, they portrayed a single construct of socioeconomic status. Thus, using the imputed datasets, I standardized each variable and then created a scale, which I also standardized. The scale showed high reliability (Cronbach's alpha= 0.82). I used this variable to estimate interaction effects.

Table 1

Summary of Level 1 Variables

Variables	N	Missing	Range	SD	Mean Pre-MI	Mean Post-MI
4th grade reading scores	187,113	19%	122-400	53.19	271.02	267.34
2nd grade reading scores	203,453	12%	111-364	48.76	253.85	252.08
People in household	194,465	16%	2-10	1.57	4.68	4.69
SES composite	196,403	15%	-4-3	1.00	0.00	-0.01
Students' gender (1=Female)	232,305	0%	0-1	0.50	0.49	0.49
Indigenous origin (1=Yes)	184,314	21%	0-1	0.33	0.13	0.13
Parental expectations	190,955	18%	1-6	1.05	4.83	4.82
Early literacy interactions	194,760	16%	1-4	0.55	2.92	2.92

School-Level Control Variables. Researchers from the Chilean Ministry of Education classify all schools into five socioeconomic categories: low, medium low, medium, medium high, and high. In this study, 10.5% of fourth-grade students attended schools classified as low, 32% attended schools classified as medium low, 33% attended schools classified as medium, 15.5% schools classified as medium high, and 9% schools classified as high. To classify schools, they consider students' household income, their parents' level of education, and the percentage of students who are classified at the two most vulnerable categories in the vulnerability index. The Chilean vulnerability index is a composite variable calculated by the National Board of School Assistance and Scholarships (JUNAEB, in Spanish) which considers students' and their families' participation in social services, public health insurance, and scholarships, as well as students' school attendance and academic achievement. They classify all students into four

categories: first priority (for those most vulnerable), second priority, third priority, and non-priority.

In 2017, three types of schools existed in Chile: public schools (serving 34.97% of the students in this study) which depended both in funding and administration on local municipalities; private schools with subsidized funding (serving 56.45% of the students in this study), which were privately administered but received public funding as well as private funding; and private schools (serving 8.58% of the students in this study), which were privately funded and administered. Schools are also classified as rural (serving 10.23% of the students in this study) or urban (serving 89.77% of the students in this study) according to their location.

Table 2

Summary of Level 2 Variables

Variables	Number of Students	Percent
Type of school		
Public	69,294	34.97
Private w/public funding	111,844	56.45
Private	17,002	8.58
School SES level		
Low	21,139	10.67
Medium low	59,447	30.00
Medium	65,121	32.87
Medium high	33,687	17.00
High	18,746	9.46
Schools' location		
Urban	177,867	89.77
Rural	20,273	10.23

Table 3

Pairwise correlations between Level 1 Variables

	Variables	1	2	3	4	5	6	7
1	4th grade reading scores	1.00						
2	2nd grade reading scores	0.68	1.00					
3	People in household	-0.06	-0.08	1.00				
4	SES composite	0.30	0.33	-0.05	1.00			
5	Student's gender (1=Female)	0.08	0.08			1.00		
6	Indigenous origin (1=Yes)	-0.05	-0.07	0.01	-0.19		1.00	
7	Parental expectations	0.24	0.27	-0.09	0.52	0.03	-0.11	1.00
8	Early literacy interactions scale	0.16	0.18	-0.07	0.29	0.06	-0.05	0.28

Note. All shown correlations are significant at $p < 0.05$.

Analysis

To answer my first question regarding the frequency with which Chilean parents engaged in early literacy interactions, I first divided the population into SES quintiles. Then, I compared the frequency with which parents in different SES quintiles engaged in each early literacy interaction. Finally, I gauged whether these differences across SES were significant by conducting analysis of variance (ANOVA) tests of differences, with Bonferroni corrections to adjust for multiple comparisons.

To answer my second and third questions regarding the effect of parents' early literacy interactions on their children's fourth grade reading scores and the possible interaction between such effect and families' SES, I used multilevel models with students (level one) clustered in schools (level two). Multilevel modeling was needed in order to account for the nested structure

of the data (Luke, 2004). To ease the interpretation of estimated coefficients, I grand-mean-centered the continuous variables at the student level: second-grade reading scores, number of people in the household, family SES, and parental expectations. After this type of centering, a value of zero represents the mean across all students.

Model 0: Unconditional Model. I used this unconditional model to calculate the intraclass correlation coefficient, which was found to be 0.16. This ICC suggested that about 16% of the variance in students' reading scores in fourth grade (4RS) could be accounted by between-school differences which, added to the nested structure of the data, confirmed the need for multilevel modeling.

$$4RS_{ij} = \beta_0 + r_{ij}$$
$$\beta_0 = \gamma_{00} + u_{0j}$$

Model 1: Previous Achievement Model. I estimated Model 1 as a random-intercept model, in which I predicted students' reading scores using control variables at the student level (StC: gender, people in household, indigenous origin, families' SES composite, and parental expectations) and at the school level (ScC: type of school, location of school, and schools' SES), as well as students' second-grade reading scores (2RS). All variables at the student level were entered as fixed.

$$4RS_{ij} = \beta_0 + \beta_1(StC)_{1j} + \beta_2(2RS)_{2j} + r_{ij}$$
$$\beta_0 = \gamma_{00} + \gamma_{01}(ScC)_j + u_{0j}$$
$$\beta_1 = \gamma_{10}$$
$$\beta_2 = \gamma_{20}$$

Model 2: Early Literacy Interactions Model. Model 2 was also a random-intercept model, in which I predicted students' fourth-grade reading scores using all variables at the student and school level in Model 1, plus the scale of mean early literacy interactions (ELI) between parents and their children before they entered first grade. The effects of all variables were entered as fixed.

$$4RS_{ij} = \beta_0 + \beta_1(StC)_{1j} + \beta_2(2RS)_{2j} + \beta_3(ELI)_{3j} + r_{ij}$$

$$\beta_0 = \gamma_{00} + \gamma_{01}(ScC)_j + u_{0j}$$

$$\beta_1 = \gamma_{10}$$

$$\beta_2 = \gamma_{20}$$

$$\beta_3 = \gamma_{30}$$

Model 3: Early Literacy Interactions Model with SES Interaction. The final model included all variables in Model 2, and an interaction term between the early literacy interactions scale and the continuous variable of families' SES. As before, all effects were entered as fixed.

$$4RS_{ij} = \beta_0 + \beta_1(StC)_{1j} + \beta_2(2RS)_{2j} + \beta_3(ELI)_{3j} + \beta_4(ELI * SES)_{4j} + r_{ij}$$

$$\beta_0 = \gamma_{00} + \gamma_{01}(ScC)_j + u_{0j}$$

$$\beta_1 = \gamma_{10}$$

$$\beta_2 = \gamma_{20}$$

$$\beta_3 = \gamma_{30}$$

$$\beta_4 = \gamma_{40}$$

Results

In this section, I describe the results obtained to answer my three research questions regarding 1) the frequency of Chilean parents' early literacy interactions, 2) the association between these interactions and students' fourth-grade reading scores while controlling for their

second-grade scores, and 3) the extent to which that association was moderated by families' SES. Results for the three random-intercept models can be found in Table 5.

Early Literacy Interactions across SES Quintiles

Most parents reported engaging with their children in early literacy activities often or always, which was more frequent than reports detailed in other studies conducted in Chile. Strasser and Lissi (2009) had found that only 3.7% of Chilean mothers with at least some postsecondary education reported reading daily to their children in the previous week. However, parents' reports in this dataset were more optimistic. In this study, 23% of mothers who had at least some postsecondary education, 14% of those who had high school degree, and 14% of those who had eleven or fewer years of education reported "always" reading books to their children.

The overall mean level of engagement was higher for some activities—talking about things (3.23), reading labels and signs (3.20), and singing songs (3.19)—than for others, like telling stories (2.82), talking about books (2.70), and reading books (2.59) (see Figure 2). As shown in Table 4, students' fourth-grade reading scores were positively and significantly correlated to each early literacy activity. Yet, correlations were highest for two of the activities with the lowest means of engagement: reading books ($r = 0.18$, $p < 0.001$) and telling stories ($r = 0.16$, $p < 0.001$).

Table 4

Pairwise Correlations between Literacy Interactions and Fourth Grade Reading Scores

	Variables	1	2	3	4	5	6	7	8	9
1	4th grade reading score	1.00								
2	Read books	0.18	1.00							
3	Tell stories	0.16	0.58	1.00						
4	Sing songs	0.06	0.27	0.40	1.00					
5	Play with alphabet toys	0.10	0.32	0.38	0.36	1.00				
6	Talk about things	0.08	0.24	0.27	0.33	0.29	1.00			
7	Talk about books	0.07	0.37	0.35	0.30	0.33	0.48	1.00		
8	Play word games	0.12	0.36	0.38	0.35	0.47	0.33	0.45	1.00	
9	Write letters or words	0.10	0.36	0.35	0.32	0.43	0.31	0.37	0.51	1.00
10	Read aloud signs and labels	0.09	0.31	0.31	0.33	0.34	0.36	0.36	0.38	0.50

Note. All shown correlations are statistically significant at $p > 0.05$.

Significant differences were observed between SES quintiles. I conducted nine one-way analyses of variance (ANOVA) with Bonferroni comparisons to contrast the mean frequency of engagement for each activity across SES quintiles. For every activity (see Figure 2), the mean frequency of interaction was lowest for the lowest quintile, and significantly increased with each quintile. These increments always resulted in statistically different means from those observed at the previous quintile ($p <0.001$).

Figure 2

Mean Frequency of Early Literacy Interactions by SES Quintiles
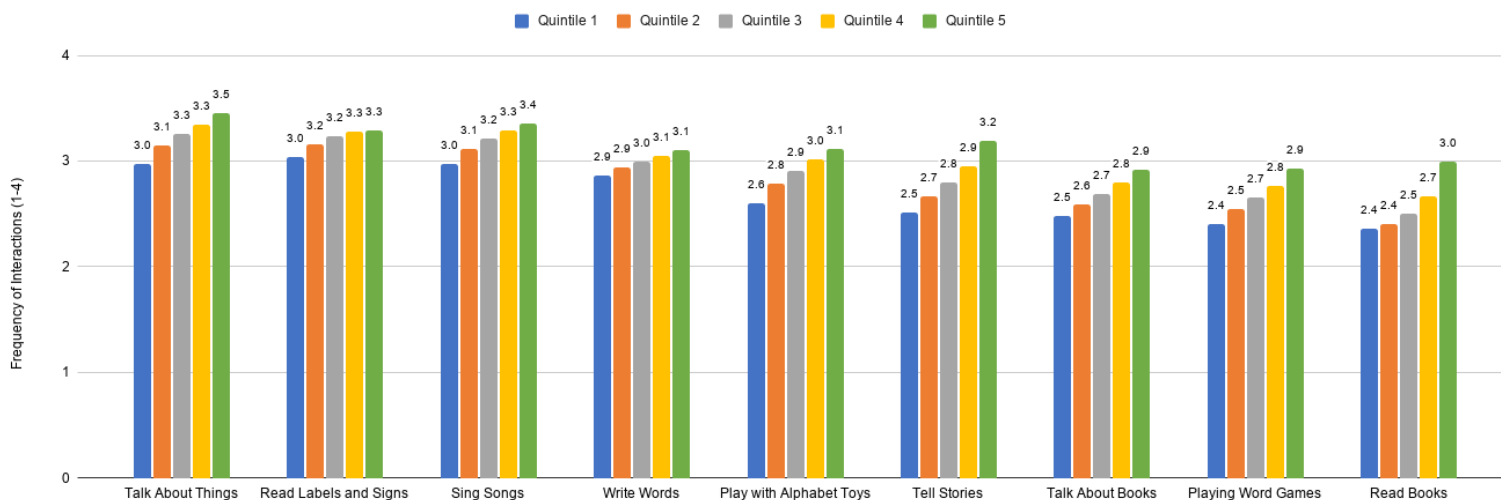
Note. All mean differences are statistically significant at *p* <0.001.

The variance found across SES quintiles was larger for some activities than for others. The largest differences across SES quintiles were found across the mean frequencies with which parents reported telling stories (F [4, 190332] = 4351.21, *p* < 0.001) and reading books (F [4, 189856] = 4069.54, *p* < 0.001). Other differences across SES quintiles were small but still statistically significant, like those found among the mean frequencies of writing words (F [4, 189152] = 519.27, *p* < 0.001) and reading labels and signs (F [4, 189401] = 654.04, *p* < 0.001).

Early Literacy Interactions and Students' Reading Scores

I developed two multilevel models to examine whether parents' frequency of engagement in early literacy interactions with their children before they began first grade significantly predicted children's fourth grade reading scores. The first one considered only background variables at the student and the school level, including students' second-grade reading scores. The second one incorporated the early literacy scale to see whether it explained variance beyond a powerful control variable such as previous achievement.

Results from Model 1 (see Table 5) showed that, as expected, students' second-grade reading scores positively and significantly predicted their fourth-grade reading scores. Specifically, one additional point in the second-grade reading test was associated with an increase of 0.72 points in fourth-grade reading scores by (p <0.001). I calculated the proportional reduction of prediction error to estimate how much variance Model 1 explained compared to the null model (McCoach, 2010; Snijders & Bosker, 2012). Model 1 explained 34.94% of the variance in the null model.

Table 5

Multilevel Regressions of Fourth Grade Reading Scores (N = 232,305)

Variables	Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE
Indigenous origin (1=Yes)	0.78*	0.32	0.78*	0.32	0.77*	0.32
Gender (1=Female)	3.76***	0.17	3.68***	0.17	3.68***	0.17
People in household	-0.20***	0.06	-0.18**	0.06	-0.18**	0.06
Parental expectations	1.81***	0.12	1.69***	0.12	1.71***	0.12
SES	3.53***	0.16	3.32***	0.17	3.31***	0.17
Type of school (Ref=Public)						
Private w/public funding	-0.43	0.39	-0.44	0.39	-0.43	0.39
Private	0.28	1.49	0.36	1.49	0.36	1.49
School SES (Ref=Low)						
Medium low	-0.78	0.48	-0.77	0.48	-0.73	0.48
Medium	0.52	0.56	0.56	0.56	0.62	0.56
Medium high	1.95**	0.69	2.05**	0.69	2.07**	0.69
High	4.12**	1.54	4.34**	1.55	4.29**	1.55
Location of school (1=Rural)	3.22***	0.47	3.21***	0.47	3.20***	0.47
2nd grade reading score	0.72***	0.00	0.72***	0.00	0.72***	0.00
Early literacy scale	.	.	1.43***	0.19	1.48***	0.19
SES*Early literacy scale	.	.	.	.	0.40*	0.17
Intercept	265.71***	0.49	265.68***	0.49	265.58***	0.50
Residual variance	37.52	0.07	37.52	0.07	37.51	0.07
Between-group variance	8.35	0.15	8.36	0.15	8.36	0.15
Proportional reduction of prediction error	34.94%		34.94%		34.95%	

Note. *p<0.05, **p<0.01, ***p<0.001.

Despite the strength of the association between fourth- and second-grade scores, the early literacy interactions scale included in Model 2 was also found to positively and significantly predict students' reading comprehension in fourth grade, countering what I had hypothesized. Based on the literature, I expected students' second-grade scores to completely mediate the effect of early literacy interactions on their fourth-grade reading scores. Thus, I did not expect to see a significant effect of the early literacy scale on students' fourth-grade reading scores, but I found that a one-unit increase in the literacy scale was estimated to increase students' fourth-grade reading scores by 1.43 points (p <0.001). Although the early literacy scale was a statistically significant predictor, the overall variance components in Model 2 remained almost identical to that in Model 1. Indeed, the proportional reduction of prediction error remained unchanged at 34.94% after including the early literacy interactions scale.

Moderation between SES and the Early Literacy Interactions Scale

In Model 3, I included an interaction term between students' SES and the early literacy interactions scale, to examine whether the effect of literacy interactions on students' fourth-grade reading scores varied across SES. Contrary to what I had hypothesized, results showed that a positive and significant moderation existed (p <0.001), suggesting that students with high SES benefit more from the literacy interactions with their parents than students with low SES. In other words, for each one-unit increase in SES, the association between literacy interactions and fourth-grade scores became stronger (p <0.05).

Discussion

Chilean Families Value Early Literacy Interactions

Results from this study showed that most Chilean parents report frequently interacting with children in early literacy activities. Parents' reports about their engagement in early literacy

interactions show that they see these activities as something valuable, which is a great starting point.

More research is needed to understand the quality and depth of these interactions, so as to develop ways to take even more advantage of those opportunities. For example, we know that parents do not read as frequently to their children as they sing songs with them, but most research has focused on the benefits of reading to children. Research that explored what songs could offer in terms of literacy skills seems pertinent to the Chilean reality and could benefit the thousands of Chilean children who are sang to everyday.

Correlation analyses showed that shared book reading is the activity that most strongly correlates to students' reading skills, so perhaps resources could be prioritized for the promotion of this interaction over others. Indeed, research suggests that reading aloud to children might generate a virtuous circle of reading, as children who are read to tend to show interest in reading and are likely to initiate additional read aloud interactions and find opportunities for independent reading (DeBarshye, 1995; McCormick & Mason, 1986; Morrow & Smith, 1990).

Findings from other studies might be useful to guide potential efforts to increase and enhance Chilean parents' practice of reading to their children before they enter school. Five ideas seem particularly important: 1) having access to many books that match children's interests, 2) allowing children to choose, 3) turning reading into an enjoyable activity, 4) establishing routines for reading, and 5) promoting conversations around reading. Scholars have found that environments that are rich in a variety of books tend to increase the likelihood of reading (Allington, 2014; Guthrie et al., 2007). When books abound, it is more likely that children will find some that are interesting to them. Public resources could be devoted to help parents gain access to good-quality reading materials, stocking and promoting the use of school and public

libraries. With more books in stock, libraries could allow families to borrow more books for longer periods of time, which would mean that children whose parents use libraries could have more readily available books at home.

Along with increasing families' access to books, national-wide efforts could be devoted to informing parents about the benefits of reading to children and of ways to do it effectively. For example, studies have found that allowing children to choose what they read is an effective way to promote motivation to read (Guthrie et al., 2007; Spaulding, 1992). Parents could be informed about the benefits of choice so that their children's interest in reading increases. Furthermore, one of the few scholars who has studied the affective quality of shared book reading found that children whose parents were affectionate and supportive while reading to them became more fluent and more engaged readers (Bergin, 2001). Thus, parents could be informed about the benefits of making reading an enjoyable moment more than a teaching opportunity.

Parents could also be encouraged to find moments to incorporate reading early into their routines, as studies have found that that parental practices related to reading tend to be stable over time (Hume et al., 2015; Roberts et al., 2005). Parents who begin reading frequently to their children continue to do so as their children grow. Physicians like the obstetrician and the pediatrician, who are in contact with families before and at the time of the birth of the children, could play a role in promoting reading from an early age. The sooner families establish reading routines, the better it will be for their children.

Finally, researchers could develop ways to help parents take advantage of the literacy-related interactions they already embrace, like singing to their children and reading labels and signs. Parents could be made aware of the benefits of playing with rhymes in a song, for

example, to foster phonological awareness, and of different games to play while reading labels and signs to promote alphabetic knowledge and concepts of print.

Early Literacy Interactions Have Long-Lasting Consequences

Several scholars have found that early literacy practices such as shared book reading or teaching literacy at home have a direct effect on children's reading skills in kindergarten and early first grade (Jordan et al., 2000; Mason & Sinha, 1992; Mendive et al., 2017; Sénéchal & LeFevre, 2002, 2014; Stephenson et al., 2008; Strasser et al., 2017; Strasser & Lissi, 2009). However, when scholars tested the association between home literacy practices on children's reading skills in spring of first grade and onward, they found that the effect of these literacy interactions disappeared if the analysis controlled for children's reading-related skills in previous years (Mason & Sinha, 1992; Mendive et al., 2017; Sénéchal & LeFevre, 2002, 2014; Strasser et al., 2017).

Contradicting previous research and my own hypothesis, results from this study showed that, even when controlling for students' second-grade reading scores, the early literacy interactions scale was estimated to have a positive and significant effect on students' fourth-grade reading scores. These findings suggest that the frequency of engagement in literacy-related activities among Chilean families during the preschool years might directly associate to children's reading skills in older elementary grades, and not just indirectly as other studies had suggested. As expected, though, the proportion of variance explained in students' fourth-grade reading scores did not increase much when the early literacy scale was added to the previous-achievement the model, which supports previous findings that suggest that most of the variance in older elementary grades is explained by achievement in younger elementary grades. The statistical significance of the early literacy scale, despite the presence of strong controls, suggests

that early childhood is a critical time to engage in literacy-related interactions as the stimulation that occurs during that period can still explain differences found five years later. This conclusion should encourage policy makers to find ways to support parents in their key role of being the first promoters of reading for their children.

Different from those of other studies, my conclusions are supported by the robustness provided by a large and heterogeneous sample, given that participants represented the totality of students who attended fourth grade in Chile in 2017. However, while most previous research included several outcome variables to measure children's reading skills, usually distinguishing code-related skills (e.g., phonological awareness, fluency, letter identification) from comprehension skills (e.g., expressive and receptive vocabulary, oral language), the outcome variable in my study was students' scores in standardized reading tests, which require both decoding and comprehension skills. Furthermore, the SIMCE assessment is also curriculum based, and so knowledge about content is also required for a successful test. As such, SIMCE scores represent overall achievement, and it is not possible to disentangle the effect of early literacy interactions. Perhaps the effect of the early literacy scale on students' reading scores observed in this study is only due to an impact on one of these strands of reading skills, as observed on vocabulary by Sénéchal and LeFevre (2002, 2014), or on decoding skills by (Mendive et al., 2017). More research with large and heterogeneous samples and differentiated outcome variables is needed to continue to examine the influence of home literacy practices on children's reading skills in older elementary grades.

The Ubiquitous Influence of SES

Research from international settings, like that conducted by Bus et al. (1995) and Phillips and Lonigan (2009), had suggested that families' SES did not uniquely associate to their literacy

practices. However, my findings were consistent with those described by other scholars who, having examined the literacy-related practices of Chilean parents with their preschool children, concluded that parents with high SES engaged in these interactions more frequently than parents with low SES (Mendive et al., 2017; Strasser & Lissi, 2009). The SES composite variable in this study, which included parents' level of education, household income, and number of books at home, was found to positively and significantly impact the relationship between the early literacy interactions scale and students' fourth-grade reading scores. Sadly, this positive moderation means that children with low SES are doubly disadvantaged: not only do their parents engage with them less frequently in literacy interactions but also each of these experiences has less impact on their reading skills compared to their peers with high SES. Consequently, differences in the frequency with which parents interact with their children in early literacy activities before they enter first grade contribute to expand the reading achievement gap between Chilean children with low and high SES.

The constrains of poverty might make parents with low SES less available to engage in the literacy interactions surveyed in this study, yet parents might engage in other practices which could potentially be as valuable in the promotion of reading skills as the practices described here. We need more naturalistic qualitative research to identify other language-related practices embraced by Chilean families in order to promote children's reading skills by tapping into them. For example, studies on parent-child conversations in which they reminisce past events show that such co-constructed narratives positively affect children's language skills, with effects comparable to those of shared book reading (Leyva & Smith, 2016; Reese et al., 2015).

Limitations

Data regarding parents' frequency of interaction in early literacy interactions was self-reported by parents. These reports might have been influenced by the social-desirability bias of some of these practices. Furthermore, parents were asked in October of 2015 about their interactions with children before March of 2014, and so their reports might not be completely accurate. Students' reading achievement was measured through scores in standardized reading tests, yet research suggests these tests might not always be fair nor accurate representations of students' skills (Araujo et al., 2017; Benítez & Padilla, 2013; Caro et al., 2014; Huang et al., 2016). Additionally, I acknowledge that the survey used to assess families' interactions with print is limited in scope and does not necessarily provide an exhaustive or fair representation of families' rich experience with language and literacy (Edwards, 1995; Moll et al., 1992)

Conclusion

The benefits of early literacy interactions at home reach beyond children's preschool years and into primary school. My findings suggest that Chilean children whose parents frequently read them books, tell them stories, and teach them about letters or words tend to have higher reading scores in fourth grade, even when controlling for their reading achievement in second grade. The effect of early literacy practices on students' achievement is more positively pronounced for children with high SES, suggesting that the achievement gap between children with low and high SES might widen if the situation remains unchanged. We urgently need to find creative ways to promote language-related practices that foster every children's literacy skills at home.

Study 2: A Chip Off the Old Block: Do Keen-Reading Parents Raise Keen-Reading

Children?

Developing life-long readers is a goal of most educational systems. For example, the first learning objective in the Chilean national curriculum for language arts in secondary school is to ensure students "read habitually to learn and to enjoy themselves" (MINEDUC, 2013, p. 1). However, data show that most Chilean students are not keen readers: they are neither frequent nor motivated readers. Regarding frequency, for example, a nationally representative survey showed that only 13% of Chilean students between nine and seventeen years old considered themselves frequent readers, and that, on average, they read only two books for pleasure per year (Consejo Nacional de la Cultura y las Artes, 2014).

Previous research on Chilean students' reading motivation is not very encouraging, either. Orellana and Baldwin (2018) used the Motivation to Read Survey (Gambrell et al., 1996) to gauge the value of reading and self-concept as readers of 1,290 Chilean students in third, fourth, and fifth grade in the fall and spring. They found that students' value of reading tended to decrease across the school year for students of all grades, with the biggest difference found between fourth-graders' fall and spring measures. Thus, research suggests that Chilean schools are not succeeding in their efforts to help students become motivated and frequent readers.

Teachers should not be alone in the task of fostering keen readers. Theoretical models on the development of reading motivation and frequency suggest that parents and peers also play a key role. According to Wigfield and Guthrie (2000), the likelihood of choosing to read depends on three factors: a person's self-perceived competence for reading, the reasons that justify a person's decision to read (e.g., internal, like feeling challenged or curious; or external, like obtaining a good grade or a prize), and social influences by peers or parents. After surveying

randomly selected students in primary and secondary school, Guthrie et al. (1999) concluded that students who were the most motivated to read usually felt competent as readers, reported internal reasons to read, and were surrounded by people who valued reading and encouraged them to read.

Many scholars have studied how self-perceived competence affects students' reading skills and motivation (de Naeghel et al., 2012; Orellana & Baldwin, 2018; Susperreguy et al., 2018; Swalander & Taube, 2007). Yet, fewer studies have explored how parents and peers shape adolescents' reading frequency and motivation. To contribute to fill this gap, I examined whether having keen-reading parents increased sixth, eighth, and tenth grade students' likelihood of being keen readers, while controlling for the influence of having keen-reading peers attend their same school. My hope was to provide policy makers with research-based evidence to support parents to become reading models for their children.

My research questions were:

1. To what extent are Chilean parents keen readers (highly motivated and frequent readers)? Does parents' keen-reading profile vary across socioeconomic status (SES)?

2. What is the relationship between having keen-reading parents and the likelihood of students being keen readers, after controlling for potential confounders?

3. To what extent does the relationship between having a keen-reading parent and being a keen-reading student vary as function of families' SES?

First, I conceptualize what I mean by keen readers. Then, I review relevant literature concerning parental influences over adolescents' probability of becoming keen readers. Next, I describe how SES might affect parents' likelihood of being keen readers. After that, I explain how peers might also influence adolescents' odds of being keen readers. I follow by describing

the methods I used and the results I obtained. I end this study with a discussion of my findings, their implications, and limitations.

Keen Reading: High Motivation and High Frequency

Gambrell (2011) defined reading motivation as "the likelihood of engaging in reading or choosing to read" (p. 172). According to this definition, students who display high levels of reading motivation are more likely to read than their peers with low levels of reading motivation. Thus, this definition links high reading motivation to its logical consequence: frequent reading. Following this rationale, I conceptualized "keen readers" as those who report high levels of reading motivation (as measured by the mean of eleven items with a four-point Likert scale questionnaire) and reading frequency—reading, on average, one hour per day (McKool, 2007; Shapiro & Whitney, 1997).

Most previous literature has considered reading motivation and reading frequency as as distinct variables. However, researchers who conducted a large study on the influence of parents' reading habits over their children's found conflicting results when they included parents' reading frequency separately from their reading attitude, which they attributed to collinearity issues (Lim et al., 2015). To avoid those issues, I conceptualized keen reading as a composite variable—a reading profile—that characterizes those who report high levels of reading motivation and high reading frequency. This concept of "keen reading" is supported by the work of several scholars who have concluded that a high and positive correlation exists between reading frequency and reading motivation ($r = 0.66$ in this study). Students who report high reading motivation tend to spend more time reading and read more books than their peers who report low motivation (de Naeghel et al., 2012; Guthrie et al., 1999, 2013; Schiefele et al., 2012; Wigfield & Guthrie,

1997). Given the high correlation between motivation and frequency, the analysis of keen reading as a composite variable might also prevent collinearity issues found in Lim et al. (2015).

Parents' Influence on Their Children's Likelihood of Being Keen Readers

Wigfield and Guthrie (1997) illustrated the development of reading motivation partially through the social influences exerted by peers and surrounding adults. Based on their model, youth appreciate and become interested in reading when they see that their parents or other people they respect value and support their reading habits (Guthrie & Davis, 2003; Klauda, 2009).

Many researchers have studied how parents influence the development of their children's reading skills (Bus et al., 1995; Hume et al., 2015; Scarborough, 1994; Sénéchal & Young, 2008). However, focusing only on the development of reading skills may not be enough when studying adolescents (youth between 12 and 18 years old). Indeed, as some scholars have noted, even reading-proficient students may become 'alliterate'(Harris & Hodges, 1995) as they reach adolescence: they simply choose not to read, even though they are able to do so (Merga & Moon, 2016; Shapiro & Whitney, 1997). Thus, research that explores adolescents' reading motivation and reading frequency, as opposed to their reading skills, may paint a more accurate picture of their relationships to reading.

Very few studies have examined how parents influence their children's reading motivation and frequency, and even fewer have studied that relationship between parents and adolescent children. To my knowledge, no previous study has conceptualized parents' reading frequency and motivation into a single variable, such as keen reading. Thus, I organize findings from previous research into two categories: first, I discuss the influence of parents' reading

frequency on their children's reading motivation and frequency; and then, I describe the effect of parents' reading motivation on their children's reading motivation and frequency.

Influence of Parents' Reading Frequency

Many scholars agree on the positive impact of reading to children (Bråten et al., 1999; Bus et al., 1995; DeBarshye, 1995; Hume et al., 2015; Loera et al., 2011; Morrow, 1983; Neuman, 1986; Yeo et al., 2014). However, the few studies that have examined whether parents' own reading frequency (i.e., time they spend reading for their own pleasure) affects their children's reading motivation and frequency have found inconsistent results.

Some authors have found that parents' reading frequency does not necessarily correlate to their children's reading frequency (Hall & Coles, 1999; Neuman, 1986; Shapiro & Whitney, 1997). For example, after surveying a sample of over 8,000 English students between 10 and 14 years old, Hall and Coles (1999) observed that the average reading frequency of boys who lived with adults they perceived as readers was not different from that of their peers who lived with adults they did not perceive as readers. Likewise, the average number of books that girls read per year did not depend on whether they lived with adults they perceived as readers. Furthermore, Shapiro and Whitney (1997) counted the instances of leisure reading during three weeks for a group of 90 fifth-graders in the United States, and interviewed those whose reading frequency was at least 1.5 standard deviations above the mean. They found that these avid readers were not more likely to perceive their parents as frequent readers than their reluctant-reading peers. In the same line, Neuman (1986) surveyed 84 parents of fifth-graders in Boston, and found that, after controlling for families' SES, parents' own reading frequency did not significantly correlate to their perception of their children's reading frequency.

Other studies found that parents' reading frequency was a significant predictor of children's reading frequency (Arua & Arua, 2011; Bråten et al., 1999; S.-Y. Chen, 2008; Lim et al., 2015; McKool, 2007; Yeo et al., 2014). For example, Bråten et al. (1999) surveyed 117 Norwegian third and fourth graders and found that children who perceived others in their home (e.g., parents or siblings) as being readers read more frequently than their peers. McKool (2007) found similar results. In her study with a socioeconomically heterogeneous sample of nearly 200 fifth graders in the United States, she found that avid readers (top ten most-frequent readers per school) were more likely to have parents who modeled reading for enjoyment than reluctant readers (bottom ten least-frequent readers per school). Similarly, Chen (2008) surveyed over 20,000 Taiwanese adolescents and found that ninth-graders' odds of being avid readers were positively correlated to their parents' reading frequency.

Influence of Parents' Reading Motivation

Other scholars studied how parents' general beliefs around reading impacted their children's reading motivation. Studies with young children found that parents who endorse reading as a pleasurable activity were likely to have children who showed interest in reading and reported high reading motivation (Baker, 2003; DeBarshye, 1995; Yeo et al., 2014).

To my knowledge, only two studies have examined the influence of parents' reading motivation on their children's reading motivation. Lim et al. (2015) examined the results of the 2009 Program for International Student Assessment (PISA) on reading of a nationally representative sample consisting of nearly 5,000 fifteen- and sixteen-year-old Korean students. They found that parents' attitude towards reading positively predicted students' positive reading attitude, and negatively predicted students' negative reading attitude. That is, as parents' positive attitude towards reading increased, their children's positive attitude tended to increase, and their

negative attitude tended to decrease. They also found that parents' reading frequency negatively correlated to students' positive reading attitude, yet they regarded this finding as a result of collinearity issues.

With the same objective as Lim et al. (2015), researchers from the Chilean Agency of Educational Quality (CAEQ) developed a multilevel model to examine how demographic variables, SES factors, literacy-related habits, teacher practices, and school characteristics contributed to predict Chilean tenth graders' reading motivation (Agencia de Calidad de la Educación, 2016). Using the 2015 national reading assessment dataset (SIMCE; System of Measurement of Educational Quality, acronym in Spanish) they found that, while controlling for other variables, parents' self-reported reading motivation level was a significant predictor of students' reading motivation. Specifically, they observed that a one-unit increase in parents' reading motivation resulted in an increase of 0.15 points in students' reading motivation. Unfortunately, the CAEQ report lacked a thorough explanation of their methods.

Summary

Research is inconclusive about the influence of parents' reading frequency on their children's reading frequency. Besides reaching inconsistent conclusions, studies on reading frequency have relied on reports of parents to describe children's reading frequency, and vice versa. These reporting systems hinder the reliability of their findings.

On the other hand, research on the influence of parents' reading motivation on their children's reading habits has been mostly conducted with very young children. Only two studies have examined parents' influence on their adolescent children, yet one of them suspected having collinearity issues (Lim et al., 2015) and the other lacked a detailed explanation of its methods (Agencia de Calidad de la Educación, 2016). Thus, research with more robust methods could

shed light on the still uncertain relationship between parents' reading frequency and motivation and their children's.

Influence of SES on Parents' Likelihood of Being Keen Readers

Although inconsistent, previous research suggests that parents can influence their children's reading and motivation. But what impacts parents' likelihood of being keen readers? In international settings, scholars found that parents' reading-related habits were positively correlated to their SES status (DeBarshye, 1995; McKool, 2007; Neuman, 1986). In Chile, nationally representative statistics show that, on average, people with low SES read less frequently than those with high SES. The demands of poverty, its associated stress, and other life constraints (Berliner, 2006) might decrease the available leisure time and access to books of families with low SES, and the available resources to spend on books (particularly considering the high cost of books in Chile). For example, data from a national survey showed that Chilean people's reading frequency was positively correlated to their head-of-household's educational level (Consejo Nacional de la Cultura y las Artes, 2014). Indeed, of all participants whose head-of-household had at least some tertiary education, 66% declared reading at least one book for pleasure the previous year and 33% consider themselves to be frequent readers; compared to 40% and 11%, respectively, for those whose head-of-household had not completed secondary education.

With limited resources available to be spent on dispensable items, families with low income are likely to have fewer books at home than affluent families. Indeed, Chilean data suggest that a significant and positive correlation exists between household income and number of books at home ($r = 0.44$ in this study). Given that research suggests that readers thrive in book-rich environments (Au & McQuillan, 2001; Gambrell, 2011a; Neuman & Roskos, 1993;

Nieuwenhuizen, 2001), it is likely that children who have large libraries at home will read more than those who do not own as many books. Thus, data suggest that Chilean parents with low SES are less likely to be keen readers than those with high SES.

Yet, parents' SES might not significantly affect children's reading motivation and frequency when parents with low SES are able to overcome the odds and display high levels of reading motivation and frequency. Indeed, scholars found that when they adjusted the correlation between parents' SES and children's reading frequency using parents' reading frequency or motivation as control variables, SES measures were no longer significant predictors of children's reading frequency or motivation (DeBarshye, 1995; McKool, 2007; Neuman, 1986). These findings provide hope by suggesting that the effect of parents' SES on their children's keen-reading profile might be mediated by parental behaviors. More research is needed to confirm whether this is also true for adolescents in Latin America.

Adolescents' Influence on Their Peers' Likelihood of Being Keen Readers

Beside parents, peers can also be a source of influence for adolescents. Researchers have described adolescence as a period when peers become an important referent for identity construction (Wentzel, 2017) and whose influence can affect students' academic performance (Epple & Romano, 1998; Gottfried et al., 2001; Hoxby, 2000) and academic motivation (Altermatt & Pomerantz, 2003; Berndt et al., 1999; X. Chen et al., 2003; Kindermann & Vollet, 2014). Regarding their reading habits, Alexander and Fox (2011) explained that adolescents' decisions about reading are likely to be affected by their perception of what helps them accumulate social capital in the eyes of their peers. For example, while examining the reading habits of over 1,000 adolescents in a predominantly Latino community in the United States,

Moje et al. (2008) observed that almost all participants saw their peers as a source for reading materials, either by recommending what to read or by providing the actual texts.

Based on these studies, we would expect students who are surrounded by keen-reading peers to be more likely to be keen readers themselves, than others whose peers do not show a similar enthusiasm about reading. Nevertheless, to my knowledge, no published study has accounted for the influence of peers on adolescents' reading frequency and motivation. Given that this peer-effect has been documented in other constructs, it seems reasonable to hypothesize that schools' proportion of keen readers might influence students' likelihood of being keen readers, which explains why I included it as a control variable in this study.

In the following section, I explain the methods I used to examine whether an association existed between the odds of being a keen-reading adolescent and having keen-reading parents, while controlling for the influences of peer effects of keen reading. First, I describe the datasets and how I dealt with missing values, and then, I describe the variables and statistical models I analyzed.

Methods

Data

In this study, I used one of the same datasets examined by the CAEQ in 2016, but I expanded it beyond just tenth graders, to include eighth- and sixth-graders, as well. Different from the CAEQ report, I used two composite variables: one that considered students' reading motivation and frequency; and another that considered parents' reading motivation and frequency. I also included peer effects as controls.

The data, collected by the Chilean Department of Education in 2015, results from the yearly process of standardized assessment, the Chilean System for Measurement of Educational

Quality (SIMCE; acronym in Spanish). Researchers may request access to SIMCE data through the Agency for Educational Quality (www.agenciaeducacion.cl). The SIMCE assessment is a series of four standardized tests (usually math, reading, social sciences and natural sciences), administered by the Agency of Educational Quality during two consecutive days in late spring. All students—regardless of the type of school they attend—in the selected cohorts (usually fourth, eighth, and tenth grade) are required to take the tests, which are aligned to the national curriculum. Additionally, students, parents, and teachers respond questionnaires that ask about families' socioeconomic backgrounds, teachers' instructional practices, and additional topics (i.e., bullying, physical health, substance abuse, etc.) that vary each year. I used the 2015 SIMCE dataset because that year parents and students answered questions about their reading frequency and motivation.

The dataset consisted of the population of Chilean students who attended sixth, eighth, and tenth grade in 2015: a total of 613,124 students, 49.32% of whom were female. Of the population, 34.05% of students were sixth graders, 34.95% were eighth graders, and 31% were tenth graders. According to their parents, 12.36% of students had indigenous origins—either the mother or the father declared belonging to an indigenous group (e.g., Aymara, Rapa Nui, Quechua, Mapuche, Atacameño, Coya, Kawéskar, Diaguita or Yagán).

Three types of schools existed in Chile in 2015, classified according to the source of its funding: public schools, schools with both private and public funding, and private schools. Nearly 38% of all students in the dataset attended public schools, 54% attended schools with private and public funding, and 8% attended private schools. Schools in Chile are also classified according to the SES of the families they serve. About 14.31% of all students in the dataset attended schools classified as low, 31.60% attended schools classified as medium low, 29.88%

attended schools classified as medium, 15.40% schools classified as medium high, and 8.80%

schools classified as high.

Missing Values

To deal with missing values (see Table 6), I used multiple imputation. Multiple

imputation (MI) consists in the prediction of 5 to 25 values, for each missing value. MI allows

for complete-data analyses through inferences based on the combination of imputed datasets

which, as a set, "validly reflect sampling variability due to missing values" (Little & Rubin,

2002, p. 85). I used the Stata command "mi impute chained" to impute 25 datasets with 10

iterations to predict values in all variables that had missing values (StataCorp, 2017). I also

included variables with no missing values in the imputation model, like students' gender, type of

school, schools' SES, and schools' location.

All models in my study were estimated using these 25 imputed datasets. The Stata

command "mi estimate" (StataCorp, 2017) estimates models using the imputed data and

adjusting coefficients and standard errors for the variability between imputations, according to

Rubin's combination rules (Rubin, 1987).

Variables

All variables included in my analyses are summarized in Table 6 and 7. Correlations

between variables can be found in Table 8.

Outcome Variable. I used students' keen-reading profile as the outcome variable.

Students responded questions regarding their reading frequency and their reading motivation.

Tenth and eighth grade students reported how much time they spent reading for enjoyment per

day (1 = "I don't read for enjoyment"; 5 = "More than 2 hours per day"). Their mean reading

frequency was 2.32 (SD = 1.34, missing before MI = 6.16%). They also rated their agreement

with eleven items (e.g., "Reading is one of my favorite hobbies", "I like to exchange books with my friends") on a four-point Likert scale regarding their reading motivation (1 = "Strongly disagree", 4 = "Strongly agree"). These items were identical to those used in the 2009 PISA Student Questionnaire. I reverse-coded negative items (e.g., "I read only if I have to"). Principal component factor analysis with orthogonal rotation confirmed that all reading motivation items loaded to a single factor. I used the mean of these eleven items as a scale for reading motivation, even when some students had answered only one or few of them (mean = 2.49, SD = 0.67, missing before MI = 3.57%, Cronbach's alpha = 0.90).

Sixth graders reported how frequently they read for enjoyment (1 = "Never or almost never", 4 = "Every day or almost every day"). Their mean reading frequency was 2.31 (SD = 1.07, missing before MI = 5.51%). They also rated their agreement on a four-point Likert scale with seven items regarding their reading motivation (e.g., "I like to read", "I would be happy if someone gave me a book as a present"). I reverse-coded negative items (e.g., "I read only if I have to"). I used the mean of these seven items as a scale for reading motivation, even when some students had answered only one or few of them (mean = 2.59, SD = 0.67, missing before MI = 4.91%, Cronbach's alpha = 0.84).

Students' reading frequency and mean reading motivation were significantly correlated at r = 0.66 (p <0.001). I combined these variables into a single binary variable to distinguish keen-reading students (1) from reluctant-reading students (0). All students who reported reading at least sixty minutes per day for enjoyment (in the case of eighth and tenth graders) and every day (in the case of sixth graders) and who, on average, agreed or strongly agreed with the items asking about their reading motivation were classified as keen readers (13.96% of the population with available data). Those who read less than sixty minutes per day or less frequently than every

day or who, on average, disagreed or strongly disagreed with the reading motivation statements

were classified as reluctant readers (86.04% of the population with available data). The one-hour

threshold for reading frequency was established after analyzing previous literature which

suggested that above-the-norm readers devote, on average, one hour to reading per day (McKool,

2007; Shapiro & Whitney, 1997).

Table 7

Summary of Level 1 Variables

Variables	Range	*N*	Missing	Mean	*SD*
Students' keen reading status (1=Yes)	0/1	591,833	3.47	0.14	0.35
Parents' keen reading status (1=Yes)	0/1	515,122	15.98	0.16	0.37
SES composite	-4.10- 3.47	518,897	15.37	0.00	1.00
Proportion of keen-reading students per school	0-1	613,033	0.01	0.14	0.07
Number of people in household	2-10	512,464	16.42	4.57	1.54
Students' gender (1=Female)	0/1	613,124	0.00	0.49	0.50
Indigenous origin (1=Yes)	0/1	484,146	21.04	0.12	0.33
Parental expectations	1-6	509,400	16.92	4.71	1.11

Predictors. The student-level predictor in this study was parents' keen-reading profile.

Parents responded questions regarding their reading frequency and their reading motivation. The

items that asked about reading frequency and reading motivation were identical to those in the

2009 PISA parent questionnaire. One parent per student reported how often the parent read for

enjoyment (1= "Never or almost never", 4 = "Every day or almost every day"). The mean

frequency was 2.55 (SD = 1.06, missing before MI = 16.62%).

Parents also rated their agreement on a four-point Likert scale with seven items regarding

their reading motivation (e.g., "I like to spend my time reading", "I enjoy reading"). I reverse-

coded two items with negative wording. I confirmed through principal-component factor analysis

that all items measured a single construct. I used the mean of these seven items as a scale for

parents' reading motivation, even when some parents had answered only one or few of them

(mean = 2.86, SD = 0.63, missing before MI = 16.38%, Cronbach's alpha = 0.80).

Parents' reading frequency and mean reading motivation were significantly correlated at

r = 0.44 (p <0.001). To prevent collinearity issues, I combined these means into a single binary

variable to distinguish keen-reading parents from reluctant-reading parents. I coded parents as

keen readers (1) if they reported reading every day or almost every day and if, on average, they

agreed with all reading motivation statements (mean reading motivation equivalent or higher

than 3). Reluctant readers (0) were those who read less frequently than every day or who tended

to disagree with the reading motivation statements (keen-reading parents = 15.95%, reluctant-

reading parents = 84.05%).

I also included a school-level predictor, by calculating the proportion of keen-reading

students per school, across all grades (mean = 0.14, SD = 0.07).

Student-Level Control Variables. I included binary variables for students' gender

(female = 1) and ethnicity (indigenous = 1). I coded students' as having indigenous origin if

either their mother or their father identified as part of an indigenous group (e.g., Aymara, Rapa

Nui, Quechua, Mapuche, Atacameño, Coya, Kawéskar, Diaguita or Yagán). Additionally, I

included a count of the people living in each household, which was reported by parents as

ordinal choices. I recoded this variable as interval ratio (e.g., "2 people" = 2, "10 or more

people" = 10). Parents also reported the highest educational level they expected their children to

attain (1 = "I don't think she/he will complete high school", 6 = "Postgraduate studies"). Parents

reported the total number of people living at home using ordinal choices. I recoded this variable

as interval ratio (e.g., "2 people" = 2, "10 or more people" = 10). About 1% of the parents

believed that their children would not complete high school, 9.56% believed that their children

would earn a high school degree, 17.99% believed children would earn a technical degree,

50.87% believed they would earn a university degree, and 20.52% believed they would complete

postgraduate studies (missing before MI = 17%).

To depict families' socioeconomic status, I developed a composite variable using parents'

level of education, household income, and number of books at home. In the parent questionnaire,

parents or caregivers reported mothers' and fathers' level of education (1= "Did not study", 20 =

"Doctorate degree"). Mothers' mean number of years of education was 11.71 (SD = 3.70,

missing before MI = 31%), while fathers' mean number of years of education was 11.65 (SD =

3.90, missing before MI = 34%). These two variables were significantly correlated at 0.64 (p

<0.001). Parents also reported their total household income (1= "Less than CLP\$100.000, 15 =

"More than CLP\$2.200.000") and the number of books they had at home (1= "None", 5 = "More

than 100"). I explored the relationship between these four variables using factor analysis with

orthogonal rotation. This analysis showed that all variables loaded to a single factor, suggesting

that, combined, they portrayed a single construct. I standardized each variable and then created a

SES scale, which I also standardized. The scale showed high reliability (Cronbach's alpha=

0.81).

Table 8

Summary of Level 2 Variables

Variables	Number of students	Percent
Type of school		
Public	231,991	37.84
Private with public funding	331,768	54.11
Private	49,365	8.05
Schools' SES level		
Low	87,754	14.31
Medium low	193,777	31.60
Medium	183,221	29.88
Medium high	94,423	15.40
High	53,949	8.80
Schools' location		
Urban	565,306	92.20
Rural	47,818	7.80

School-Level Control Variables. Researchers from the Chilean Ministry of Education classify all schools into five socioeconomic categories: low (serving 14.31% of the students in this study), medium low (31.60%), medium (29.88%), medium high (15.40%), and high (8.80%). To classify schools, they consider students' household income, their parents' level of education, and the percentage of students each school serves who are classified at the two highest vulnerability categories in the vulnerability index. The Chilean vulnerability index is a composite variable calculated by the JUNAEB (National Board of School Assistance and Scholarships, in

Spanish) which considers students' and their families' participation in social services, public health insurance, and scholarships; as well as students' school attendance and academic achievement. They classify all students into four categories: first priority (for those whose vulnerability is the highest), second priority, third priority, and non-priority.

In 2015, three types of schools existed in Chile: public schools which depended both in funding and administration of local municipalities (serving 37.84% of students in this study); private schools with subsidized funding, which were privately administered but received public as well as private funding (serving 54.11% of students in this study), and private schools, which were privately funded and administered (serving 8.05% of students in this study).

Schools are classified as rural (serving 7.80% of students in this study) or urban (serving 92.20% of students in this study) according to their location.

Table 9

Pairwise Correlations between Level 1 Variables

	Variables	1	2	3	4	5	6	7
1	Students' keen-reading status	1.00						
2	Parents' keen-reading status	0.11	1.00					
3	Keen-reading students per school	0.19	0.08	1.00				
4	People in household	-0.02	-0.06		1.00			
5	SES composite	0.10	0.23	0.30	-0.01	1.00		
6	Students' gender (1=Female)	0.22	0.02	0.15	0.01		1.00	
7	Indigenous origin (1=Yes)	-0.02	-0.04	-0.07	0.02	-0.19	0.00	1.00
8	Parental expectations	0.12	0.16	0.23	-0.06	0.49	0.08	-0.10

Note. All shown correlations are significant at $p < 0.05$.

Analysis

To answer my research questions, I used logistic regression models. Despite the nested structure of the data, with students clustered in schools, multilevel modeling was not necessary given the low amount of variance across schools (ICC = 0.04).

I developed three conditional and nested models to analyze relationships between variables:

Model 1: Covariates Model. The first conditional model included all control variables: students' grade, indigenous origin, gender, number of people in the household, parental expectations, family SES, type of school, school SES level, and school location. Given that the odds of being keen readers were likely to be influenced by their peers (Alexander & Fox, 2011; Ivey & Johnston, 2014}, I also included a control variable that considered the proportion of keen-reading students per school, an effect that had not been accounted for in previous research. I predicted that the school-level proportion of keen-reading students would increase the probability of being a keen-reading adolescent, even when controlling for other relevant covariates.

$$\text{logit (Keen Reader } [y = 1]) = \alpha + \beta_1(\text{Control Variables})$$

Model 2: Parents' Reading Habits Model. The second conditional model included all control variables in the previous model and parents' profile of being keen or reluctant readers. The goal of this model was to see whether having a keen-reading parent had a significant effect on students' odds of being keen readers, while controlling for all relevant covariates. I

hypothesized that parents' keen-reading profile would positively predict adolescents' odds of being keen readers.

$$\text{logit (Keen Reader } [y = 1]) = \alpha + \beta_1(\text{Control Variables}) + \beta_2(\text{Keen-Reading Parent})$$

Model 3: Interaction Model. The third conditional model included all variables in previous models, plus an interaction term between the profile of parents as keen readers and families' SES. The goal was to see whether the effect of having keen-reading parents on the odds of being a keen reader varied across socioeconomic levels. Chilean data suggested that parents with low SES were less likely to be keen readers than parents with high SES. Therefore, I assumed that parents with low SES who were keen readers would be exceptionally devoted to reading, given that odds were against them. Based on that rationale, I hypothesized that the effect of having a keen-reading parent on the likelihood of being a keen-reading adolescent would be larger for students with low SES than for those with high SES.

$$\text{logit (Keen Reader } [y = 1]) = \alpha + \beta_1(\text{Control Variables}) + \beta_2(\text{Keen-Reading Parent}) +$$
$$\beta_3(\text{Keen-Reading Parent}) * (\text{Family SES})$$

Results

In this section, I summarize the results I obtained from several analyses, as they correspond to each of my research questions.

Question 1: Parents' Reading Habits across SES Quintiles

Data showed that most Chilean parents see themselves as frequent readers: 22.22% reported reading for their own enjoyment every day or almost every day, 32.96% once or twice per week, 22.88% once or twice per month, and 21.94% reported reading never or almost never.

I compared parents' reading habits across SES quintiles, using the SES composite. As expected from previous literature, parents' mean reading motivation and reading frequency

increased with each quintile (see Table 10). Analysis of variance (ANOVA) with Bonferroni adjustments for multiple comparisons showed that these mean differences were significant for all possible combination of pairs of quintiles, with means at higher quintiles being always significantly higher than those at lower quintiles (p <0.001).

Table 10

Parents' Reading Habits by SES Quintiles

	Mean SES	Mean parents' reading frequency	Mean parents' reading motivation	Percentage of keen reading parents	Total number of parents
Quintile 1	-1.30	2.31	2.62	7.64%	102,616
Quintile 2	-0.56	2.39	2.72	9.79%	103,451
Quintile 3	-0.09	2.50	2.83	13.18%	103,247
Quintile 4	0.44	2.64	2.95	18.27%	102,688
Quintile 5	1.52	2.94	3.18	30.99%	102,678

Note. All means are significantly different from each other ($p < 0.001$).

Question 2: Effect of Parents' Keen-Reading Profile

To explore the effect of parents' reading habits on their children's, I first considered all available data before multiple imputation and counted how many keen-reading parents had keen-reading children. As Table 11 shows, the percentage of keen-reading parents who had keen-reading children (23.03%) was higher than the percentage of reluctant-reading parents who had keen-reading children (12.63%), and vice versa: the percentage of reluctant-reading parents who had reluctant-reading children (87.37%) was higher than the percentage of keen-reading parents

who had reluctant-reading children (76.97%). However, these differences required a rigorous comparison before allowing for reliable conclusions.

Table 11

Students' and Parents' Keen-Reading Profile

Students	Parents		
	Reluctant	Keen	Total
Reluctant	362,760	61,249	424,009
	87.37%	76.97%	85.70%
Keen	52,449	18,323	70,772
	12.63%	23.03%	14.30%
Total	415,209	79,572	494,781
	100%	100%	100%

To further explore those differences, I developed three logistic models (see Table 12). To ease the interpretation of effects in these logistic models, I used odds ratio. Odds ratios compare the odds of an event occurring to the odds of an event not occurring. In this case, they represent the odds of students being a keen reader versus the odds of them being reluctant readers. The natural logarithm of an odds ratio is equal to its log of odds.

The first model included only control variables, and showed that, as expected, SES was significantly and positively correlated to students' odds of being keen readers ($p < 0.001$). This finding was not surprising since preliminary analyses had showed that there was a positive and significant correlation between families' income and the number of books they had at home ($r =$

0.47, $p < 0.001$), and also between parents' keen-reading profile and their SES ($r = 0.23$, $p < 0.001$).

Also consistent with previous literature, the odds for female students were estimated to be 3.5 times higher than those for male students ($p < 0.001$). While controlling for other relevant covariates, tenth graders were estimated to have the highest odds of being keen readers: 29% higher than those of sixth graders. The proportion of keen readers per school was also a powerful and positive predictor of students' odds of being keen readers. Specifically, a 1% increase in the school proportion of keen readers was estimated to increase its students' odds by 5% ($p < 0.001$).

Model 2 included parents' keen-reading profile, along all covariates. As I had hypothesized, a significant and positive relationship was estimated between the odds of being a keen-reading student and having a keen-reading parent, even when controlling for strong predictors. The odds for adolescents with a keen-reading parent were estimated to be 76% higher than those of students with a non-keen-reading parent, keeping other variables constant. I further analyzed this relationship by comparing three separate, identical models for students in each grade (sixth, eight, and tenth) with the same variables in Model 2, except grade. Results showed that the effect of parents' keen-reading profile was positive and significant for students in every grade.

Question 3: SES Moderation

In Model 3, I included an interaction term between parents' keen-reading profile and SES to see if the effect of parents' keen-reading profile on students' odds of being keen readers was consistent across different SES levels. Consistent with my hypothesis, results showed the existence of a significant and negative interaction, suggesting that parents' reading habits affected more steeply the odds of being keen readers of adolescents with low SES than those of

students with high SES. Again, I further explored this interaction by comparing three separate, identical models for students in each grade, with the same variables in Model 3, except grade. Results showed that the interaction effect between parents' keen-reading profile and SES on students' odds of being keen readers was negative and significant for eight- and tenth-grade students, but not significant for sixth graders.

Table 12

Log of Odds of Being a Keen-Reading Student (N=613,124)

Variables	Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE
Grade (Ref=6th)						
8th	0.21***	0.01	0.25***	0.01	0.26***	0.01
10th	0.26***	0.01	0.31***	0.01	0.31***	0.01
Indigenous origin (1=Yes)	0.05**	0.01	0.04**	0.01	0.04**	0.01
Gender (1=Female)	1.26***	0.01	1.26***	0.01	1.26***	0.01
People in household	-0.02***	0.00	-0.02***	0.00	-0.02***	0.00
Parental expectations (1-6)	0.22***	0.01	0.20***	0.01	0.20***	0.01
SES composite	0.23***	0.01	0.18***	0.01	0.20***	0.01
Type of school (Ref=Public)						
Private w/public funding	0.04***	0.01	0.04***	0.01	0.04***	0.01
Private	-0.04	0.04	-0.05	0.04	-0.04	0.04
School SES (Ref=Low)						
Medium low	0.05***	0.02	0.07***	0.02	0.06***	0.02
Medium	0.00	0.02	0.03	0.02	0.02	0.02
Medium high	-0.20***	0.02	-0.16***	0.02	-0.16***	0.02
High	-0.39***	0.04	-0.34***	0.04	-0.33***	0.04
School location (1=Rural)	0.08***	0.02	0.07***	0.02	0.06***	0.02
School proportion of keen readers	5.18***	0.06	5.14***	0.06	5.14***	0.06
Parent keen reader (1=Yes)			0.57***	0.01	0.61***	0.01
Parent keen reader * SES					-0.09***	0.01
Intercept	-4.66***	0.04	-4.73***	0.04	-4.73***	0.04

Note. *p < 0.05, **p < 0.01, ***p < 0.001. All effects reported in log of odds.

Discussion

In this section, I discuss the results summarized in the previous section and comment on their implications for practitioners and researchers. First, I address the core of my research questions regarding the influence of parents' reading habits on their children's probability of being keen readers. Then, I discuss the role that SES played in the models, both as a control variable and as an interaction effect.

Parents' Reading Habits Matter

My study contributes to the field by portraying students from Chile and by examining their likelihood of being keen readers instead of their reading achievement, which had been the focus of most previous research. My findings show that parents who are keen readers are more likely to have keen-reading children, which is consistent with the model developed by Wigfield and Guthrie (1997) and with findings suggested by some previous studies (Agencia de Calidad de la Educación, 2016; Arua & Arua, 2011; Bråten et al., 1999; S.-Y. Chen, 2008; Lim et al., 2015; Yeo et al., 2014).

Furthermore, my study strengthens the conclusions of these studies by using more rigorous methods. For example, unlike Arua and Arua (2011), Bråten et al. (1999), and Yeo et al. (2014), I used a very large and representative dataset: a population of over 600,000 students who attended sixth, eight, and tenth grade in 2015 in Chile. Chen (2008) and Lim et al. (2015) also used large datasets, but their methods were not as robust. While Chen (2008) gauged participants' reading habits using only one item, this study included multi-item scales with strong reliability to measure students' and their parents' reading motivation, and another item to measure their reading frequency. Moreover, to prevent the collinearity issues that Lim et al.

(2015) suspected, I developed a single variable to represent keen-reading profile, thus acknowledging the strong correlation between reading motivation and reading frequency.

My findings confirmed previous research that suggested that students' reading habits are likely to be influenced by their parents', even in secondary school (Arua & Arua, 2011; S.-Y. Chen, 2008; Lim et al., 2015). My models included an aggregated variable that represented the proportion of keen-reading students per school as a control variable, which had not been done in previous studies. The significance of this school-level proportion acknowledges participants' developmental stage and confirms the theories that describe adolescence as a time when peers become an important source of influence (Alexander & Fox, 2011). My findings showed that parents' keen-reading profile was estimated to significantly affect students' odds of being keen readers even while accounting for the influence of peers. This is a novel result that should make parents cherish their relationships with their adolescent children and do everything in their power to become reading role-models.

Conscious of the long-term benefits of reading, policy makers should complement parents' efforts by developing policies to ease parents' access to interesting books. Due to their proximity to families, school libraries might provide an effective way to facilitate parents' access to books if they were also stocked with books for adults. Furthermore, schools could foster close relationships between teachers and parents, in order to join their efforts on nurturing keen readers. For example, schools could try to develop a culture where families' knowledge and practices are valued, and where parents are invited to interact with their children's learning rather than only be informed about it (Turner, 2019). More research is needed to understand how Chilean schools are including parents in their efforts to foster keen-reading students.

Concerns and Hope for Adolescents with Low SES

Previous studies had suggested that the relationship between parents' SES and their young children's reading habits might be mediated by parents' reading-related behaviors (Hansen, 1969; Neuman, 1986; Rowe, 1991). Those findings suggested that what parents did had more impact on their children's reading habits than their SES. However, my findings suggest that, at least among Chilean adolescents, SES is a significant predictor of the likelihood of being a keen reader, even when controlling for parents' reading habits. This finding suggests that, keeping other variables constant, adolescents whose parents have the same levels of reading motivation and frequency, are estimated to have different probabilities of being keen readers based on their parents' SES. A higher level of SES inequality in Chile versus that of other countries could explain why SES is relevant for Chilean adolescents beyond their parents' reading practices. For example, Chile's most recent Gini index is 44.4, while Australia's (the location for Rowe's study) is 34.4 and the United States' (the location for Hansen's and Neuman's studies) is 41.4.

SES might also be especially influential in Chile due to its impact in reducing families' access to books. In the 2014 Chilean national reading survey, 42% of Chilean students between nine and fourteen reported reading books their parents had bought for them, while only 15% declared borrowing books from libraries (Consejo Nacional de la Cultura y las Artes, 2014). We know that readers thrive in print-rich environments (Au & McQuillan, 2001; Gambrell, 1996; Neuman & Roskos, 1993). Yet, given that most Chilean students report that their parents buy the books they read and that they seldom visit libraries, it is logical to conclude that Chilean children with low SES are rarely in print-rich environments. Indeed, data showed that a positive and significant correlation existed between families' income and the number of books they had at

home. Therefore, it is not surprising that SES is such a powerful predictor of the likelihood of being a keen reader student in Chile. If more efforts were dedicated to stock and promote the use of public libraries, perhaps the effect of SES might be mitigated. Future research could examine whether the free digital libraries developed in 2019 by the Chilean Government—Biblioteca Pública Digital and Biblioteca Escolar Digital—are able to offer that rich print environment that readers need.

Making sure families with low SES have frequent access to books is especially important since my findings also showed that the effect of parents' reading profile was more pronounced for students at low SES levels than for their peers at high SES levels. These results suggest that students with low SES have more to gain from having keen-reading parents than affluent students. Given that reading motivation and reading achievement are strongly correlated (Guthrie & Humenick, 2004; Schiefele et al., 2012), efforts to promote parents' reading frequency and motivation might not only increase their children's likelihood of being keen readers but might also help reduce the achievement gap between students with low and high SES.

Limitations

Most data used in this study was self-reported which, especially in the case of reading motivation and reading frequency, might be affected by social-desirability biases. A large population, confidential responses, and low stakes might reduce the impact of such biases, but still there is no easy way to measure whether students and parents were honest in their reports. I used multiple imputation to reduce possible biases in the missing data as much as possible.

Conclusion

The results of this study provide hope in the quest to foster students' reading frequency and reading motivation. It is true that SES affects the development of adolescents' reading

habits, but even in countries like Chile where there is high socioeconomic inequality, my results showed that SES is not all that matters. Parents' reading motivation and frequency can affect their children's, even more so among adolescents with low SES.

The main contribution of this study is the strength of its methods due to the use of a large dataset, composite variables to avoid collinearity, and powerful control variables. This study robustly confirms what previous research had suggested: adolescents whose parents are frequent and motivated readers are likely to be keen readers themselves. I hope these findings encourage all relevant actors to find ways to promote parents' love for reading and, through them, their children's.

Study 3: A Diamond in the Rough: Keen Reading, an Opportunity for Chilean Tenth-Graders

Few people would argue against the importance of reading. Reading increases our knowledge about the world, it broadens the vocabulary to express ourselves, it is a fundamental skill required at most workplaces, and it has the power to affect our levels of empathy, self-esteem, and self-efficacy (Schwanenflugel & Knapp, 2016). Reading proficiency is also key in democratic societies, where citizens' ability to participate depends on their capacity to understand their rights and responsibilities—written in bills and constitutions. Furthermore, understanding what we read is crucial in times like these when the amount of available information is overwhelming (OECD, 2010).

The Chilean national curriculum regards reading as an essential skill (Ministerio de Educación, 2013a), yet only half of all Chilean students graduate from school as proficient readers, even if they were proficient in primary school. Indeed, about 75% of Chilean fourth graders were classified as proficient readers in 2009, but only 48% of them continued to be proficient six years later in tenth grade. In this study, I explored the factors that might contribute to explain tenth graders' reading proficiency. Specifically, I examined the role that students' reading motivation, overall reading frequency, and frequency of reading different genres had on adolescents' proficiency, while accounting for their reading achievement in fourth grade. In this paper, I use the terms reading achievement, reading performance, reading proficiency, and reading comprehension interchangeably to refer to readers' ability to comprehend (form a mental representation) what they read, determined through reading comprehension assessments. My research questions were:

1. Do students who read at or above grade level in fourth grade continue to read at grade level once they are in tenth grade?

2. How do students' keen-reading profile (high reading motivation and frequency), and frequency of reading different genres in tenth grade relate to the odds of reading at grade level in tenth grade, while controlling for reading achievement in fourth grade?

3. How do school-level percentages of keen readers and readers of different genres relate to the odds of reading at grade level in tenth grade, while controlling for reading achievement in fourth grade?

First, I describe the challenge of adolescents' reading proficiency. Next, I review previous research regarding factors that are associated to reading achievement, like reading motivation, reading frequency, reading specific genres, and contextual effects. Then, I explain the dataset and the methods I used. Finally, I display results, discuss implications, and describe limitations.

The Problem of Adolescents' Reading Proficiency

Many scholars have conceived the development of reading proficiency along a continuum, through which students enhance their abilities as they get older. For example, Chall (1983) conceptualized the development of reading skills across five stages: initial decoding, fluency, reading for meaning, relationships and viewpoints, and synthesis. In her model, the skills displayed at each stage grow from those developed at the previous stage, and each stage corresponds to ages from first grade to college. Other scholars have argued that the development of oral language skills begins at birth, arguing that as soon as children are exposed to language, they begin developing their listening and speaking skills which later affect their writing and reading ability (Morrow & Gambrell, 2011).

Although they might disagree on the exact age at which the process begins, scholars have found solid evidence to support the idea of a developmental continuum to understand the process of learning to read. They have observed a strong continuity between skills acquired in early ages and those displayed in later grades. Children who display low levels of reading-related skills in preschool have been known to display similarly low levels when they reach elementary school (Lonigan & Shanahan, 2010; Storch & Whitehurst, 2002). Indeed, early literacy skills such as phonological awareness, knowledge of the alphabet, knowledge of print conventions, and children's ability to write their own names have been shown to predict later literacy development. In 2008, the United States' National Early Literacy Panel synthesized several studies in the field and confirmed the existence of a strong and positive correlation between preschoolers' literacy skills and their decoding, reading comprehension, and spelling skills at least up to fifth grade (National Early Literacy Panel & National Center for Family Literacy, 2008).

Those findings might confuse some people into believing that children who acquire all relevant skills at an early age will automatically become successful readers when they reach adolescence. Data show otherwise. When students' abilities are compared to the proficiency level expected for their age, consistent growth can no longer be assumed. As Snow and Moje (2010) have noted, it is incorrect to assume that the reading instruction children receive in the elementary grades will be enough to carry them successfully through their adolescent years. These scholars have questioned what they called the 'inoculation fallacy', argued by those who believe that "early vaccination of reading instruction will permanently protect against reading failure" (p. 66). According to Snow and Moje (2010), even students who were successful readers in primary school can fail to achieve proficiency in secondary school.

Developmental Perspectives on the Impact of Adolescence on Reading Achievement

Alexander and Fox (2011) used a developmental perspective to explain how the changes that occur during adolescence—conceptualized from 12 to 18 years old—might impact students' reading skills and habits. Acknowledging that brain development in this period should make students better and more efficient readers, they described other ecological and psychosocial changes that could hinder adolescents' reading proficiency.

Ecological Changes

According to Alexander and Fox (2011), changes that occur in the students' school context might explain why many adolescents fail to read proficiently in academic contexts. They argue that secondary schools' focus on content-area learning could be problematic, as students are expected to learn from texts that are usually challenging—informational, abundant in academic language, structured in genre-specific organization, and containing jargon specific to that area—without providing them with explicit reading instruction in each subject (Alexander & Fox, 2011). Secondary schools often fail to teach the "disciplinary literacies" that will allow students to read to learn across the different subjects (Moje, 2008).

Other scholars have argued that adolescents might become struggling readers in secondary school because the reading-related tasks are substantially more complex than those they performed in primary school (Snow & Goldman, 2015). Chall (1983) simply put it this way: first, students are expected to learn to read; then, they should be able to read to learn. However, the ability to decode fluently might be too far from the challenge of gaining new knowledge from a text. Reading to learn involves multiple, simultaneous tasks. For example, the Organization for Economic Cooperation and Development (OECD) described reading proficiency for 15-years old as the ability to integrate and interpret information across multiple texts, to reflect and evaluate

what they read, and to relate the text to their own experiences (OECD, 2010). Similarly, Guthrie et al. (1999) explained that skilled adolescents should be able to integrate information across multiple texts, develop critical relationships between texts and their personal experiences, and effectively employ knowledge gained from texts. Being able to read at this expert level demands not only the acquisition of appropriate skills and frequent opportunities to practice, but also stamina and dedication to go through challenging tasks.

Psychosocial Changes

Psychosocial developments in adolescence might also affect how students relate to reading (Alexander & Fox, 2011). Adolescents' emerging understanding of their own identity and sense of belonging might result in a shift in their interests and motivations, as they explore new activities, acquire new tastes, and develop networks of youth who enjoy doing the same activities. Peers become an important referent for normative behavior and, hence, affect if and how adolescents choose to read, based on what helps them accumulate capital in the eyes of their peers.

According to Ivey and Johnston (2015), reading can be social in two dimensions: physical, when students come together with their peers to talk about books and share recommendations; and imagined, when they connect to the characters in the books, their decisions, and actions. These dimensions match the observations of other scholars, like Moje et al. (2008), who observed that adolescents read materials recommended by their peers, about characters who shared their ethnicities, and about conflicts that resonated with them. These findings suggest that if teachers disregard adolescents' social needs when designing reading plans, they might fail to motivate students to read.

Despite the difficulties that ecological and psychosocial changes present for adolescent readers, some students are able to read at the level expected of them. For example, Chilean data from 2015 showed that 20.61% of the students who read below-grade level in fourth grade achieved proficiency by tenth grade. In the following section, I describe three reading-related factors that might explain individual differences among tenth graders' reading proficiency: reading motivation, reading frequency, and reading different genres.

Factors Associated to Reading Proficiency

Researchers have demonstrated that reading motivation and reading frequency are positively associated to reading proficiency (Froiland & Oros, 2014; OECD, 2010; Wang & Guthrie, 2004). For example, Froiland and Oros (2014) utilized data from the United States' Early Childhood Longitudinal Study-Kindergarten (ECLS-K, 1998 cohort) and followed 8,960 adolescents from fifth to eighth grade. They found that the composite variable for intrinsic reading motivation and self-efficacy (perceived competence as readers) measured in fifth grade was a significant predictor of eighth graders' reading achievement, even when controlling for previous achievement, gender, and socioeconomic status (SES).

Gambrell (2011) defined reading motivation as "the likelihood of engaging in reading or choosing to read" (*p*. 172). According to this definition, students who display high levels of reading motivation are more likely to read than their peers with low levels of reading motivation. Thus, Gambrell's definition links reading motivation to its logical consequence: reading frequency. Following this rationale, I conceptualized "keen readers" as those who report high levels of reading motivation and frequency. This concept of "keen reading" is supported by the work of several scholars who have found that students who report high reading motivation tend to spend more time reading and read more books than their peers who report low motivation (de

Naeghel et al., 2012; Guthrie et al., 1999, 2013; Schiefele et al., 2012; Wigfield & Guthrie, 1997).

Although reading motivation and reading frequency are highly correlated ($r = 0.70$ in this study), to my knowledge, no other study has conceptualized keen reading as a composite variable. Therefore, I discuss previous research regarding reading motivation and reading frequency separately.

Intrinsic Reading Motivation

Reading motivation is a multidimensional construct, which includes at least two types of motivation: intrinsic reading motivation and extrinsic reading motivation. Intrinsic reading motivation refers to someone's "willingness to read because that activity is satisfying or rewarding in its own right", like a reader who likes to read because she is curious or because she likes to become involved in a story (Schiefele et al., 2012, p. 429). In contrast, extrinsic reading motivation is the "effort [to read] directed toward obtaining external recognition, rewards, or incentive" (Guthrie et al., 1999, p. 234), like a student who reads to get a good grade or to obtain a prize.

In this study, I limit my discussion to intrinsic reading motivation, as evidence suggests that it is more effective in promoting reading achievement than extrinsic motivation (Lau & Chan, 2003; Retelsdorf et al., 2011). For example, Retelsdorf et al. (2011) analyzed the growth in reading performance of over 1,500 students from fifth to eight grade. They found that the variable reading for interest—a subset of intrinsic reading motivation—significantly predicted students' growth in reading achievement even after controlling for covariates, whereas reading for competition—a subset of extrinsic reading motivation—did not.

Several studies have shown the positive association between intrinsic reading motivation and reading achievement (Gottfried et al., 2001; Guthrie et al., 2013; OECD, 2010). Motivation has been associated to reading comprehension through several factors. For example, students who like to read will probably dedicate more effort to the task and be more strategic than students who read only if they have to. Indeed, data from the 2009 PISA reading assessment showed that students who reported high levels of reading motivation also employed more strategies while reading (OECD, 2010). As Kintsch and Kintsch (2005) suggest in their theoretical explanation of reading comprehension, readers who are interested in the text are more likely to monitor their own understanding and, thus, are more likely to comprehend what they read.

Intrinsic reading motivation is also associated to reading performance through its link to reading frequency. Studies have shown that students who report high levels of intrinsic reading motivation read more frequently than their peers (Guthrie et al., 1999). Reading frequently, in turn, has been found to be associated with reading achievement, as those who read more tend to perform better in reading assessments (OECD, 2010). Cognitive models of reading can explain the theory behind this association between reading frequency and reading performance. Reading well requires being able to simultaneously decode and understand the words in a text, as well as making inferences and associations between words, sentences, and paragraphs. These processes are demanding for readers' working memory (Kintsch & Kintsch, 2005). However, the more readers read, the more they are able to automatize the decoding processes (they become more fluent), and the more knowledge and vocabulary they acquire. Increased fluency and knowledge make reading easier, and thus enhance their ability to read with comprehension.

The relationship between adolescents' intrinsic reading motivation and reading performance has not been sufficiently examined in Chile. Some of the few exceptions are studies that utilized the 2009 Program of International Student Assessment (PISA) in reading. That year, the students' questionnaire included eleven items to measure intrinsic reading motivation (e.g., "I read only if I have to", "Reading is one of my favorite hobbies"). Results showed that intrinsic reading motivation was significantly associated with Chilean students' reading scores: a one-unit increase in the intrinsic motivation index increased reading scores by 29 points (OECD, 2010, p. 135).

The association between intrinsic reading motivation and reading proficiency was further explored by Gómez Vera et al. (2015). Through a logistic multilevel regression, they examined the contribution of different variables to the likelihood of Chilean students in the lowest SES quintile to perform at or above the mean in the 2009 PISA reading assessment. They observed that students who performed above the mean were more likely to report intrinsic reading motivation than students whose scores were below the mean.

In a complementary study, Valenzuela et al. (2015) analyzed the influence of students' intrinsic reading motivation on Chile's overall improvement in reading scores from the 2006 to the 2009 PISA assessment. After controlling for school-level characteristics, they concluded that, despite the strength of systemic factors (e.g., average parental education, academic tracking, being a single-sex school, etc.), students' intrinsic reading motivation explained about 25% of the improvement. That is, the variance between the 2006 and the 2009 mean score could be attributable, at least in part, to an increment in the number of students who reported reading for enjoyment.

Researchers from the Agency of Educational Quality also explored the relationship between reading motivation and reading proficiency (Agencia de Calidad de la Educación, 2016). Using data from the 2015 Chilean national standardized reading assessment, they developed a multilevel model to predict tenth graders' reading scores and concluded that intrinsic reading motivation was a significant and positive predictor, when controlling for other relevant covariates. However, their report lacked a detailed description of the methods they used to reach such conclusions. My research expands these results by utilizing more rigorous control measures (e.g., fourth grade achievement) and responding to a larger set of research questions.

Reading Frequency

Research has shown that students who read frequently tend to perform better in reading comprehension assessments than those who read less frequently (Anderson et al., 1988; Chinn et al., 2001; Guthrie et al., 1999; Kırmızı, 2011; Morrow, 1992; OECD, 2010; Schiefele et al., 2012; Taboada et al., 2008; Wigfield et al., 2008). This positive relationship has been proven true also among Chilean students. According to the 2009 PISA results report, Chilean adolescents who reported reading daily (60.3% of the sample) scored 23 points higher than their peers who reported never reading for enjoyment (OECD, 2010, Table III.1.4).

Reading Different Genres

Some studies have found that the genre students read can also relate to the reading skills they develop. Specifically, reading fiction (e.g., novels, short stories) has been associated to increased reading comprehension (McGeown et al., 2015; Moje et al., 2008). Moje et al. (2008) examined the reading and writing practices of nearly 1,000 adolescents in urban communities in the US, the majority of whom identified as Latinos (72%) or African American (21%). They observed that students' frequency of reading novels was significantly correlated to their

achievement in English Language Arts, while reading other types of materials (e.g., websites, emails, comics) was not. Moje et al. (2008) theorized that the style of novels might resemble more the style of texts found in the Language Arts subject than other materials. They urged for more research to understand whether the link between out-of-school reading and achievement for adolescents might depend more on what students read (i.e., how closely those texts align to the style of a discipline) than on how much or how frequently they are reading, as had been argued for younger children by Stanovich (1986).

Similarly, researchers from the OECD compared the scores of students who read different materials at least several times a month to those who reported not reading each material or reading it less frequently than several times a month (OECD, 2010) After adjusting the scores using background covariates, they found that reading fiction had the strongest positive association with reading comprehension when compared to reading newspapers, magazines, comics, and nonfiction books (Table III.1.24). However, in the case of Chilean students, reading nonfiction was more strongly associated to reading performance than any other genre (Table III.1.24). More research is needed to explain why the scores of Chilean students might be influenced differently by reading fiction and nonfiction than students from other participating countries.

Contextual Effect of Reading-Related Variables

Researchers have described adolescence as a period when peers become an important referent for identity construction (Alexander & Fox, 2011; Wentzel, 2017), whose influence can affect students' academic performance (Epple & Romano, 1998; Gottfried et al., 2001; Hoxby, 2000) and academic motivation (Altermatt & Pomerantz, 2003; Berndt et al., 1999; X. Chen et al., 2003; Kindermann & Vollet, 2014) explained that adolescents' decisions about reading are

likely to be affected by their perception of what helps them accumulate social capital in the eyes of their peers. Adolescents whose peers value reading are more likely to read than others whose friends do not value reading. While examining the reading habits of over 1,000 adolescents in a predominantly Latino community in the United States, Moje et al. (2008) observed that almost all participants saw their peers as a source for reading materials, either by recommending what to read or by providing the actual texts.

These findings suggest that students who are surrounded by proficient readers might be more likely to be proficient readers themselves. Indeed, Cooc and Kim (2017) studied over 4,000 second and third graders and found a positive association between peers' reading skills and students' own reading skills. Likewise, a keen-reading group might be likely to positively influence its members' reading motivation and frequency, as well. Nevertheless, to my knowledge, no published study has accounted for the influence of peers' reading motivation and frequency on students' reading proficiency. Given that this peer-effect has been documented in other constructs, it seems reasonable to hypothesize that schools' percentage of keen readers might influence students' reading proficiency.

The Present Study

In this study, I explored factors that might predict Chilean tenth graders' reading proficiency, while controlling for their previous achievement in fourth grade, using datasets collected by the Chilean Government.

The conceptual model that guided my study is illustrated in Figure 3. I expected students' reading proficiency level in tenth grade to be explained by both student-level and school-level effects. I hypothesized that one of the strongest predictors of tenth-grade proficiency would be students' reading scores in fourth grade.

However, beyond the predictive power of previous achievement, I hypothesized that students' keen-reading profile, and the frequency with which they read magazines, comic books, fiction books, nonfiction books, and newspapers would influence their reading proficiency. Based on the results reported by the OECD (2010), I hypothesized that reading fiction, nonfiction, magazines, and newspapers would positively relate to students' reading proficiency levels, while the estimated association with reading comic books would not be significant.

Considering the literature on peer effect, I hypothesized that schools' mean fourth-grade reading score, as well as the percentage of keen readers and readers of different genres, except comic books, would also be influential even after controlling for individual-level scores and reading variables.

Figure 3

Conceptual Model
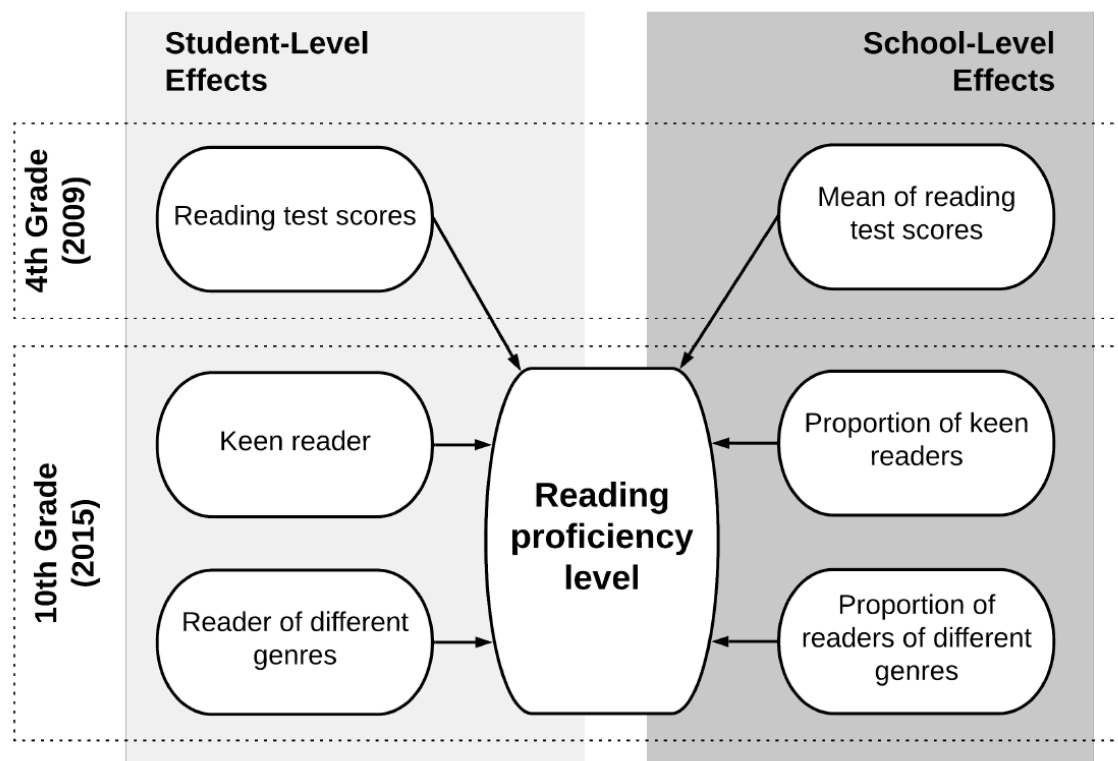
Note. Control variables have not been included in this conceptual model.

Methods

Data

I utilized data from the 2015 Chilean System for Measurement of Educational Quality (SIMCE; in Spanish), collected by the Chilean Department of Education, as part of the process of standardized assessments they administer every year. Each year, all students—regardless of the type of school they attend—in the selected cohorts (usually fourth, eighth, and tenth grade) take the assessment. The SIMCE assessment is a series of four standardized tests, administered by the Agency of Educational Quality during two consecutive days in late spring. This Content

assessments, which at least includes tests on math, reading, social sciences and natural sciences, is realigned to the national curriculum that all Chilean schools—private, public, and subsidized—should follow. Additionally, students, their parents, and their teachers respond questionnaires that ask about families' socioeconomic backgrounds, teachers' instructional practices, and additional topics (i.e., bullying, reading motivation, physical health, substance abuse) that vary each year.

Students' results in the SIMCE reading assessment are classified into three proficiency levels: insufficient, basic, and adequate. Given that I use the SIMCE dataset in my study, I conceptualize reading proficiency using the learning standards on which SIMCE is based, reported in the supreme decree Nº178/2015 issued by the Ministry of Education. According to this decree, levels basic and adequate represent at-grade-level proficiency. Tenth-grade reading proficiency is characterized as the ability to interpret and infer meanings, causes, and motivations from texts, relate ideas between and within texts, locate explicit information, and identify, compare, and assess authors' points of view, purposes, and styles. Tenth graders who display at least these abilities in the SIMCE assessment are classified as proficient readers.

For this study, I used the data for the population of 221,994 Chilean students who attended tenth grade in 7,101 classrooms and across 2,860 schools in 2015. I used students' reading scores in 2009 (fourth grade) and 2015 (tenth grade); students' personal questionnaire in 2015, and their parents' questionnaire in 2015. Students' questionnaire in tenth grade included questions taken from the 2009 PISA reading assessment about the frequency with which students' read different genres, the minutes they spent reading for enjoyment per day, and their intrinsic reading motivation. Information about contextual and socioeconomic information was gathered through the 2015 parents' questionnaires.

The dataset consists of all Chilean students who attended tenth grade in 2015: a total of 221,994 students, 49.85% of whom were female. According to their parents, 7.46% of all students had indigenous origins. Three types of schools existed in Chile in 2015, classified according to the source of their funding: 1) public schools, 2) schools with both private and public funding, and 3) private schools. Nearly 36% of all students attended public schools, 56.05% attended schools with private and public funding, and 8.23% attended private schools. Schools in Chile are also classified according to the SES of the families they serve: 22.71% of students attended schools classified as low, 34.23% attended schools classified as medium low, 22.58% attended schools classified as medium, 12.02% schools classified as medium high, and 8.47% schools classified as high.

Missing Values

To deal with missing values (see Table 13), I used multiple imputation. Multiple imputation (MI) consists in the prediction of 5 to 25 values, for each missing value. MI allows for complete-data analyses through inferences based on the combination of imputed datasets which, as a set, "validly reflect sampling variability due to missing values" (Little & Rubin, 2002, p. 85). I used the Stata command "mi impute chained" to impute 25 datasets with 10 iterations to predict values in all variables that had missing values (StataCorp, 2017) I also included variables with no missing values in the imputation model, like students' gender, type of school, schools' SES, and schools' location.

All models in my study were estimated using these 25 imputed datasets. The Stata command "mi estimate" (StataCorp, 2017) estimates models using the imputed data and adjusting coefficients and standard errors for the variability between imputations, according to Rubin's combination rules (Rubin, 1987).

Measures

All variables included in my analyses are summarized in Table 13. Correlations between variables can be found in Table 14.

Outcome Variable. All models in this study use students' tenth-grade reading proficiency as their outcome variable. Using their scores in the national standardized reading assessment, the Chilean government classifies students into three reading proficiency levels: insufficient, basic, and adequate. These three levels are based on the learning standards for each grade, reported in the supreme decree Nº178/2015 issued by the Ministry of Education and are translated into cut-off scores: all students who score 295 points or more are categorized as "Adequate" readers, those who score between 295 and 250 are categorized as "Basic" readers, and those who score less than 250 are considered "Insufficient" readers. Of these three categories, only insufficient readers are regarded as below grade-level. Following that categorization, all students in this study which were "Basic" and "Adequate" were joined in the single category "At or above grade-level" (47.59%), while all students categorized in the "Insufficient" category were considered as "Below grade-level" (52.41%). This variable had 17% of missing values before MI.

To be considered as reading at grade-level, students needed to—at least—be able to state the main idea of a grade-appropriate text, infer possible causes and consequences of an event as well as characters' purposes, motivations, and feelings in familiar situations, locate explicit information in the body of a text, reflect on a reading to evaluate and pose opinions based on personal impressions and background knowledge, and recognize perspectives and points of view in a text when they are evident.

Students' reading proficiency in tenth grade was positively and strongly correlated to fourth grade reading score ($r = 0.47$).

Student-Level Predictors. I included students' keen-reading students by considering their reading frequency and intrinsic reading motivation. Students reported how much time they spent reading for enjoyment per day (1 = "I don't read for enjoyment"; 5 = "More than 2 hours per day"). Their mean reading frequency was 2.29 ($SD = 1.35$, missing before MI= 17.37%). They also rated their agreement with eleven items (e.g., "Reading is one of my favorite hobbies", "I like to exchange books with my friends") on a four-point Likert scale regarding their reading motivation (1 = "Strongly disagree", 4 = "Strongly agree"). These items were identical to those used in the 2009 PISA Student Questionnaire. I reverse-coded negative items (e.g., "I read only if I have to"). Principal component factor analysis confirmed that all reading motivation items loaded to a single factor. I used the mean of these eleven items as a scale for reading motivation, even when some students had answered only one or few of them (mean = 2.51, $SD = 0.67$, missing before MI= 16.77%, Cronbach's alpha = 0.90).

Given that students' overall reading frequency and mean reading motivation were significantly correlated ($r = 0.70$, $p <0.001$), I combined these variables into a single binary variable to distinguish keen-reading students (1) from reluctant-reading students (0). All students who reported reading at least sixty minutes per day for enjoyment and who, on average, agreed or strongly agreed with the items asking about their reading motivation were classified as keen readers (15% of the population after MI). Those who read less than sixty minutes per day or less frequently than every day or who, on average, disagreed or strongly disagreed with the reading motivation statements were classified as reluctant readers (85% of the population after MI). The one-hour threshold for reading frequency was established after analyzing previous literature

which suggested that above-the-norm readers read, on average, one hour per day (McKool, 2007;

Shapiro & Whitney, 1997).

Students also reported the frequency with which they read magazines, newspapers,

comics, fiction, and nonfiction on a four-point scale (1 = never, 5 = every day). These items were

identical to those used in the 2009 PISA Student Questionnaire (OECD, 2010). Like the

researchers from the OECD, I recoded each of these variables into binary variables: for each

genre, students were categorized as readers o non-readers. Students who reported reading each

genre a couple of times a month or more frequently were categorized as readers of that genre

while the rest were categorized as non-readers.

School-Level Predictors. I created school-level variables for each student-level

predictor, by calculating means or percentages per school: mean of fourth-grade reading scores

(mean = 269.03, SD = 24.38, missing before MI = 0.1%), percentage of keen-reading students

(mean = 0.29, SD = 0.11, missing before MI = 0.07%), magazine readers (mean = 0.51, SD =

0.09, missing before MI= 0.07%), newspaper readers (mean = 0.50, SD = 0.11, missing before

MI= 0.07%), comic readers (mean = 0.35, SD = 0.08, missing before MI= 0.07%), fiction readers

(mean = 0.60, SD = 0.10, missing before MI= 0.07%), and nonfiction readers (mean = 0.44, SD

= 0.10, missing before MI= 0.07%).

Student-Level Control Variables. Considering previous literature, I included students'

fourth-grade reading scores, obtained in the 2009 SIMCE reading test in its original metric

(mean = 273.21, SD= 50.25, range = 99.01-366.7, missing before MI = 32.73%).

I also included students' gender (females = 1, males = 0) and students' ethnicity

(indigenous origin = 1, non-indigenous origin = 0). Parents reported whether students' mother or

father identified his or her origin as indigenous (e.g., Aymara, Rapa Nui, Quechua, Mapuche,

Atacameño, Coya, Kawéskar, Diaguita or Yagán). I coded students' as having indigenous origin

if either their mother or their father identified as such. Students' with indigenous origin

represented 11.29% of the population.

Parents also reported the total number of people living at home (e.g., "2 people" = 2, "10

or more people" = 10) and the highest educational level they expected their children to attain (1

= "I don't think she/he will complete high school", 6 = "Postgraduate studies"). In all multilevel

models, these two variables were treated as interval-ratio.

To depict families' socioeconomic status, I developed a composite variable using parents'

level of education, household income, and number of books at home. In the Parent

Questionnaire, parents or caregivers reported mothers' and fathers' level of education (1= "Did

not study", 20 = "Doctorate degree"). Mothers' mean number of years of education was 11.71

(SD = 3.70, missing = 31%), while fathers' mean number of years of education was 11.65 (SD =

3.90, missing = 34%). These two variables were significantly correlated at 0.64. Parents also

reported their total household income (1= "Less than CLP $100.000, 15 = "More than

CLP$2.200.000") and the number of books they had at home (1= "None", 5 = "More than 100").

I explored the relationship between these four variables using factor analysis with orthogonal

rotation. This analysis showed that all variables loaded to a single factor, suggesting that,

combined, they portrayed a single construct. Thus, I standardized each variable and then created

a SES scale. The scale showed high reliability (Cronbach's alpha= 0.80).

Table 13

Summary of Variables

Variables	N	Missing	Range	Mean	SD
10th grade proficient reader	184,277	16.99%	0/1	0.48	0.50
Indigenous origin (1=Yes)	146,689	33.92%	0/1	0.11	0.32
Gender (1=Female)	221,994	0.00%	0/1	0.50	0.50
People in household	154,743	30.29%	2-10	4.51	1.52
Parental expectations	154,285	30.50%	1-6	4.75	1.07
SES composite	156,962	29.29%	-3-3	-0.00	0.79
4th grade reading score	149,340	32.73%	99-367	273.21	50.25
Keen reader	183,159	17.49%	0/1	0.15	0.36
Magazine reader	183,441	17.37%	0/1	0.52	0.50
Newspapers reader	181,894	18.06%	0/1	0.50	0.50
Comics reader	182,258	17.90%	0/1	0.35	0.48
Fiction reader	181,585	18.20%	0/1	0.60	0.49
Nonfiction reader	180,833	18.54%	0/1	0.45	0.50
School percentage of indigenous students	221,599	0.18%	0-100	12%	0.13
School percentage of female students	221,994	0.00%	0-100	50%	0.20
School mean people in household	221,599	0.18%	2-8	4.53	0.42
School mean parental expectations	221,599	0.18%	2-6	4.73	0.54
School mean SES	221,599	0.18%	-2-2	0.00	0.61
School mean 4th grade reading scores	221,766	0.10%	187-348	269.02	24.38
School percentage of keen readers	221,831	0.07%	0-100	15%	0.08
School percentage of magazine readers	221,831	0.07%	0-100	51%	0.09
School percentage of newspaper readers	221,831	0.07%	0-100	50%	0.11
School percentage of comic readers	221,831	0.07%	0-100	35%	0.08
School percentage of fiction readers	221,831	0.07%	0-100	60%	0.10
School percentage of nonfiction readers	221,831	0.07%	0-100	44%	0.10

Table 14

Pairwise Correlations between Variables

		1	2	3	4	5	6	7	8	9	10	11	12
1	10th grade reading proficiency	1.00											
2	Indigenous origin (1=Yes)	-0.05	1.00										
3	Females	0.14		1.00									
4	People in household	-0.05	0.02	0.01	1.00								
5	Parental expectations	0.29	-0.09	0.09	-0.04	1.00							
6	SES composite	0.26	-0.17		0.01	0.46	1.00						
7	4th grade reading score	0.47	-0.07	0.07	-0.06	0.32	0.33	1.00					
8	Keen reader	0.20	-0.01	0.17	-0.01	0.11	0.09	0.09	1.00				
9	Magazine reader	0.06		0.18		0.05	0.02	0.05	0.10	1.00			
10	Newspaper reader	0.03		-0.03	0.04	0.04	0.05	0.05	0.04	0.35	1.00		
11	Comic reader	0.03	0.02	-0.10		0.01	-0.02	0.01	0.11	0.27	0.17	1.00	
12	Fiction reader	0.17	0.01	0.21		0.10	0.05	0.10	0.31	0.27	0.13	0.30	1.00
13	Nonfiction reader	0.18	-0.01	0.19	-0.01	0.13	0.09	0.12	0.35	0.23	0.18	0.21	0.46

Note. All shown correlations significant at $p < 0.05$.

School-Level Controls. I created school-level aggregated variables for each student-level control, by calculating means or percentages per school: mean score in fourth-grade reading test, percentage of indigenous students, percentage of female students, mean number of people in the household, mean level of parental expectations, mean SES level, percentage of keen readers, and percentage of readers of each genre.

Analysis

I used multilevel models to answer my research questions. I developed four two-level random-intercept models with students (level 1) clustered in schools (level 2). Multilevel modeling was needed in order to account for the nested structure of the data (Luke, 2004). I grand-mean-centered the continuous control variables at the student level: family SES, number

of people in the household, and fourth-grade reading scores. After this type of centering, a value

of zero is interpreted as the mean across all students.

Model 0: Unconditional Model. I used an unconditional model to calculate the

intraclass correlation coefficient, which was found to be 0.32. This coefficient suggests that

about 32% of the variance in students' reading proficiency level (RP) can be attributed to

between-school differences, which confirmed the need for multilevel modeling.

$$logit(RP_{ij}) = \beta_0$$

$$\beta_0 = \gamma_{00} + u_{0j}$$

Model 1: Keen-Reading. The first conditional model estimated tenth graders' reading

proficiency (RP) using all control variables at the student level (StC): indigenous origin, gender,

number of people in the household, parental expectations, SES, and fourth grade reading score;

school-level aggregated variables of student-level controls (ScC): percentage of indigenous

students, percentage of female students, mean number of people in the household, mean years of

parental expectations, and mean fourth grade reading score); as well as students' keen-reading

profile (StKR) and school-percentage of keen-reading students (ScKR). All effects were entered

as fixed.

$$logit(RP_{ij}) = \beta_0 + \beta_1(StC)_{1j} + \beta_2(StKR)_{2j}$$

$$\beta_0 = \gamma_{00} + \gamma_{01}(ScC)_j + \gamma_{02}(ScKR)_j + u_{0j}$$

$$\beta_1 = \gamma_{10}$$

$$\beta_2 = \gamma_{20}$$

Model 2: Reading Different Genres. The second model included all control variables plus students' profiles as readers of different genres (StG), entered separately; as well as the school-percentage of readers of each genre (ScG). All effects were entered as fixed.

$$logit(RP_{ij}) = \beta_0 + \beta_1(StC)_{1j} + \beta_2(StG)_{2j}$$

$$\beta_0 = \gamma_{00} + \gamma_{01}(ScC)_j + \gamma_{02}(ScG)_j + u_{0j}$$

$$\beta_1 = \gamma_{10}$$

$$\beta_2 = \gamma_{20}$$

Model 3: Full Model. The final and full model included all control variables, plus all reading-related variables at the student and the school level. All effects were entered as fixed.

$$logit(RP_{ij}) = \beta_0 + \beta_1(StC)_{1j} + \beta_2(StKR)_{2j} + \beta_3(StG)_{4j}$$

$$\beta_0 = \gamma_{00} + \gamma_{01}(ScC)_j + \gamma_{02}(ScKR)_j + \gamma_{03}(ScG)_j + u_{0j}$$

$$\beta_1 = \gamma_{10}$$

$$\beta_2 = \gamma_{20}$$

$$\beta_3 = \gamma_{30}$$

Results

In this section, I summarize my findings, as they pertain to my three research questions.

Question 1: Continuity of Reading Proficiency

To examine the continuity of students' reading proficiency from primary to secondary school, I first conducted exploratory analyses. As expected, the data showed that reading proficiency was considerably stable across grades (see Table 15). The most likely scenario for tenth grade students was to remain in the same proficiency category as they were in fourth grade. According to the 2015 SIMCE data, of all 131,806 students for whom fourth and tenth grade scores were available, 67.93% (89,529 students) remained in the same proficiency category in

tenth grade as they were in fourth grade: 19.34% remained as non-proficient and 48.59%

remained as proficient. The second most likely scenario was for students to decrease their

reading proficiency: 27.05% were proficient in fourth grade but not in tenth grade (35,658

students). Finally, the least likely scenario was for students to increase their reading proficiency:

the remaining 5.02% corresponded to students who were proficient in tenth grade despite being

non-proficient in fourth grade (6,619 students).

Table 15

Frequency Table of Fourth and Tenth Grade Reading Proficiency

4th Grade	10th Grade		
	Non-Proficient	Proficient	Total
Non-Proficient	25,490	6,619	32,109
	(19.34%)	(5.02%)	(24.36%)
Proficient	35,658	64,039	99,697
	(27.05%)	(48.59%)	(75.64%)
Total	61,148	70,658	131,806
	(46.39%)	(53.61%)	(100%)

Table 16

Log of Odds of Proficient Reading in 10ᵗʰ Grade (Multilevel Logistic Regressions)

Variables	Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE
Indigenous origin (1=Yes)	0.03	0.02	0.02	0.02	0.02	0.02
Gender (1=Female)	0.41***	0.01	0.44***	0.01	0.36***	0.01
People in household	-0.01	0.00	-0.01	0.00	-0.01	0.00
Parental expectations	0.22***	0.01	0.22***	0.01	0.21***	0.01
SES	0.07***	0.01	0.09***	0.01	0.07***	0.01
4th grade reading score	0.02***	0.00	0.02***	0.00	0.02***	0.00
School percentage indigenous students	0.00	0.00	0.00	0.00	0.00	0.00
School percentage female students	-0.00	0.00	-0.00***	0.00	-0.01***	0.00
School mean people in household	0.03	0.04	0.06	0.04	0.04	0.04
School mean parental expectations	0.34***	0.07	0.25***	0.07	0.20**	0.07
School mean SES	-0.42***	0.05	-0.36***	0.05	-0.30***	0.05
School mean 4th grade reading score	0.02***	0.00	0.02***	0.00	0.02***	0.00
Keen reader	0.92***	0.02			0.70***	0.02
Magazine reader			-0.05***	0.01	-0.04**	0.01
Newspaper reader			-0.06***	0.01	-0.05***	0.01
Comic reader			0.08***	0.01	0.05***	0.01
Fiction reader			0.39***	0.01	0.31***	0.01
Nonfiction reader			0.33***	0.01	0.21***	0.01
School percentage keen readers	0.01***	0.00			0.01***	0.00
School percentage magazine readers			0.01**	0.00	0.01***	0.00
School percentage newspaper readers			0.00	0.00	0.00	0.00
School percentage comic readers			-0.00	0.00	-0.01**	0.00
School percentage fiction readers			0.01***	0.00	0.01***	0.00
School percentage nonfiction readers			0.00*	0.00	0.00*	0.00
Intercept	-7.79***	0.39	-8.28***	0.38	-7.64***	0.39
Between-school variance	0.62	0.01	0.58	0.01	0.60	0.01

Note. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. All effects reported in log of odds.

After conducting exploratory analyses, I fitted four multilevel logistic regression models. To ease the interpretation of effects in these logistic models, I used odds ratio. Odds ratios compare the odds of an event occurring to the odds of an event not occurring. In this case, they represent the odds of students being proficient readers versus the odds of them being non-proficient readers. The natural logarithm of an odds ratio is equal to its log of odds.

The null model did not include any covariates, only random effects specific to between-school variation in tenth grade proficiency. In the null model, the estimated intercept was -0.08 (CI = [-0.12, -0.04]) and the estimated variance of schools' random effect was 1.09. Thus, the probability of achieving tenth grade proficiency for a randomly selected student attending a school whose random effect was equal to zero on the logit scale was 48%.

In models 1, 2, and 3 all control variables were included, students' fourth-grade reading scores among them (see Table 16). As expected, students' fourth-grade reading score was significantly and positively associated with the odds of achieving proficiency in tenth grade. Its estimated association remained identical in magnitude across all models (odds ratio = 1.0192, 95% CI = [1.0190, 1.0196], $p < 0.001$): a one-point increase in students' fourth-grade reading score was estimated to increase their odds of achieving proficiency in tenth grade by approximately 2%, while keeping other variables constant. Likewise, a one-point increase in a schools' mean fourth grade reading score was estimated to increase its students' odds of achieving proficiency by 2%.

Question 2: Association between Reading Proficiency and Student-Level Reading-Related Variables

To answer my second research question regarding the link between reading-related variables and students' proficiency, I explored each of those variables separately in Models 1 and 2, and jointly in Model 3 (see Table 16).

Consistent with previous research and my hypothesis, the composite variable of being a keen reader in tenth grade (which considered students' intrinsic reading motivation and overall reading frequency) was a significant predictor of tenth graders' reading proficiency, as seen in Model 1, and along other reading variables in Model 3. In Model 1, the odds of achieving tenth grade proficiency for keen readers were estimated to be 1.5 times higher than those for reluctant readers (odds ratio = 2.4972, 95% CI = [2.4130, 2.5843], $p < 0.001$). The association between students' keen-reading profiles and their tenth-grade reading proficiency remained significant in Model 3, when variables regarding genre-specific reading were included (odds ratio = 2.0153, 95% CI = [1.9447, 2.0884], $p < 0.001$).

Results regarding readers of specific genres in Model 2 partially countered my expectations. Based on previous research, I had expected to see significant and positive associations between reading proficiency and readers of each genre, except for comic readers. Yet, the estimated associations for all genres were estimated to be significant. Surprisingly, magazine and newspaper reading were estimated to be negatively and significantly associated to the odds of achieving tenth grade proficiency, although these associations were much weaker in magnitude than the positive association between reading proficiency and reading fiction and nonfiction.

Consistent with previous literature, the strongest association of genre reading and proficiency was estimated for fiction readers. In Model 2, the odds of achieving proficiency for fiction readers were 48% higher than for readers who reported not reading fiction (odds ratio = 1.4760, 95% CI = [1.4368, 1.5162], $p < 0.001$). The odds of nonfiction readers were estimated to be 39% higher than for students who declared not reading nonfiction (odds ratio = 1.3892, 95% CI = [1.3500, 1.4300], $p < 0.001$. The odds for magazine readers were estimated to be 5% lower than for non-magazine readers (odds ratio = 0.9488, 95% CI = [0.9243, 0.9740], $p < 0.001$), and the odds for newspaper readers were estimated to be 6% lower than for non-newspaper readers (odds ratio = 0.9397, 95% CI =[0.9243, 0.9740], $p < 0.001$). The estimated associations between reading each genre and reading proficiency remained identical in direction and statistical significance, and lower in magnitude in Model 3, when all reading variables were included.

Question 3: Associations between Reading Proficiency and School-Level Reading-Related Variables

To answer my third research question regarding the association between school-level reading variables and students' reading proficiency, Model 1 included the school-level percentage of keen readers, Model 2 included the school-level percentage of readers of different genres, and Model 3 included all school-level percentages of readers. As expected, the school-level percentage of keen readers was significantly and positively correlated to the odds of achieving tenth grade proficiency. Specifically, in Model 1, a 1% increase in schools' percentage of keen readers was estimated to increase the odds of their students by 1% (odds ratio = 1.0091, 95% CI = [1.0076, 1.0107], $p < 0.001$).

Regarding the school-percentages of readers of different genres in Model 2, results showed that the percentage of magazine, fiction, and nonfiction readers positively correlate to

students' odds of achieving reading proficiency: a 1% increase in each of these percentage was estimated to increase students' odds by approximately 1%. Consistent with previous literature, the association between the likelihood of being proficient and the percentage of fiction readers was estimated to be more significant and slightly larger than those of magazine and nonfiction readers.

In Model 3, the percentages of keen readers and readers of different genres remained significant and almost identical, except for the percentage of comic readers which became negative and significant. A 1% increase in the school percentage of comic readers was estimated to decrease students' odds of achieving proficiency by 1% (odds ratio = 0.9949, 95% CI = [0.9911, 0.9987].

Discussion

In this section, I discuss the results described in the previous section. First, I discuss the implications of the strong continuity between fourth and tenth grade reading proficiency. Next, I discuss the unexpected results regarding the associations between likelihood of reading proficiency and reading different genres. Then, I consider the link between being a keen reader and achieving reading proficiency both at the individual and the school level, and the implications of these results in classroom settings.

Reading Well Early Matters

The strong continuity found between students' fourth- and tenth-grade reading proficiency expands previous literature that suggests continuity between children's emergent skills and their reading skills in elementary school (e.g. Stanovich, 1986). Given that I found that nearly 70% of all students will remain in the same proficiency level in tenth grade as they were in fourth grade, families and schools should do more to make sure students receive the support

they need in those elementary years. The investment in high-quality instruction in those years is likely to reap more benefits for the children than remediating lessons conducted during adolescence.

It is true that not all students are able to transfer those skills into adolescence. Findings showed that about 27% of all students will not read proficiently in tenth grade despite being proficient in fourth grade. However, the predictive strength of reading motivation could help revert that situation. If families and schools foster both reading skills and reading motivation early, then perhaps more adolescents might be able to reading proficiently in tenth grade, supported by strong foundations in skills and motivation.

Reading Fiction Compared to Reading Other Genres

Results from Model 2 suggest that what adolescents read is as important as how often they read. Reading fiction a couple of times per month or more frequently strongly and positively predicts Chilean students' reading proficiency, a finding consistent with previous literature (Moje et al., 2008; OECD, 2010). Fiction reading might be positively associated to an increase in the odds of achieving proficiency through variables not included in this model. For example, differences in access to materials, not observed in this dataset, could affect the way that genres relate to the odds of achieving proficiency. In Chile, many periodicals are distributed for free on paper or through free access on the Internet. Thus, students who report reading magazines and newspapers might be reading, literally, because the material fell into their hands. In contrast, students who read fiction need to actively search for books, which is an extraordinary feat in a context where books are considered expensive (Fundación La Fuente, 2010) and where nearly 80% of people report that they have never visited a library (Consejo Nacional de la Cultura y las Artes, 2011). These circumstances could suggest that students who read fiction have a

commitment and dedication to reading, beyond a merely vocal report of enjoying reading, which might not have been completely captured by the reading motivation scale.

Additionally, it is likely that the fiction novels to which students have access (i.e., at their schools' or public libraries) are more similar to the texts they are expected to comprehend in standardized assessments than other materials easily available, like free periodicals. Low-cost materials meant for mass audiences tend to use simple and direct language and include topics of wide appeal. Their style and content are different from those found in literature, which goes through long editing processes and is written for aesthetic purposes. Fiction readers, hence, might be more frequently exposed to sophisticated writing and content knowledge than their peers, and thus might have a head-start when it comes to reading texts of some complexity, such as those found in academic contexts.

Another hypothesis that might explain the link between fiction reading and proficiency over that of other genres is that students who read fiction might be frequent readers since longer than readers of other genres, who might have just discovered a passion for reading. If that was the case, fiction readers would have an advantage over their peers not so much because of the characteristics of the genre they read, but due to the accumulated practice of reading and its effect in honing their abilities to read, automatizing their use of strategies, deepening their wells of knowledge, and increasing their levels of metacognition. More research is needed to understand exactly what mechanisms play a role in the link between reading fiction and reading performance.

Results regarding reading newspapers, magazines, comics, and nonfiction were surprising, considering previous research (OECD, 2010). In my study, only fiction, nonfiction, and comic reading positively predicted reading proficiency, yet in the OECD report all genres

but comics showed a positive correlation to students' scores. Even more, in my study, newspapers and magazines were negatively correlated to the odds of being a proficient reader. Three main differences between this study and the OECD report might explain these discrepant results. First, this study measured the odds of achieving proficiency while accounting for other covariates, including previous achievement, while the OECD report includes background variables but not previous achievement. The presence of this powerful variable likely affected the way in which reading different genres predicted the odds of achieving proficiency. Also, in this study I estimated probabilities of proficiency, whereas researchers from the OECD estimated values for reading scores. This difference in the nature of the outcome variable could also affect the relationship between variables. Finally, the SIMCE assessment at the core of this study is different from the PISA assessment used in the OECD's report. Differences in the texts included in each test, their genres, language, and structure could explain why, for example, reading newspapers was estimated to be negatively associated to SIMCE scores and positively to PISA scores. Analyzing the differences in standardized reading tests could be an interesting area for future research.

Promoting Intrinsic Reading Motivation in Students and Schools

Results from Models 1 and 3 showed that the odds of achieving proficiency for students who are keen readers are significantly higher than for reluctant readers. Expanding previous research (Agencia de Calidad de la Educación, 2016; OECD, 2010; Orellana et al., 2020), these results demonstrated the predictive power of reading motivation and reading frequency, beyond strong control variables, such as previous achievement. It is true that from these models I cannot conclude that reading motivation and reading frequency cause reading proficiency. Yet, the presence of a previous achievement variable suggests that the odds of achieving proficiency in

tenth grade for two students with similar background characteristics who performed equally well in fourth grade but who differ only in their keen-reading profile in tenth grade, will likely favor the keen reader. Promoting adolescents' keen reading, then, seems an effective way to begin to tackle the problem of adolescent literacy.

Teachers could foster students' reading motivation while considering their psychosocial development (Alexander & Fox, 2011). Given that at this age belonging to peer-based networks becomes an important source for identity development, teachers should strive to promote reading in a way that does not threaten students' self-concept nor their needs to socialize.

Research conducted by Ivey and her colleagues (Ivey & Broaddus, 2001; Ivey & Johnston, 2013, 2015, 2018) provides some light on best practices to promote reading among adolescents. Results from their studies suggest that reading motivation and frequency increase when teachers encourage students to choose what they want to read from lists of compelling young adult books and to read at their own pace. Students also reported valuing the opportunities to have lively discussions about books, and to share book recommendations with their peers. While nationally mandated standardized tests are unavoidable, teachers should do their best to foster reading motivation despite these arid assessments. As a consequence of enhanced motivation, students are likely not only to read more frequently but also to heighten their reading self-concept as they became increasingly confident on their ability to read (Ivey & Johnston, 2015).

Results from Model 3 showed that, beyond students' own motivation, schools' percentage of keen readers significantly contributed to predict students' odds of achieving reading proficiency. It seems that being surrounded by peers who are motivated to read is associated with an increase in the probability of performing well, perhaps because large numbers

of motivated students might influence the way that reading is taught and thought about in schools. More research is needed to understand what underlying factors might explain the power of school-level reading habits. This novel result expands the research on peer effects and should encourage relevant actors to build school-wide cultures of loving to read, and not just isolated programs hidden behind classroom doors.

To build this culture of reading, schools could follow the motivational premises sketched in the research conducted by Gambrell (2011a, 2011b), Guthrie et al. (2013), and Wigfield et al. (2014). Scholars agree that to build reading motivation, schools should create book-rich environments, and their curricula should incorporate choice, strategic support for struggling readers, adequately planned time for sustained reading, ample opportunities for social interactions, after-reading tasks that promote hands-on activities and real-world connections, and incentives that emphasize the value of reading. Perhaps Chilean schools could begin with small steps by offering more opportunities for choice and social interactions.

Limitations

Data used in this study was mostly self-reported which, especially in the case of reading motivation, might be affected by social-desirability biases. A large population, confidential responses, and low stakes might reduce the impact of such biases, but still there is no easy way to measure whether students were honest in their reports. As with all other studies, my results are limited by the way in which each variable was measured and the method I used to deal with missing values. I used multiple imputation to reduce possible biases in the missing data as much as possible, especially regarding students at the lower ends of the SES composite.

Conclusion

Reading motivation and reading frequency could potentially buffer students' from lowering their reading proficiency during adolescence. Findings from this study showed that students who reported high levels of reading motivation and who read frequently for pleasure were more likely to read at-grade-level than their peers. Furthermore, my findings show that what adolescents read is as important as how often they read, and they support previous research that suggest that reading fiction is more beneficial to reading achievement than reading other genres.

Schools could do more to foster cultures of reading, given that schools' percentage of keen readers was found to significantly predict students' odds of achieving reading proficiency. To take into account the psychosocial changes that students experience through adolescence as well as experts' advice on the promotion of reading, the reading classroom should become a vibrant space, where readers feel their choices and opinions are respected and where they are invited to share their reading experiences.

Conclusion to the Dissertation

Together, these three studies help depict an accurate picture of the reading situation among Chilean families. From the first paper, we ascertained that Chilean parents value and frequently engage in literacy-related interactions with their children before they enter first grade, and that families' with high SES tend to engage in these activities more frequently. We also learned that those interactions have the power to affect students' reading scores even up to fourth grade, and that the effect is steeper for families at high SES. Thus, we concluded that the differences with which families interact in early literacy interactions can become a source that widens the achievement gap between high and low SES students.

From the second paper, we determined that the likelihood of adolescents being keen readers can be affected by the reading frequency and motivation of their parents, even beyond the influence of their peers. We also observed that SES is a powerful predictor of the likelihood of being a keen reader, and that the effect of having a keen-reading parent is more positively pronounced for adolescents with low SES than for those with high SES. Fostering reading motivation and frequency among parents, thus, seems like an effective way to reduce the reading achievement gap between students with low and high SES, given that reading motivation and achievement are highly correlated (Schiefele et al., 2012; Wang & Guthrie, 2004).

From the third paper, we established that in Chile, like in other countries, a large percentage of students who were proficient readers in elementary grade fail to achieve proficiency in tenth grade. The odds of achieving proficiency in tenth grade, while controlling for achievement in fourth grade, increase when students are motivated and frequent reader. Furthermore, results showed that students who read fiction have a significant advantage in the likelihood of achieving proficiency over their peers who prefer to read other genres. Findings

from this paper also suggested that students' odd of being proficient readers increase when their classmates report high levels of reading motivation and frequency.

Findings from these three studies are supported by the use of a large, nationally representative dataset, control variables of high explicative power, and robust methods, such as multilevel modeling (to account for clustering of errors) and multiple imputation (to deal with missing data). The SES heterogeneity in the population also allowed for reliable conclusions in analyses across different SES groups. These analyses showed that SES explains an important percentage of the variance across the frequency of parent-child early literacy interactions, and across children and adolescents' reading achievement, motivation, and frequency. Nevertheless, the predictive power of such predictors as students' and parents' reading motivation and frequency show promise about variables that could help reduce the achievement gap between low and high SES students. Thus, the main finding of all three papers is that reading achievement can be affected by malleable factors, like early literacy interactions, and parents' and students' reading motivation and frequency. Even when controlling for strong covariates such as previous achievement and SES variables, these malleable factors held significant predictive power.

From this main finding, three implications can be deduced: 1) children's reading skills should be fostered at home from the day children are born and into their adolescent years, 2) parents should model a love for reading for their children to imitate, and 3) schools should foster a culture of love for reading among all their students. Programs like those developed by Fundación Alma, Fundación Niños Primero, and Fundación Oportunidad provide an example of how parents can be supported in their role of first educators of their children. In small-group workshops, one-on-one trainings, and home visits parents and volunteers could talk about ways to foster their children's development in language skills and other domains while conducting

their daily routines. Government programs like Chile Crece Contigo, which accompanies women from their first pregnancy visit till their children are five years old, also have structures in place that could be used to educate parents in best practices around reading while also providing the resources they need to foster a love for reading in their children (e.g., books, literacy toys, writing materials, access to libraries).

Once they enter school, children spend nearly half of their time at school. Schools can do more to foster students' love for reading and join parents' in their efforts. Research has shown that Chilean students' beginning-of-year reading motivation is higher than their end-of-year motivation (Orellana & Baldwin, 2018), which suggests that schools could be hindering—instead of promoting—students' love for reading. Following Gambrell's (2011b) advice on this topic, schools could offer more room for choice, allot more time in class to actually read, assess reading in ways that reflect real-life purposes for reading, make the classroom rich in reading materials, offer many opportunities for students to discuss their readings, and line-up reading incentives so that they reflect the value of reading. Reading educators have shown that it is possible to foster students' love for reading when the curriculum and the environment are adequately aligned to that purpose (Atwell, 2007).

Schools and families could work together to nurture children's love for reading, beginning with the practices that families already embrace. According to research conducted by Moll et al. (1992), and Paratore et al. (1999, 2011) effective family-school partnerships include parents' culture and knowledge in the curriculum. This interaction between the curriculum and parents' knowledge communicates to children that their families' practices are a valued source of learning. In the same way, families' preferred literacy-related interactions could be promoted and

complemented in the classroom, for example, by having teachers learn the songs that parents sing at home, and vice versa.

My research leaves unanswered questions that open the field for more research. First, we need a better understanding of the literacy-related interactions that are happening between parents and children inside Chilean homes. We need naturalistic qualitative studies that describe routines and practices commonly embraced by Chilean families so as to design instruments and programs that are able to tap into those interactions to foster children's and adolescents' love for reading. Most surveys used to gauge reading practices in Chile have been design in other countries, which means that they might fail to capture funds of knowledge that are particular to Chilean families.

Similarly, we need more in-depth descriptions of what is occurring inside Chilean reading classrooms. We need qualitative studies that describe what teachers do before, during, and after asking students to read, surveys that describe the reading plans implemented by schools, analyses that compare practices across schools, and examinations that correlate those actions to students' reading motivation and achievement. Most of the knowledge we have about best practices to foster reading motivation and reading frequency comes from studies conducted in other contexts. Thus, we are not able to know how well it applies to the Chilean classroom without more research on the topic.

Finally, we need to continue to study ways to effectively reduce the reading achievement gap between low and high SES students. We need to discover other malleable factors, besides reading motivation, that could help boost low SES students' reading achievement so that their opportunities to successfully graduate from school, enter college, and find good-paying jobs is not determined by their parents' income or education. An in-depth analysis of the practices of

low SES Chilean families, like the one I suggested before, might inform private organization members and policy makers in the development of reading-related programs that align well to families' needs and desires.

We know that reading well matters and that reading frequently affects how well we read. We also know that most Chilean are accomplishing neither of these objectives, yet. We can do more to foster a love for reading among Chileans by promoting it inside our families and schools.

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