Chile's enduring educational segregation: A trend unchanged by different cycles of reform

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Socioeconomic segregation continues to be a central issue for education systems in which market-driven reforms have been implemented. This study analyses trends of socioeconomic segregation in Chile (1999–2018), considering a period with an absence of policies aimed at reducing segregation (1999–2007) and a later stage (2008–2015) when measures were implemented with the potential to affect the socioeconomic composition of schools. Results show that the segregation of both disadvantaged and wealthy students increased to extremely high levels during the first period, and has not shown signs of any significant decrease since then. The slight reduction observed in the second period is associated with changes regarding school fees in the private subsidised education sector rather than the selectivity status of the schools. The challenges faced in fostering greater socioeconomic integration within a market-driven educational system are discussed in this article.

Keywords: school composition; education inequalities; school choice; educational policy; education markets; privatisation

Introduction

The separation of students from different socioeconomic backgrounds into different schools has been a long-standing concern in the educational arena, due to its effects on student achievement both in the short and the long term (van Ewijk & Sleegers, 2010; Bifulco *et al.*, 2011; Carrell *et al.*, 2018). Not only does the socioeconomic stratification of the school system affect educational outcomes, but it poses a threat to social cohesion (Putnam, 2000; OECD, 2019), as students in these settings may be deprived of the opportunity to learn from the experiences of students belonging to different social, cultural or ethnic groups (Borgonovi & Pokropek, 2017).

An intense theoretical and empirical debate about the benefits and risks of market policies in education has been developed during recent decades. The critics' main concern is the extent to which these schemes may increase the segregation of the school systems (Epple *et al.*, 2017). Under these arrangements, while the separation of the students is not inherently problematic, it is a consequence of seeking to meet

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diverse parental expectations (Chubb & Moe, 1990). Yet, the school choice process is displayed in landscapes of asymmetrical relations (Ball, 2003; Frankenberg & Siegel-Hawley, 2013). Thus, parents from disadvantaged backgrounds may become 'losers' in this process, as they are more likely to base their decisions on 'cost-related' factors rather than the quality of the school (McEwan & Carnoy, 2000; OECD, 2012), and they tend to have less information about the quality of the schools, with a more restricted set of choices (West *et al.*, 1998; Allen *et al.*, 2014). Moreover, the families of students with higher motivation and ability may pursue enrolment in high-quality schools so they can join other children with similar socioeconomic and academic characteristics, causing stratification of the educational system (Bifulco & Ladd, 2007; Raveaud & Van Zanten, 2007; Rowe & Lubienski, 2017). However, this process of segregation may be driven not only by families, but also by institutional features. For example, Verger *et al.*, (2020) argue that schemes of private participation in education are far from irrelevant and may exacerbate segregation when designed to foster market competition (identifying school admissions and tuition as being among the potential drivers). These institutional arrangements, which step back from the traditional public provision, have gained popularity in many educational systems over time (Hogan & Thompson, 2021). For example, between 2000 and 2018, countries such as Sweden, Chile, Hungary, Brazil, Polonia, Italy and Japan have significantly increased the proportion of secondary students enrolled in private subsidised schools (OECD, 2020). In other educational systems (e.g. Belgium, Netherlands, Ireland, France, United States and Spain), financial incentives to foster parental school choice or between-school competition have been put in place (Musset, 2012). Not only do institutional features matter for the private provision framework, but also for desegregation policies. Indeed, some of the recent initiatives in this regard have actually failed to reduce segregation when relying on school choice dynamics (Bonal & Bellei, 2020), or have faced strong opposition from middle-class parents who perceive these changes as a threat to their chances of social mobility (Hernandez & Carrasco, 2020; Carrasco *et al.*, 2021).

Chile has emerged as an iconic case in the implementation of school choice policies after the start of the reform in 1981 (Lubienski, 2006). Not only does Chile have some of the highest levels of private education provision among OECD countries (with 91% of school enrolment under a voucher scheme in 2018), but it also allowed schools to be profit-driven for almost 30 years. The adoption of a market-oriented educational system (and its specific features implemented in Chile) raised concerns about the extent to which structural factors might be accentuating the separation of students from different socioeconomic backgrounds (Hsieh & Urquiola, 2006; Valenzuela *et al.*, 2014). However, for several years little effort was made to address the uneven distribution of students across school sectors and between schools. Only in 2008 did a new cycle of policies start to tackle—either directly or indirectly—the issue of schools' socioeconomic and academic composition. Although not all of these policies were explicitly stated to have the purpose of challenging school segregation, they all have the potential to affect the distribution of students across schools and have been analysed as potential drivers for desegregation. Some of these policies have been criticised for not being strong enough to produce the expected changes (Carrasco *et al.*, 2017; Valenzuela & Montecino, 2017), or for ignoring other drivers of

socioeconomic segregation, such as parental preferences and the geography of opportunities. Recently, a new milestone was achieved in 2015 with the School Inclusion Law, which includes new and more radical regulations specifically oriented towards tackling the issue of segregation through the elimination of the co-payment model and the use of a centralised school admissions system.

This article focuses on presenting the trends of socioeconomic segregation in Chile, considering two stages in the development of policies addressing the socioeconomic composition of schools. In the first period, which we call 'Missing desegregation policies' (1999–2007), the composition of the schools was almost exclusively driven by the school choice scheme and complemented by specific features (co-payment, student selection). No relevant initiatives were established during those years to influence the allocation of students in schools. In the second phase (2008–2015), which we call the period of 'Soft desegregation policies', several measures were introduced to address quality and equity in education. Given their design, the new policies had the potential to affect—either directly or indirectly—schools' socioeconomic composition. They introduced new programmes and regulations to address issues related to co-payment and student selection, and to 'perfect' the voucher system by regulating the supply side of the educational market. Through the analysis of recent trends, this article observes to what extent these efforts are associated (or not) with changes in the separation of social groups in the educational system. Therefore, the analysis should not be understood as an attempt to assess the impact of policy changes on levels of segregation, but rather to gain an understanding of how segregation evolves over time and how this is associated with policy features such as private participation, co-payment and student selection. As the participation of private providers and the use of market schemes have been widespread in many educational systems (Musset, 2012), observing the Chilean case may serve as a cautionary tale about the potential risks regarding segregation, the decisive role of the policy framework and the difficulties faced in counteracting the segregative nature of market dynamics. Indeed, recent research reviewing international experiences highlights the lack of priority to tackle school segregation and confirms an increase in the implementation of policy approaches that clashes with the aim of desegregation (Bonal & Bellei, 2020). Moreover, market-oriented and privatisation policies have proven difficult to be reversed once implemented beyond local contexts (Verger *et al.*, 2017).

This study advances on the previous research in several aspects. First, it observes the evolution of segregation in Chile over two decades, enabling us to understand the changes and continuities regarding the stratification of the educational system and shedding light on its association with different periods of policy enactment.[1] In addition to providing updated and detailed information regarding the second period, this study provides a clear picture of the situation before the implementation of a new major reform regarding co-payment, student selection and profit, which started a gradual rollout in 2015.[2] Second, it shows segregation trends not only at the national level and by type of school, but according to some of the factors that previous literature has identified as helping to exacerbate segregation within a school-choice framework. Indeed, this study provides figures according to the schools' selectivity status and their use of co-payment. While no previous studies have reported segregation figures associated with selectivity, co-payment has been included in only a few. Unlike

those studies, in this article segregation associated with co-payment is reported according to the amount of school fees.[3] Finally, it addresses the issue of high rates of missing data for estimating segregation. This limitation, which affects the segregation estimates, has been systematically ignored in previous studies.

This article is organised according to the following sections. After this Introduction, the second section describes the main features of the Chilean educational system and the recent measures with the potential to affect schools' socioeconomic composition. The third section introduces the data and methods, underlining the advantages of the *H*-index for measuring segregation and the problems associated with missing data. The fourth section presents the results. Finally, a discussion focused on the complexities of fostering greater socioeconomic integration within a market-driven educational system is presented.

Two policy periods for assessing the goal of desegregation

In 1981, Chile was a pioneer in implementing a school choice reform (Gauri, 1998). This set of policies encouraged private stakeholders to participate as education providers by creating and administrating new schools. As part of this scheme, public schools, and the new private subsidised schools, were treated equally in terms of funding by the state. The financing mechanism used a flat voucher assigned to each of the students enrolled in a public or private subsidised school (changed in 2008 by the Preferential School Subsidy Act, SEP), regardless of their socioeconomic background. Families could enrol their children in any school operating under the scheme, irrespective of their place of residence. The market-driven approach operates under the assumption that school competition to capture enrolment will lead to increases in the productivity of the system. As private subsidised schools could be organised as for-profit institutions, greater enrolment would translate into an increase in the owners' profits. Since the implementation of the reform, the private subsidised sector increased its participation from 15% of total enrolment in 1981 to 54% in 2018. The growth of the private subsidised sector came at the expense of municipal schools, which saw their enrolment decrease from 78% of the total to 37% in the same period. Several studies have highlighted that students migrating to the private subsidised sector were comparatively wealthier than those staying in the public sector (Torche, 2005; Hsieh & Urquiola, 2006), with a subsequent social and academic stratification of the educational system (Mizala & Torche, 2012). Apart from the private subsidised schools, a small fraction (between 7% and 9% from 1981 to 2018) of the students attended non-subsidised private schools, which mainly serve students from wealthy families.

Although the basis of the educational system has been unaltered since 1981, several adjustments were introduced in later years. First, in 1994 the private subsidised sector was authorised to charge fees to families. In practice, fees were considered to be a complement to the regular voucher. The maximum co-payment was defined by the national authority, and discounts on the voucher amount were applied as the co-payment increased. The co-payment policy gained popularity over time, with nearly 40% of the private subsidised sector operating under this scheme from 2004 to 2010. Second, selection procedures were allowed in practice, and schools conducted

admission processes based not only on the academic characteristics of the students, but also on their family's social, cultural and economic background. For example, González Parrao (2020)—analysing data from 2004 to 2013—concludes that between 40% and 60% of schools carried out admission procedures, depending on the grade and year under analysis. Both co-payments and student selection have been mentioned as potential drivers of greater segregation in the Chilean context (Valenzuela *et al.*, 2014).

'Missing desegregation policies' (1999–2007) and 'Soft desegregation policies' (2008–2015)

The complex development of the Chilean model of educational reform over the last 40 years has been analysed using wide-ranging taxonomies. In general, the Chilean case has been categorised using a range of policy design aspects such as funding, provision and targets. Building on the previous progress in this regard, we offer a more specific taxonomy in order to examine more precisely the evolution of desegregation policy aims. In our view, previous categories have been extremely helpful in understanding the rationale of reforms (or the action theory behind their impact) as a whole, but less useful in grasping specific policy dynamics. For instance, previous work tends to categorise Chilean reforms into two long periods divided by the transition to democracy. Kauko *et al.*, (2015) used the term 'social-democrat neoliberal post-dictatorial rule' (1990–2014) to describe the period which saw a significant wave of reforms while maintaining or extending market mechanisms. Bellei & Vanni (2015), and later Parcerisa and Falabella (2017), introduced a more nuanced description of reforms. They identified two sub-periods: the third way of reforms (1990–2006), combining market mechanisms with state-focalised intervention, and the rise of the evaluator state (2006–2014), characterised by policies of standardisation, external examination and target-based incentives combined with market mechanisms. Carrasco *et al.*, (2015) called the period a combination of performance and market accountability reforms. Recently, Zancajo (2019) has called attention to the cultural limits of the rise of a new period of Chilean reform: the de-privatisation or regulation of market forces through the School Inclusion Law.

However, while such developments offer a big picture of the Chilean development model, we add here a specific taxonomy to call attention to the policy dynamic related to desegregation policy objectives. For a long period (1999–2007), the Chilean educational system did not implement any national policies explicitly attempting to control, mediate or promote changes in schools' socioeconomic composition.[4] In this period, the student body of the schools was mainly driven by market forces and determined by the private decisions of parents and school owners. In this research, this stage is referred to as a period of 'Missing desegregation policies' to reflect the non-intervention approach of policymakers and regulators regarding issues related to co-payment, student selection or the geographic distribution of schools. After this period, several measures with the potential to affect school composition were taken, such as regulations regarding co-payment and student selection, and adjustments to the voucher design. In this study, the period 2008–2015 is understood as a period of 'Soft desegregation policies' for three reasons. First, although significant changes

were introduced, they were not explicitly aimed at producing changes regarding socioeconomic segregation. On the contrary, these initiatives were established as a series of successive and overlapping actions to address a broad set of issues, with changes in school composition being a potential indirect effect (or mediating mechanism). Second, the policies were weak in several regards. While some were not mandatory for schools, others were unspecific or unclear in their mandate (e.g. SEP). These two elements clearly imposed a limit on the potential for transformation of the schools. Furthermore, the new regulations lacked institutional mechanisms to enforce them (e.g. 2009 selection). Finally, these policy measures intervene in certain features of the supply of education (selection and co-payment), but do not consider any major change in the way families choose their schools. After 2015, a new cycle of policies addressing socioeconomic segregation started to be carried out (School Inclusion Law). These new measures are not the focus of our analysis, although we discuss the implications of our findings for the new regulations.

In 2008, the first initiative with the potential to reduce segregation was introduced. The Preferential School Subsidy Law aimed to tackle two major issues. First, up until that time, the value of the voucher was the same for all students regardless of their socioeconomic background. The new system recognised that underprivileged students required additional support in their education process. Therefore, the size of the subsidy for socioeconomically disadvantaged students was increased, and they became 'more attractive' to the schools in the enrolment process. Although, in theory, the law focuses on closing the achievement gap between privileged and underprivileged students, its implications for schools' socioeconomic composition are clear. Previous studies regarding the Chilean voucher system have suggested that schemes where the amount of the voucher is inversely related to family income, as in SEP, should help to reduce segregation within state-funded schools (González *et al.*, 2004).

Similarly, Gallego & Sapelli (2007) argue that the flat-voucher scheme limits the possibilities of introducing equity into the education system, as poor students are 'more expensive' to schools than 'less poor students'. Therefore, SEP might be considered a response—within the logic of a market-driven system—to the issue of school composition. Second, students using the extra voucher were exempt from taking part in admission procedures or paying fees to schools. Although participation in the Preferential School Subsidy Law scheme was voluntary, a significant proportion of the schools decided to join the programme. In 2018, almost 10 years after implementation of the scheme started, 99% of municipal schools and 79% of private subsidised schools were using the policy.[5] The main limitations of this policy to transform the socioeconomic composition of schools were its voluntary status and the lack of procedures to enforce the prohibition of student selection. Several reports have stated that selective practices were still in place in schools taking part in the policy (Irarrázaval *et al.*, 2012; Carrasco *et al.*, 2014).

In 2009, a new law—the General Education Act—was passed by Congress. This established a prohibition on municipal and private subsidised schools selecting students—up to sixth grade—based on their socioeconomic characteristics or academic potential. Unlike in SEP, this measure was not limited to a specific set of schools, but applied to all publicly funded schools. However, the law was unspecific and

contradictory in many regards, and there were no public institutions able to enforce it (Carrasco *et al.*, 2014).

Analysis of socioeconomic segregation in Chile

Several studies have investigated socioeconomic segregation in the Chilean educational system. This study offers an updated view of how this phenomenon has evolved over 20 years, encompassing different stages of development of the market-oriented educational system. At the same time, it shows how socioeconomic segregation has been associated with some institutional features known to accentuate segregation, such as school admissions and co-payment.

   Several studies using international datasets have warned about the extremely high levels of socioeconomic segregation in Chilean schools. For example, Murillo & Martínez-Garrido (2017) used the Duncan dissimilarity index to compare 15 Latin-American countries and showed that the Chilean level of segregation is only surpassed by Honduras, Panama and Peru. Gutiérrez *et al.*, (2020) find that the level of segregation in Chile is one of the highest among OECD countries for both rich and poor students, and state that no significant reduction in the levels of segregation took place at the secondary level from 2000 to 2015. Chmielewski & Savage (2015) reached similar conclusions when comparing levels of segregation from 1970 to 2012 based on several sources. Interestingly, these authors use data from 1970 and conclude that the Chilean educational system showed, even before the implementation of market-driven reforms, extremely high levels of segregation (based on parental education). These international comparisons place Chile as a hyper-segregation case, with levels surpassing European educational systems frequently mentioned as high socioeconomic stratification cases (e.g. Belgium, Germany, Hungary, Austria) and far from countries with low levels of segregation (e.g. Finland, Norway, Scotland, Wales).

   An intense research agenda has been developed by local researchers. This work is mainly concerned with the effects of the market-like dynamics guiding the educational system. Drawing on Chilean records, Valenzuela *et al.*, (2014) used the Duncan dissimilarity index to investigate the magnitude of socioeconomic segregation, describing trends from 1999 to 2008. Their principal findings suggest high levels of socioeconomic segregation and a slight upward trend in the degree of segregation of poor students during that period, which was especially palpable at the secondary level. The same authors (Valenzuela *et al.*, 2008) have previously found that schools are more segregated than the municipalities where they are located, suggesting that certain features of the educational system (co-payment, selection) are exacerbating the already high segregation of the areas. In a similar vein, Valenzuela *et al.*, (2013a) show that the social groups at the extremes of the socioeconomic distribution (i.e. the top 10% and the bottom 10%) are hyper-segregated, while the middle groups also show high segregation but have similar values. Elacqua (2012) uses several sources of information to estimate the levels of segregation in schools (from 2000 to 2006), according to their type of funding and religious denomination. He concludes that municipal schools are more likely to serve socioeconomically disadvantaged students. Therefore, the segregation of poor students is lower in public schools than in the

private subsidised sector. This study also highlights that for-profit schools are more likely to enrol poor students compared to the non-profit sector, and that Catholic schools have fewer disadvantaged students compared to the public sector and other private subsidised schools. In contrast with most of the Chilean studies, Paredes *et al.*, (2013) do not limit the estimates to the Duncan dissimilarity index but also use the square root index. Their work focuses on analysing how the co-payment is associated with different levels of segregation at the primary school level (from 1999 to 2010) and suggests that the segregation is mainly explained by 'within'-sector segregation (municipal, private subsidised, non-subsidised private) rather than 'between'-sector segregation. All these studies are consistent in showing significant levels of segregation for the Chilean case and suggestive of an association with private provision, co-payment and student admission. However, most of the investigative agenda has focused on data before the implementation of policy measures that could potentially affect school composition and, therefore, segregation.

Few studies have explored the changes associated with the implementation of new policy measures (or those planned at the time). For example, in the context of the public debate related to the School Inclusion Law, Santos & Elacqua (2016) tested the hypothesis of an increase in segregation caused by the school choice policies implemented in Chile by replicating the methodology of the study carried out by Allen (2007). To do so, they generated a counterfactual scenario in which all fourth-grade students (primary level) are allocated to the nearest school. They conclude that segregation is higher in the current scenario and suggest that parental preferences and entry barriers, such as co-payment and selective procedures, may be contributing to the exacerbation of segregation. Valenzuela *et al.*, (2013b) analysed the preliminary effects of the Preferential School Subsidy Law and concluded—based on primary school information in 2011—that the new policy has almost no effect in reducing the segregation of underprivileged students. In sum, previous research has shown a detailed landscape of segregation in the unregulated period, but little is known about how this panorama has evolved, despite the fact that an important set of policy measures have been carried out during the later years.

Data and methods

Measurement of segregation

Segregation—or the separation of two or more social groups—has been discussed extensively by academics for several decades. In the field of education, the notion of 'evenness'—used to address the dissimilar distribution of students from a particular background across schools—has been prevalent (Massey & Denton, 1988). Estimates in this study rely mainly on the square root index (H), which has been claimed to be a reliable way of measuring segregation based on the evenness dimension (Allen & Vignoles, 2007). This index takes values from 0 to 1, where 0 signifies a complete absence of segregation, which implies that the socioeconomic composition of each school is precisely the same as the composition at the national level. In contrast, a value of 1 indicates complete segregation, which means that all schools have only vulnerable or non-vulnerable students.

This article uses the square root index to estimate segregation values as it fulfils the seven properties for a 'good numerical index' as discussed in the literature (Hutchens, 2004; Allen & Vignoles, 2007; Jenkins *et al.*, 2008). Specifically, it strongly fulfils the 'principle of transfers'. This means that the square root index is sensitive to changes of students from schools with different proportions of socioeconomically disadvantaged students. There is no research analysing the patterns of mobility of students across schools in Chile, considering the socioeconomic status (SES) of the schools. However, Larroulet (2011) states that 47% of students move from one school to another during the primary school years (first to eighth grade). As the percentage of students changing schools is high (and the SES characteristics of the schools of origin and destination remain unknown), the square root index is a more sensible option for describing the levels of segregation and variations over time. Selecting an index that fulfils the 'principle of transfers' helps to prevent potential over- or sub-estimates of values due to the specific SES composition of the schools.[6]

In formal terms, the square root index (Equation (1)) can be denoted as

$$H_c = \sum_{i=1}^{S} \left[\frac{a_i}{A} - \sqrt{\frac{a_i b_i}{A B}} \right] \tag{1}$$

where:

H_c = the value of the square root index at the highest level (in this case, the country level)

s = the schools that are part of the country (or school system) under analysis

a_i = the number of students with a disadvantaged socioeconomic background in the school

b_i = the number of students with an advantaged socioeconomic background in the school

A = the total number of students with a disadvantaged socioeconomic background in the country

B = the total number of students with an advantaged socioeconomic background in the country

The threshold to define whether a student comes from a 'disadvantaged' or an 'advantaged' socioeconomic background varies depending on the purpose of the research, but must always be defined as a dichotomous variable (when indices for measuring segregation are used). Yet, binary definitions of social groups are a limited way of expressing SES. To tackle this issue, this study uses a continuous composite variable to represent the students' SES (derived from parental education and family incomes). This allows segregation to be assessed using several cut-off points and—in practice—allows more flexible definitions of the socioeconomically disadvantaged or well-off groups. For example, this enables segregation of certain social groups to be estimated using different parameters (e.g. 'poor' students may be defined as the bottom 10% of the SES distribution, but alternatively as the lowest 20% or 30%).

The *H*-index has an additional advantage for measuring segregation: it is decomposable by subgroups. This is an important factor in this work's scope, which aims to

understand how segregation is distributed across different types of school (regarding ownership, co-payment and selectivity status). In practice, the index reports the proportion of the total segregation due to segregation 'within' a group of schools and 'between' them (e.g. private/public). While the 'within' value is calculated by a weighted aggregation of the segregation in each of the sectors, the 'between' component 'shows the amount of segregation that would remain if there were no segregation within each sector' (Jenkins *et al.*, 2008, p. 25). The total value of segregation represents the sum of the 'within' segregation and 'between' segregation values.

This study does not attempt in any way to assess the impact of the policies implemented in the second period, but to analyse the evolution of the separation of social groups in an educational system that has been characterised as one of the most segregated worldwide. The analysis is based on the association between segregation indices and specific features of the market-oriented educational system in two different policy periods.

Measures and datasets

In order to estimate the trends of socioeconomic segregation in the Chilean educational system, this study draws on an extensive set of administrative records from the Education Quality Measurement System (SIMCE), focusing on fourth grade (as a proxy for primary education). The estimates encompass information from 16 rounds of the examination in fourth grade (from 1999 to 2018), across both public and private schools. Participation rates vary from 98% to 99% for schools and between 88% and 95% for students. As part of the SIMCE examination, questionnaires are sent to parents to collect information about the cultural, social and economic background of the household. This study relies on that information to construct an index of socioeconomic status. Using polychoric correlation,[7] a composite SES measure was estimated based on family income and the education level of the mother and father. The procedure was applied to each year. In all rounds of the test, the eigenvalues of the first component were over 2.0. This component explains at least 73% of the variance of the data each year. The values of the first component were used to classify the students into deciles of SES. This allows observation of how segregation is displayed when different cut-off points are used to define the groups. As in this analysis, the absolute value of SES is less important than the relative position of the students across the distribution; no additional efforts have been made to strengthen the comparisons regarding SES over time. In other words, the analysis will refer to a specific social group (e.g. the 30% most impoverished students each year), but will not consider if they are poorer or wealthier over time.

As with any other administrative record, SIMCE datasets are not flawless. The main limitation regarding this source of information is the fraction of parents who do not answer the questionnaire and for whom an SES measure cannot be estimated. The rate of non-response has increased over time, reaching up to 19% at the primary level. This is particularly problematic as the information is missing-not-at-random. For each year, the differences between groups (respondents and non-respondents) were tested for several observable attributes using *t*-test (e.g. SIMCE

scores, attendance) and chi-square (e.g. school-level SES classification in SIMCE, type of school, gender of entry, rural/urban status of school). Additionally, logistic models were run for each year group to assess the factors associated with being a non-respondent. In general terms, parents not responding to the survey are more likely to be part of public or non-subsidised private schools (compared to private subsidised) or to have their children enrolled in schools classified as low SES or high SES. These figures suggest that information regarding SES may be more markedly biased in the extremes of the socioeconomic distribution. As part of this research, several approaches for dealing with the issue of missing data were considered (such as weighting or multiple imputation techniques). However, due to data restrictions impeding a more sophisticated solution, a relatively conservative approach was implemented. For those cases where parents did not answer the questionnaire, the mean SES value of children's classmates was imputed. Although not perfect, this approach presents the advantage of allowing the inclusion of all students taking the test without affecting the main features of schools' socioeconomic composition. As previous studies have underlined, the socioeconomic composition of Chilean schools is highly homogenous. Therefore, this approach is expected to minimise the bias without introducing distortions to the schools' SES. It can sensibly be assumed that a high proportion of missing-not-at-random information is far more likely to bias the estimates when using an index based on the proportions of groups (figures on response rate before and after imputing values are presented in Appendix 1 and 2).

To present the segregation trends over time, there are three main variables used to classify the schools. First, there is the type of school. As the Chilean educational system is organised considering the participation of private providers, this article starts by presenting the results for each of the three groups mentioned above (public, private subsidised and non-subsidised private). This classification is part of the SIMCE datasets. Second is the level of co-payment. Administrative records provided by the Ministry of Education include detailed information regarding the co-payment arrangements by schools. The records contain a classification of schools according to the amount charged to families (from 2004 to 2018). This information was used to present the results considering the cost for parents, and not only if the school was part of the shared financing mechanism. Finally, the selectivity status of schools was constructed using information from the SIMCE questionnaire submitted to parents. This instrument includes questions about the procedures implemented in the schools' admission process. Two main factors were used to assign a selectivity status to the schools. First is the use of entrance exams. According to previous reports, this is one of the most prevalent ways of implementing student selection. Second is the use of parent interviews. This is a method for assessing parental involvement and a way of screening family social characteristics. While the first strategy is more closely related to academic selectivity, the second is used as a proxy for social selection. Schools were classified as selective when more than half of parents answered that any of these procedures were implemented.

All the *H*-index estimates were calculated using bootstrapping with replacement (50 replicates). This allows us to report whether the observed changes over time are statistically significant.[8]

Results

The findings of this study shed light on the relationship between the levels of socioeconomic segregation of students and institutional features that may accentuate the separation of social groups in a market-driven educational system. This section analyses how socioeconomic segregation has changed over time and to what extent this phenomenon is associated with private educational provision, co-payment and student admission policies. At a conceptual level, we have defined two periods for our analysis: 'Missing desegregation policies' (1999–2008) and 'Soft desegregation policies' (2009–2015), which are characterised by milestones in policy changes. However, at an empirical level, the timespans should not be understood as fixed parameters, but only as a reference. As policies have been implemented gradually (based on region or school level), some of the changes may be observed beyond the reference period. In particular, for the 'Soft desegregation policies' period, we have decided to report information up to 2018, as the new regulations that began to be implemented in 2016 (School Inclusion Law) have not yet affected the students enrolled in fourth grade (who were typically enrolled in 2014, before the implementation of the new policies).

System-level trends of socioeconomic segregation and by type of provider

At the level of the educational system, we see significant differences between the two periods analysed (Figure 1). On the one hand, during the 'Missing desegregation policies' stage there is a significant increase in levels of socioeconomic segregation in schools. This change is statistically significant in all social groups, and is even larger in groups at the extremes of the socioeconomic level distribution (0.06 points on the *H*-index for students in the wealthiest and poorest 10% groups). On the other hand, the 'Soft desegregation policies' period shows a slight reduction in the levels of segregation of social groups. Although it is statistically significant for most of the SES groups, the size of this decrease is so small that it is not sufficient to offset the increase observed in the previous period. The levels of segregation therefore remain extremely high. The data thus suggests that there was no substantive change in the social composition of schools during the 'Soft desegregation policies' period.

As mentioned above, the participation of private education providers has been identified as a factor that gives rise to increases in segregation, both due to the preferences of families and the existing asymmetries between social groups in accessing the educational offer. In the case of Chile, the data confirms that there is an important difference in the levels of segregation of students across different types of schools (Figure 2). On the one hand, the municipal sector shows the lowest levels of segregation for the poorest students and high levels of segregation for socioeconomically advantaged students. On the other hand, in the non-subsidised private sector, the level of segregation of poor students is extremely high and tends to decrease for students with greater resources. Finally, the private subsidised sector is more segregated than municipal schools for almost all social groups (except the wealthiest sectors), and shows an increase in levels of segregation in extreme groups (both wealthy and poor).
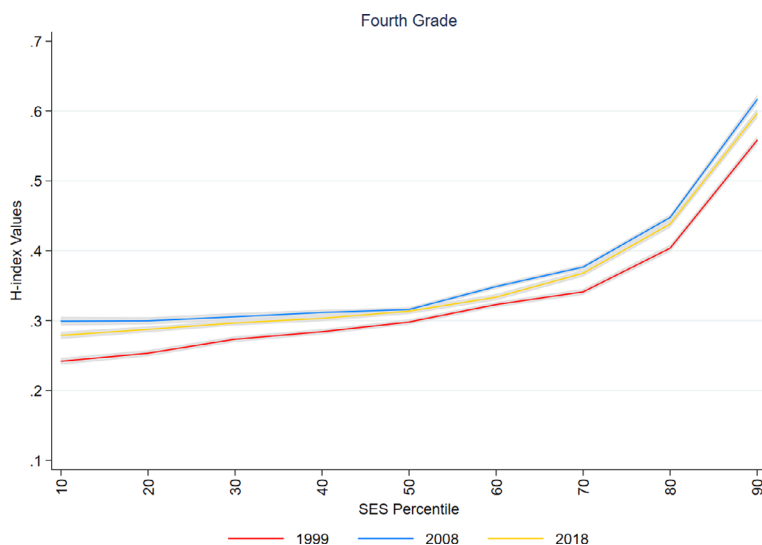
Figure 1.   Changes in socioeconomic segregation at the national level [Colour figure can be viewed at wileyonlinelibrary.com]

The main changes between the periods examined can be observed in the private sector both with and without state financing. However, the municipal sector shows little change over time. During the first period, the largest differences seen in the public sector were an increase in levels of segregation of socioeconomically advantaged groups (0.06 and 0.11 in the 80th and 90th percentiles, respectively). The other social groups showed very small variations. Meanwhile, in the second period the variations observed are of very limited magnitude, with no real change in the characteristics of segregation in the sector. The situation in the public sector in the second policy period contrasts with that observed at the national level, where slight reductions were observed in levels of segregation for almost all the thresholds analysed.

By comparison, significantly more differences are seen in the private subsidised sector. As with the national data, there is a significant increase in the level of segregation in this sector during the 'Missing desegregation policies' period (which was especially notable at the extremes of the SES distribution). However, the reduction seen during the second period is much greater than that observed at the national level. In the case of the private subsidised sector, these decreases were not only sufficient to reverse the increase seen in the former period, but they were also large enough for the segregation of socioeconomically vulnerable groups (lowest 50th percentile) to fall, compared with 1999. For socioeconomically advantaged students, the behaviour is equivalent to that observed at the national level (with a slight decrease in the latter period, but not significant enough to offset the increase seen in the 'Missing desegregation policies' period). These changes imply that the differences in the existing levels of segregation between the private subsidised sector and the municipal sector at the end of the 'Missing desegregation policies' period have decreased significantly during the 'Soft desegregation policies' period (except at the extremes of the SES distribution).
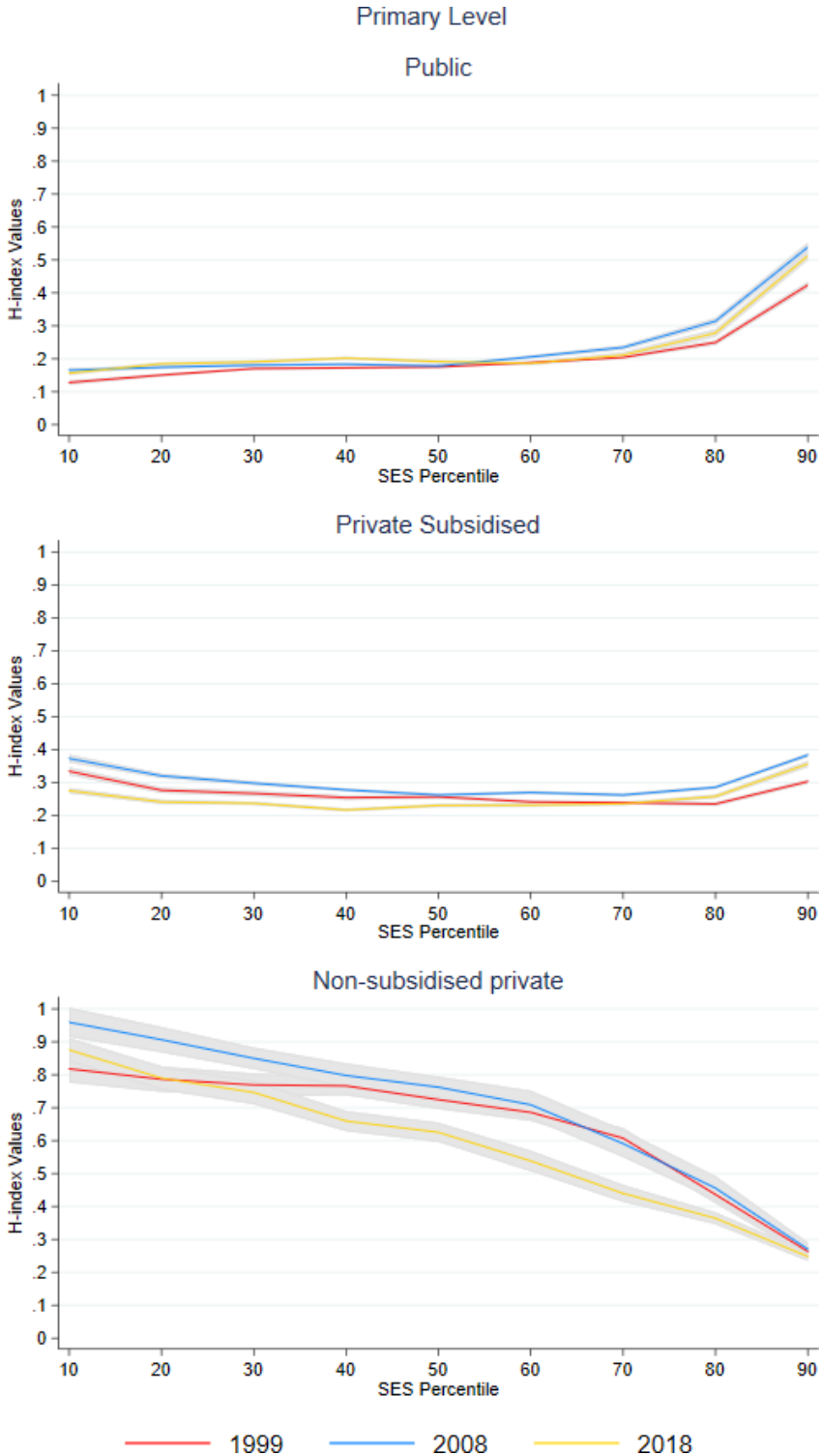
Primary Level

Public

Private Subsidised

Non-subsidised private

Figure 2.   Changes in socioeconomic segregation by type of school [Colour figure can be viewed at wileyonlinelibrary.com]

Finally, the non-subsidised private sector has also shown significant changes. On the one hand, a significant increase in levels of segregation of the poorest students (lowest 30%) can be observed in the 'Missing desegregation policies' period. For the rest of the SES groups there are no statistically significant changes between 1999 and 2008. On the other hand, we can see an important and statistically significant decrease in the 'Soft desegregation policies' period throughout the entire distribution (except in the highest 10%, where the difference is not significant). Although these changes seem substantive, they are not sufficient to alter the hyper-segregated nature of the sector with respect to the poorest students. It is likely that the significant reduction in the level of segregation during the second period is partly due to the transfer of a large group of private subsidised schools to this sector after the implementation of the regulations under the School Inclusion Law. Indeed, between 2016 and 2018, some 74 schools joined this sector. Furthermore, the sector has received a significant number of new students, accounting for 9.0% of total system enrolment in 2018.

Segregation, co-payment and school admissions

Levels of segregation in co-payment schools show significant differences between the two policy periods. While the first stage is characterised by few variations in the levels of segregation, the second shows important progress in terms of student integration (particularly regarding the poorest students). Table 1 shows the values of the *H*-index for different years, as well as the variation between the periods analysed. The 'Missing desegregation policies' period shows very few variations in the segregation of the system, both in free and co-payment schools. In fact, the statistically significant variations that can be observed are confined to certain specific thresholds and are not part of a broader trend. As administrative records for co-payment only began in 2004, the 'Missing desegregation policies' period examined here will probably not be able to adequately account for the temporary variations in the levels of segregation in the system. In contrast, the 'Soft desegregation policies' period is typified by growing integration of the poorest students into the system, both in free private subsidised schools and those that use co-payment. These variations are particularly notable for the poorest students in high co-payment schools. Despite being smaller, reductions in the levels of segregation of the richest students can also be observed in free private subsidised schools. These decreases are consistent with policy efforts aimed at exempting the most vulnerable students from co-payment. In addition, free private subsidised schools also show a decrease in the level of segregation for socioeconomically advantaged students.

The data suggests that, in both the private subsidised and public education sectors, selective schools show higher segregation levels compared with their non-selective counterparts. During the 'Missing desegregation policies' period, selective schools show an upward trend in the level of segregation, while non-selective schools show smaller changes (with the exception of the richest students). Meanwhile, the 'Soft desegregation policies' period displays heterogeneous changes for the different groups. First, non-selective public schools are the only group that shows some increase in levels of segregation, although these are limited to specific social groups. Second, the selective private subsidised sector shows the most notable decrease in

Table 1.   Socioeconomic segregation by co-payment level

	Percentile	2005	2008	2010	2012	2014	2016	2018	Δ(2005–2008)	Δ(2008–2018)	Δ(2005–2018)
Private subsidised free	10	0.27	0.26	0.24	0.24	0.22	0.22	0.21	0.00	−0.05*	−0.05*
	20	0.25	0.24	0.22	0.22	0.20	0.22	0.20	−0.01	−0.04*	−0.05*
	50	0.25	0.21	0.22	0.22	0.21	0.20	0.20	−0.04*	−0.01	−0.05*
	80	0.31	0.31	0.32	0.32	0.31	0.28	0.24	0.00	−0.07*	−0.07*
	90	0.50	0.55	0.56	0.57	0.51	0.50	0.49	0.05	−0.06*	−0.01
Private subsidised low fees	10	0.21	0.24	0.22	0.20	0.21	0.17	0.14	0.03*	−0.10*	−0.07*
	20	0.16	0.16	0.15	0.14	0.13	0.11	0.10	0.00	−0.06*	−0.06*
	50	0.14	0.13	0.12	0.13	0.14	0.13	0.13	−0.01	0.00	−0.01
	60	0.15	0.14	0.13	0.15	0.14	0.14	0.14	−0.01	0.00	−0.01
	90	0.27	0.29	0.33	0.35	0.36	0.34	0.32	0.02	0.02	0.05*
Private subsidised high fees	10	0.58	0.56	0.55	0.50	0.54	0.44	0.41	−0.02	−0.14*	−0.17*
	20	0.44	0.43	0.40	0.38	0.37	0.29	0.29	−0.01	−0.14*	−0.15*
	50	0.19	0.19	0.17	0.18	0.15	0.14	0.14	−0.01	−0.05*	−0.06*
	80	0.13	0.13	0.13	0.15	0.15	0.15	0.15	0.00	0.01	0.02
	90	0.15	0.15	0.15	0.15	0.14	0.13	0.14	0.00	−0.01	−0.01

The groups analysed were recoded based on the original administrative records regarding school fees. In those datasets, schools are classified into four groups according to the gradient of the co-payment. In this study, those groups have been reduced to two co-payment categories to facilitate the presentation of the results (and due to the small number of schools included in the top category in the original datasets). Δ denotes variation between years.
*Statistically significant variation between years (significance level $< 1\%$).

levels of segregation. This suggests there is a greater integration of students from the poorest sectors. Third, non-selective private subsidised schools show reductions in the segregation levels, but they are limited to the most extreme groups in terms of SES. The variations in the levels of segregation associated with schools' selectivity are smaller than those observed with respect to the co-payment status of the schools. Part of the association observed is probably due to the correlation between the schools' selectivity and their co-payment status (Table 2).

Discussion

Two periods of policies have been used to understand the changes in socioeconomic segregation in the Chilean educational system. This study not only confirms the upward trend in segregation in the 'Missing desegregation policies' period, but also provides evidence that little has changed at the national level in the 'Soft desegregation policies' period. Thus, after reaching its highest levels in 2008–2009, the index continued to show extreme separation of social groups (which is especially notable for wealthy students) in 2018.

However, the findings do show some small changes within the school types. In particular, the 'Soft desegregation policies' period has been accompanied by a significant decrease in the level of segregation in private subsidised schools, particularly for students from disadvantaged backgrounds. This downward trend is mostly driven by the changes in the segregation displayed by schools charging fees to families. While the data suggests that changes in the segmentation of students were highly correlated with the co-payment level of private subsidised schools, the selectivity status of the schools appears to play a far less critical role in the decrease in socioeconomic segregation of the students.

The measures implemented during the 'Soft desegregation policies' period have emphasised the importance of factors associated with the supply of education. In that sense, the measures abolishing co-payment and student selection may be interpreted as ways in which to regulate the Chilean educational quasi-market, intervening in the factors hindering the expression of parental preferences. However, the reduction in the levels of segregation observed is not substantial enough to change the extremely segregated landscape in the Chilean educational system. This suggests that, at most, the measures implemented during the period of 'Soft desegregation policies' have helped to halt an upward trend in segregation. Several factors may explain the very limited change in levels of segregation in the more recent period. First, some of the regulations (particularly regarding student selection) had weak design, leaving significant space to implement hidden cream-skimming practices. Second, the measures have focused on the supply side, ignoring the fact that parental preferences can also drive segregation. As is well known, parental preferences vary across socioeconomic groups and poor families experience greater constraints to access educational opportunities. Third, the policies implemented only affected schools with public funding and did not make any effort to influence the extreme segregation of wealthy students, which appears to be entrenched in private schools.

The findings of this study serve as an empirical example of some insights presented in recent academic contributions. As stated by Verger *et al.*, (2020), educational

Table 2. Socioeconomic segregation by school selectivity status

	Percentile	1999	2008	2012	2010	2014	2016	2018	Δ(1999–2008)	Δ(2008–2018)	Δ(1999–2018)
Public selective	10	0.14	0.20	0.20	0.21	0.19	0.21	0.18	0.06*	−0.02	0.04*
	20	0.17	0.21	0.21	0.22	0.20	0.23	0.20	0.03*	0.00	0.03*
	50	0.22	0.23	0.27	0.26	0.27	0.26	0.20	0.01	−0.02*	−0.01
	80	0.33	0.40	0.44	0.45	0.45	0.42	0.34	0.08*	−0.06*	0.02
	90	0.49	0.60	0.64	0.64	0.66	0.65	0.58	0.11*	−0.02	0.09*
Public non-selective	10	0.11	0.11	0.11	0.12	0.12	0.10	0.12	0.00	0.01	0.02*
	20	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.01	0.04*	0.05*
	50	0.14	0.13	0.15	0.16	0.17	0.18	0.18	−0.01	0.05*	0.04*
	80	0.20	0.23	0.26	0.27	0.29	0.27	0.23	0.03*	0.00	0.03*
	90	0.37	0.48	0.51	0.56	0.55	0.51	0.46	0.10*	−0.01	0.09*
Private subsidised selective	10	0.42	0.46	0.46	0.43	0.44	0.42	0.39	0.04*	−0.07*	−0.04*
	20	0.34	0.40	0.40	0.37	0.37	0.37	0.34	0.06*	−0.07*	−0.01
	50	0.28	0.31	0.30	0.30	0.28	0.29	0.28	0.02*	−0.02*	0.00
	80	0.23	0.29	0.29	0.29	0.29	0.29	0.27	0.06*	−0.01*	0.05*
	90	0.27	0.35	0.35	0.35	0.34	0.32	0.33	0.08*	−0.02*	0.06*
Private subsidised non-selective	10	0.22	0.24	0.23	0.21	0.20	0.19	0.19	0.02	−0.05*	−0.03*
	20	0.19	0.20	0.18	0.18	0.17	0.17	0.17	0.02	−0.03*	−0.01
	50	0.21	0.19	0.20	0.20	0.20	0.19	0.19	−0.02*	0.00	−0.02*
	80	0.22	0.25	0.28	0.28	0.29	0.25	0.23	0.03*	−0.02	0.01
	90	0.32	0.41	0.44	0.45	0.44	0.39	0.36	0.08*	−0.04*	0.04*

Information for all years and deciles is available upon request to the corresponding author. Δ denotes variation between years.
* Statistically significant variation between years (significance level < 1%).

systems implementing market-like systems tend to show higher levels of segregation. As expected for the Chilean case, segregation is greater in schools using high fees and implementing selection procedures. The corrections introduced during the period of 'Soft desegregation policies' do not challenge the market dynamics, but constitute change focused on the logic of school choice and competition. As stated by Bonal & Bellei (2020), these approaches are expected to have a limited impact, as parental preferences are a driver of segregation too.

A new cycle of policies addressing segregation has started with the implementation of a recent educational reform (School Inclusion Law) adopting more radical methods to enforce the prohibition of student selection and co-payment. These changes, however, still do not alter the market-oriented nature of the system. In addition to discarding the use of fees, the new scheme relies on a centralised system for deciding admissions to all publicly funded schools. This technology optimises the allocation of students considering their parental preferences, thereby creating a system ruled by parental choices by removing obstacles for the functioning of the market. Although some changes are expected by widening the enrolment options for students (particularly banning co-payment), the segregative nature of the school-choice scheme will remain in place.

A new framework for promoting socioeconomic desegregation may appraise three factors. First, it should address the issue of school composition, considering not only the supply-side factors but also introducing measures to mitigate the tendency of families to confine themselves to socioeconomically homogenous groups (or as an effect of the available local offer). If increasing social mix is a policy objective, new policies should be aimed at actively promoting desegregation and not merely relying on market forces. For example, the new admissions system could introduce more aggressive quotas to promote integration, even if this clashes—to a certain extent—with 'parental choice'. Second, by investing heavily in public education to offer socially fair mixed spaces for families from all socioeconomic backgrounds. Regarding the latter, the new scheme strengthening the public provision of education is an opportunity to achieve more ambitious desegregation goals (including bringing middle to high-SES students back to public schools). Finally, all of the policy measures implemented during recent decades share a common characteristic: they do not include wealthy students in any way, most of whom are enrolled in the non-subsidised sector. Although this sector represents a small proportion of the total enrolment, the expected impact of inclusion (especially regarding social cohesion) will be hard to achieve in a substantive manner if the elite remain extremely cloistered and separated from the rest of the students in the school system.

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Conflict of interest

The author(s) declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

NOTES

[1] The majority of previous studies have focused exclusively on the first period. The most up-to-date research covers up to 2013 (Valenzuela *et al*., 2015; Allende *et al*., 2018).

[2] Although this study covers the period from 1999 to 2018, due to the features of the data only minimal changes associated with the School Inclusion Law are observed.

[3] For example, Paredes *et al*., (2013) and Valenzuela *et al*., (2015) include binary measures of co-payment (with or without).

[4] A 2006 regulation established that 15% of enrolment in all state-funded schools should be comprised of vulnerable students. However, there is no information about the supervision of this norm, and it has been interpreted as being 'forgotten' or 'unknown' by the schools (Treviño *et al*., 2011).

[5] SEP was initially implemented from first to sixth grade (at the primary level), moving to the following grades in subsequent years. The secondary levels were only added to this programme in 2013.

[6] Several studies have used the dissimilarity index (Duncan) to report the unevenness in students' distribution in educational systems. Previous studies comparing both measures have reported a high correlation between them (Jenkins *et al*., 2008; Gutiérrez *et al*., 2020).

[7] Authors of previous Chilean studies (Valenzuela *et al*., 2008; 2014) report using principal components analysis (PCA) to construct the SES index. This work uses a homologous approach and follows the method suggested by Kolenikov and Angeles (2009). The results of the study by Valenzuela *et al*., (2014) (using the Duncan index) were replicated, obtaining similar estimates of segregation for all social groups. The correlation between Duncan and Hutchens estimates is no less than 0.978 in any of the years under analysis.

[8] A detailed summary of statistical differences (99%) across years for each SES decile is available upon request to the corresponding author.

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Appendix 1.

Parents' response rate in fourth grade (SIMCE Questionnaire)

	Fourth grade		
Year	Number of students taking SIMCE	Number of students with information from the parental questionnaire	Parental questionnaire response rate
1999	296,285	252,203	0.85
2002	282,948	248,707	0.88
2005	269,367	238,135	0.88
2006	264,001	233,114	0.88
2007	258,426	229,558	0.89
2008	255,712	223,729	0.87
2009	247,744	199,645	0.81
2010	251,839	220,151	0.87
2011	242,489	211,166	0.87
2012	239,454	200,967	0.84
2013	235,510	198,190	0.84
2014	232,514	194,908	0.84
2015	233,123	192,179	0.82
2016	238,761	192,352	0.81
2017	244,768	199,763	0.82
2018	255,226	208,285	0.82

Appendix 2.

Comparison of segregation estimates with and without imputing schools' SES average score to students with missing information.

Note: Figure shows the values of segregation estimated for each SES decile in 3 years. The vertical axis shows the estimated *H*-index value ignoring the non-response missing values. The horizontal axis shows the values obtained after imputing the mean school SES to the students with missing information. Letter 'S' indicates a statistically significant difference between the two values, while 'NS' stands for a non-statistically significant difference between them. Data shows that estimates without imputation display lower values in the *H*-index, suggesting a potential underestimation in the levels of segregation. This is particularly acute in years with higher non-response rates to the parents' questionnaire.