Turun yliopisto
University of Turku

Relationship between socio-economic backgrounds and secondary school students' achievements and self-beliefs: A comparative study of Finland and Singapore

Lim Ai Hong
Faculty of Education
Department of Education
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THE UNIVERSITY OF TURKU
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Department of Education
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This thesis explores whether the achievement and self-beliefs of secondary school students are related to their socio-economic background in two different national contexts, Finland and Singapore. Both countries have a predominantly public school system and provide a high standard of national education, as evident in the strong PISA performances. However, high stratification is present in Singapore's education system, with students being selected into different academic streams while such differentiation is not present in Finland's comprehensive system.

This comparative study uses 2012 PISA data. The sample consists of 15-year-old Finnish (n = 8829) and Singaporean (n = 5546) secondary school students – from 311 and 172 schools sampled in Finland and Singapore respectively – who participated in 2012 PISA. The PISA Index of economic, social and cultural status (ESCS) was used as a measure of socio-economic background while mathematics test-score plausible values were used as a measure of achievement in this study. Using students' responses to 25 scale-items of the questionnaire, self-beliefs were measured through four dimensions: 'perceived self-efficacy', 'perceived self-concept', 'perceived controllability (internal)' and 'perceived controllability (external)'.

In this study, quantitative analysis was conducted. Besides principal components analysis (PCA) of the questionnaire scale-items, the relationships between the variables socio-economic background, achievement and self-beliefs were investigated using one-way analysis of variance (ANOVA) and multiple regression analysis.

In both countries, a strong relationship between socio-economic background and achievement was found, with socio-economic background found to predict achievement. Secondly, socio-economic background was found to be related to self-efficacy and, to a smaller extent, self-concept in both countries. In Singapore, the relationship between socio-economic background and achievement as well as that between background and self-efficacy beliefs, and that between self-efficacy and achievement were stronger than in Finland. However, self-concept was not found to predict achievement in Singapore although it was a strong predictor of achievement in Finland. Thirdly, perceived controllability was not found to be strongly related to socio-economic background for Finnish students. This was also the case for internal controllability in Singapore but not for external controllability. Lastly, while controllability contributed to the prediction of achievement, but to smaller extents than socio-economic background and self-efficacy, internal controllability beliefs seemed to counteract external controllability.

Keywords: socio-economic background, achievement, self-beliefs, stratification

Table of Contents

List of Tables

List of Figures

1. INTRODUCTION

The topic of this thesis is educational inequality, and a comparative study will be conducted. The relationship between education systems and social class inequalities has long been a dominant research theme in the sociology of education. Education is perceived as both a means to achieve social mobility as well as a tool for the reproduction of social inequalities (Sadovnik, 2008; Saha, 2008).

Over the past few years, there is a growing concern in Singapore over the diminishing success of meritocracy in promoting social mobility in the current society, particularly compared to the previous generation. The Prime Minister of Singapore, Lee Hsien Loong, acknowledged the increasing social stratification at Parliament in 2011:

> We are seeing our society stratifying, which means that children of successful people are doing better while the children of less successful people are doing less well. And fewer children from lower income families are rising and coming up to the top of the heap. […] It is a big gap. It exists in Singapore, sharper than before. (Lee, 2011)

Moreover, considerable public discussion ensued after newspapers reported comments from the principal of Raffles Institution – widely regarded as Singapore's most prestigious secondary school in for being academically selective, and producing elite graduates who occupy leadership positions in government and corporations – pointing out the sharpening social distinction between the school and other secondary schools:

> [Raffles Institution] has become a middle-class school – that is the current reality. […] the school is no longer what many alumni remember it to be in the past, with many students coming from diverse family and socio-economic backgrounds. (Teng, 2015)

The above observations mirror my own, as a secondary school teacher, of a widening achievement gap and social divide between the privileged and the disadvantaged students as well as of increasing segregation between schools, with the former group of students mostly enrolled in top schools, and the majority of the latter attending less prestigious neighbourhood schools.

On the other hand, intergenerational mobility is strongly exhibited in the Nordic countries (Blanden, 2013). Since 2000, the education system of Finland has been consistently regarded as an exemplary one that combines high quality with equity in education in the Program for International Student Assessment (PISA) studies (OECD, 2004; OECD, 2007; OECD, 2010; OECD, 2013b).

The objective of this comparative study is to explore the relationship between socio-economic backgrounds of secondary school students, and their educational achievements and self-beliefs in two different national contexts, Finland and Singapore, using 2012 PISA data.

Since the 1966 Coleman report, educational inequality associated with social class has been investigated in a number of international studies (Gamoran & Long, 2006; Chudgar & Luschei, 2009). Today, educational inequality still remains prevalent in the 21st century. There remains a lack of consensus on the effectiveness of schools in mitigating social class inequalities, and whether educational systems and policies actually exacerbate these inequalities. Over the previous decades, several attempts have been made to explain social class inequalities in education, with an emphasis on parental capital (Swartz, 1997; Bourdieu, 1999; Ball, 2003; Reay, 2004; Reay, 2010; Weis, 2010).

In addition, comparative studies have pointed out that greater inequity in educational outcomes, which are related to social class, exists in education systems with high stratification compared to those with low stratification (Oakes, 1992; Gamoran, 2010; Weis, 2010; Lamb, 2011; OECD, 2011). For the purpose of this research, Finland and Singapore are selected as there is no existing comparative study on these two countries. Both countries have a predominantly public school system to make education accessible to the masses, and provide a high standard of national education, as evident in the strong PISA performances in 2009 and 2012. However, high stratification is present in Singapore's education system – which operates on meritocratic principles – with students being selected into different academic streams while such differentiation is not practised in Finland's comprehensive system where the emphasis of education is on equity.

This thesis consists of the following sections: first, I provide an overview of the research in this field and a theoretical framework; second, I outline the research questions; third, I explain the research design, the methods of data collection and the statistical analysis; and fourth, I present the results. Lastly, I conclude by discussing the implications of the results and the limitations of this study as well as some suggestions for future research.

2. LITERATURE REVIEW

The relationship between education systems and social class inequalities has always been a dominant research theme in the sociology of education. On one hand, functionalists view education as a vital part of a meritocratic selection process to promote social mobility and achieve equality in society; on the other hand, schools have been perceived by conflict theorists as sites of class struggle and tools for the reproduction of social inequalities to preserve the position of the dominant class (Sadovnik, 2008; Saha, 2008).

Education systems worldwide have long been concerned with issues of equality or social justice. Besides social class inequalities, there are other types of educational inequality associated with gender – for instance, the lack of access to education for girls in developing countries in South Asia (Rizvi & Lingard, 2010); the 'boy problem' occurring in many developed nations, where girls' educational attainment has improved and overtaken that of boys, and girls going to university outnumber boys (ibid.); the low enrolment of females in the disciplines of science, technology, engineering and mathematics (STEM) in higher education (Gurría, 2014) – and those associated with race and ethnicity – such as the under-achievement of particular groups like the indigenous people in Australia, the Afro-Caribbean boys in the United Kingdom and the blacks in the United States (Rizvi & Lingard, 2010).

Reay (2006), in her discussion of the situation in schools in the United Kingdom, argued:

> […] until we address social class as a central issue within education then social class will remain the troublesome un-dead of the English education system. I am not conjuring up here some gentle shadowy ghost haunting our classrooms but a potential monster that grows in proportion to its neglect. (Reay, 2006, pp. 289)

This 'monster' is an increasingly pressing issue for policy makers, with the global trend of widening income and wealth gap (Rizvi & Lingard, 2010). Singapore's Gini coefficient was 0.358 (source year: 2015) (Singapore Department of Statistics, 2016a) while that for Finland was 0.257 (source year: 2014) (OECD, 2016). Thus, we will examine social class inequalities in this study. The objective of this comparative study

is to explore whether the achievement and self-beliefs of secondary school students are related to their socio-economic background in two different national contexts – Finland and Singapore – using 2012 PISA data.

Educational Equality

First, let us start with the definition of educational equality. Central to the debate on educational equality/equity is the distribution of resources – whether to apply non-discriminatory, equal treatment uniformly to all or to 'level the playing field' by redistributing resources to help disadvantaged students compete on fair grounds and 'catch up' (Roemer, 1998).

There is also the question of which aspect to be equal in: equal access, equal survival (educational attainment), equal output (academic achievement) or equal post-education outcomes (employment/income), according to Farrel (as cited in Espinoza, 2007). While educational policies that remove barriers to ensure wider participation in education are necessary as the first step towards reducing social stratification, such policies alone are insufficient since they are based on a narrow definition of educational equality as access to education (Rizvi & Lingard, 2010). Proponents of social justice suggest a broader view of the multi-dimensional nature of justice, in terms of not only distributive but also recognitional and associative justice (Gewirtz, 2006).

In addition, there is a call for stronger notions of educational equality that emphasize not only access but also "people's capacity to benefit from state provisions" (Rizvi & Lingard, 2010, pp. 76). Equity in education is defined by PISA as "providing all students, regardless of gender, family background or socio-economic status, with similar opportunities to benefit from education" (OECD, 2013b, pp. 27). In Nordic welfare states, education is a basic human right, and equity in education is of great importance. The Finnish comprehensive school or *peruskoulu* system embodies the equity principle in Finland (Sahlberg, 2011; Niemi, 2014), which entails that:

> […] all people must have equal access to high-quality education and training. The same opportunities to education should be available to all citizens irrespective of their ethnic origin, age, wealth or where they live. (Finnish National Board of Education, 2012, pp. 6)

Meanwhile, there is another – meritocratic – view of equality that places emphasis on equalizing opportunity instead of equalizing outcomes (Teh, 2014). In Singapore, meritocracy is upheld as a principle of advancing an individual based on his/her ability and academic achievement, regardless of his/her ethnicity or socio-economic background (Goh, 2013; Deng & Gopinathan, 2016).

For the purpose of this research, Coleman's concept of educational equality is adopted. Coleman (1968) advocated a definition of equality of educational opportunity as the equality of outcomes despite students' different family backgrounds and abilities. Here, the term 'outcomes' used by Coleman refers to learning achievement-related outcomes in schools (and differs from Farrel's term 'post-education outcomes'). In this view, the onus is on schools to play a more active role in mitigating socioeconomic status-based achievement gaps. Much debate has been on the effectiveness of schools in mitigating social class inequalities, and whether educational systems and policies actually exacerbate these inequalities.

2.1 Socio-economic Background, Educational Success and Self-beliefs

Socio-economic Background and Educational Success

Coleman's 1966 report, Equality of Educational Opportunity, revealed a large achievement gap between black and white American students, and that advantaged children from educationally strong families outperformed others in school. Students' family background played a far more significant role than schools in influencing student achievement in the United States, contrary to popular perception at that time (Coleman, 1968).

Forty years on, the pattern of inequality associated with socio-economic background still persisted in the United States, and was similarly exhibited in other countries around the world (Gamoran & Long, 2006; Chudgar & Luschei, 2009). Comparing three prior international studies (See Heyneman & Looxley, 1983; Baker, Goesling & LeTendre, 2002; Long, 2006), Gamoran and Long (2006) suggested that a strong relationship between achievement gaps and the socioeconomic statuses (SES) of students was observed in affluent countries because of small variances in school resources. They noted a greater effect of schools on student achievement in nations with a per capita

income below $16 000, and that the poorer the nation, the more significant the role of schools was. Another cross-national study by Chudgar and Luschei (2009) reported similar findings of a stronger correlation between student achievement and family background, compared to schools. They also observed a greater school effect on student achievement in poor and unequal countries, although no link was found between countries' wealth or levels of income inequality and the success of schools in mitigating socioeconomic status-based achievement gaps.

The trend of educational inequality remains prevalent in the 21st century. Reay (2006) referred to data from the Office for National Statistics indicating a widening educational gap between the social classes in the United Kingdom over the past ten years:

> […] a key question that we need to ask is, 'what progress has been made towards social justice and equality in education for the working classes over the last hundred years?' The answer has to be remarkably little. […] The attainment gap between the classes in education is just as great as it was 20, 50 years ago and mirrors the growing material gap between the rich and the poor in UK society. (Reay, 2006, pp. 304)

Existing research has established a consensus on the profound influence of family background on students' achievement (Bourdieu, 1999; Ball, 2003; Reay, 2004; Reay, 2010; Weis, 2010; Lamb, 2011). Children from higher-SES families with better-educated parents and more learning-related resources at home tend to perform better in school (Chudgar & Luschei, 2009). Unsurprising, a study on the perceptions of school principals from eight European countries – Finland, France, Germany, Italy, the Netherlands, Poland, Slovenia and the United Kingdom – found that family background was viewed as the most influential factor that affects not only students' learning and coping in school but also their educational transitions and trajectories (Rinne et al., 2015).

A study on post-compulsory education in Finland found that upper secondary schools were popular especially among girls and youths from more advantaged family background. In contrast, there was an over-representation of boys and disadvantaged youths in vocational schools. In the study, 'disadvantaged youths' were seen as those

who have working class parents with low educational levels, and those from immigrant background. It also found disadvantaged youths to be most at risk of dropping out of school and becoming unemployed (Rinne & Järvinen, 2010). Children of highly-educated parents are eight times more likely to advance to university than their peers from low-education families (Berisha et al., 2017).

In Singapore, there is a SES-related 'long tail' in academic performance distribution (Teh, 2014; Deng & Gopinathan, 2016). The significant impact of socio-economic background on students' educational success was also noted by the founding Prime Minister, Lee Kuan Yew:

> [Singapore's founding Prime Minister] Lee Kuan Yew observed recently that more than half the students at top schools like Raffles Institution had fathers who were university-educated. In contrast, among the four neighbourhood schools he had obtained data on, the highest percentage was only 13.1 percent, at Chai Chee Secondary. (Ng, 2011)

So far, we have seen research findings that point to the persistent influence of socio-economic background on students' achievement, and the rather limited effectiveness of schools in mitigating social class inequalities. Next, we will explore how the impact of socio-economic background on achievement is mediated through students' self-beliefs.

Self-beliefs

Central to human agency is one's self-beliefs. How one thinks and feels about oneself determines how one acts and decides. According to Bandura et al. (1996), self-efficacy, or "people's beliefs in their capabilities to exercise control over their level of functioning and environmental demands" (Bandura et al., 1996, pp. 1206), has an impact on one's level of motivation, commitment to goals, perseverance and resilience, and the causes that one attributes to one's successes/failures.

In Ajzen's theory of planned behavior, one's behavior is guided by three kinds of beliefs – behavioral, normative and control beliefs (Ajzen, 2002). Behavioral beliefs refer to beliefs about the outcomes of a behavior, and are manifested as a positive or negative attitude towards the behavior. Normative beliefs refer to beliefs about other

people's expectations, and give rise to perceptions of social pressure or subjective norm. Control beliefs refer to beliefs about one's ability to perform a behavior as well as the opportunities/hindrances to do so, and result in perceived behavioral control. Thus, perceived behavioral control comprises two components of self-beliefs – perceived self-efficacy and perceived controllability (Ajzen, 2002). Of interest to the present study are these two particular aspects of self-beliefs.

Students' self-beliefs play an important role in their learning, motivation and academic behavior (Pajares & Schunk, 2002; Schunk, 2003). Self-efficacy beliefs are instrumental in predicting aspirations and academic achievement (Bandura et al., 1996) in the domains of mathematics (Pajares & Kranzler, 1995; Pajares & Graham, 1999), reading and writing (Schunk, 2003) and science (Britner & Pajares, 2006). In fact, many students could be underperforming "not because they are incapable of performing successfully but because they are incapable of believing that they can perform successfully" (Pajares & Schunk, 2002, pp. 22). A distinction is often made between self-efficacy and self-concept. Self-efficacy is beliefs about one's capability to cope with specific tasks; self-concept refers to perceptions of one's competence in a broader sense, based on self-evaluation (OECD, 2013a). Research has highlighted the reciprocal relations between academic self-concept and achievement (Arens et al., 2016). Self-concept is found to be an outcome of achievement as well as a predictor of future achievement. Thus, we will focus not only on perceived controllability and self-efficacy but also on self-concept in this study.

In Bourdieu's concept of habitus, actions and decisions are shaped by one's perceptions of what is accessible and what is not 'for us', and thus subject to the conditions, opportunities and resources that correlate with one's socio-economic status (as cited in Swartz, 1997). Bandura et al. (1996) suggested that the impact of socio-economic background on students' academic achievement is mediated through parental educational aspirations for their children. Parental educational aspirations contribute to children's achievement both directly and indirectly by influencing children's self-efficacy beliefs and aspirations, leading to pro-social behavior and reducing problem behavior that is detrimental to learning. Reay (2004) also found family background to exert a powerful influence on students' self-beliefs. Privileged, middle-class children from families that enjoy educational successes display academic confidence and a sense

of entitlement to wider educational horizon. Conversely, besides collective class trajectories, family histories of educational marginalization and academic inferiority have led to low expectations of social mobility through education in the working-class (Reay, 2010).

Several attempts to explain the influence of socio-economic background on students' achievement and self-beliefs have been made over the previous decades. At the macro level, educational policies such as assessment, streaming and tracking have been found to exacerbate social class inequalities (Oakes, 1992; Gamoran, 2010; Weis, 2010; Lamb, 2011). Neoliberal practices of school choice and marketization of education have led to increased segregation with high-achieving, popular schools becoming largely middle-class whilst children from working-class background are left behind in less successful, unpopular schools (Ball, 2003; Reay, 2010; Lamb, 2011). At the micro level, the internalist perspective focuses on internal school factors such as selection and instruction processes, and school culture to examine the effectiveness of schools in mitigating social class inequalities while externalists seek explanations external to schooling and suggest cultural deficits in working-class homes. Weis (2010) highlighted three aspects in which schools and parents contribute to the reproduction of social class in education: parental capital, the differential distribution of knowledge and credentials through schools via tracking/streaming, and youth social identity construction in school.

In the next two sections, I will first elaborate on the role of parental capital in reproducing social inequality in education, and then discuss the relationship between the structure of education system and educational inequality, focusing in particular on the differential distribution of knowledge through school curriculum. In the last section, we will take a look at the two different national contexts of Finland and Singapore.

2.2 Role of Parental Capital

According to Weis (2010), while the concept of social class can be understood primarily with respect to the economy, "class rests fundamentally in the 'lived' realm in that it organizes the social, cultural, and material world in exceptionally powerful ways" (Weis, 2010, pp. 415).

Concept of Capital

Using Bourdieu's theoretical concepts, education is seen as a 'field', a social and symbolic space with its own rules, where students – and their parents – are 'actors' who struggle to access the 'field' and enhance their positions in the 'field'. In order to preserve their positions in the 'field', 'actors' struggle over the accumulation of capital and exploit whatever advantages that capital at their disposal can be exchanged for. Bourdieu categorized capital into three kinds – economic, social and cultural capital. Economic capital refers to wealth, income, financial assets and property. Social capital refers to the social network of connections acquired through one's family and associates, professional contacts, neighbourhood community and various social groups. Cultural capital can be further divided into several subtypes: objectified cultural capital, in the form of cultural goods or awareness and appreciation of the arts; institutionalized cultural capital, which lies in one's educational credentials and qualifications; and embodied cultural capital, which refers to the capital cultivated since early childhood through the cultural background of the family and parental involvement in a child's learning (Berisha et al., 2017). Other determinants of cultural capital include field, habitus – a system of long-standing, internalized class-based dispositions – and social and cultural reproduction – referring to the distribution structure of cultural capital, and the role of cultural capital in maintaining social class hierarchies (Sablan & Tierney, 2014).

According to Bourdieu, the respective distribution of economic capital and cultural capital form the two major 'principles of hierarchy' shaping the struggle for power in modern society. In particular, he considered cultural capital, especially educational credentials, as capital that can be obtained through the investment of resources, time and energy, and in return, begets more capital by being exchanged for occupations with high incomes and social status. Since cultural heritage is passed down from parents to

children, he found students' scholastic achievement to be strongly related to their parents' cultural capital (Swartz, 1997).

Capital, Strategy and Advantage

Ball (2003) attempted to understand the complex relationship between social class and educational inequality by examining how middle-class parents worldwide take advantage of educational policies like school choice, and strategize to ensure their children gain a competitive edge to succeed in the educational market. Quoting Morgan: "Without resources there can be no strategies" (Ball, 2003, pp. 24), he stressed the role of parental capital.

In her analysis of how middle-class families in the United Kingdom mobilize cultural capital to gain educational advantage, Reay (2004) emphasized confidence and an entitlement mentality as the manifestation of cultural capital, and cited two educational policies that work primarily in favour of the middle-class: parental involvement and school choice. First, the implementation of parental involvement policy results in parents being increasingly held responsible for their children's learning. In her study of mothers' involvement in their children's schooling, middle-class mothers, with their own educational success, were found to be competent as academic coaches to provide effective remediation. Furthermore, these mothers were well-informed about schooling matters, and used many strategies or resources to help their children academically. Thus, middle-class mothers were confident about intervening in their children's education and, coupled with a sense of entitlement, adept at dealing with schools to secure extra support for their children whereas their working-class counterparts, who themselves had relatively limited educational success, struggled to provide learning support at home, and expressed great uncertainty about how to find an avenue of help for their children.

Secondly, the school choice policy arguably privileges the middle-class, and leads to increasing social segregation between schools and students (Ball, 2003; Reay, 2010). In Reay's study of secondary schooling choice, despite the free market spirit of the school choice policy, working-class families were found to be hindered by a lack of confidence or other reservations to participate actively in choosing schools (Reay, 2004). In contrast, a sense of entitlement was discerned in the middle-class parents' mindset. They perceived their children as educational 'winners', intellectually superior to the

‘lesser other’ working-class and deserving of better schools (Reay, 2004; Reay, 2010; Weis, 2010). To ensure educational advantage for their offspring, these parents were able to mobilize cultural capital, in combination with economic capital if necessary, to employ strategies such as applying to selective schools, moving into the catchment area of their choice school and enrolling in private schools (Reay, 2004). Hence, it was the middle-class families who were not only making their choices but also getting them. This view echoed that of Ball who observed that in a number of studies, those working-class families who did actively make school choices appeared to be atypical of the working-class (Ball, 2003).

This is a paradox. School choice policy sees a broadening range of educational opportunities, and more options being offered to students and parents; yet, school choice also reinforces social stratification in the education system. Arguably, education becomes “by and large open to all yet strictly reserved for a few, […] uniting the appearance of ‘democratization’ with the reality of social reproduction” (Bourdieu, 1999, pp. 424-425).

School choice in Finland has seen residential segregation on the rise, producing social divisions in cities. Where there are hierarchical differences between schools or classes, parents also use strategies such as entry into selective classes with special emphasis (CwSE) or studying an extra foreign language to avoid schools with a ‘bad’ reputation (Kosunen, 2014). These strategies in the school choice game, not unlike those used in other countries, underscore the importance of parental cultural capital in navigating through the education ‘field’. According to a study in 2012, more than 40% of children with highly-educated parents were enrolled in CwSE, as compared to only 22% of those from low-education families (Berisha et al., 2017). Overall though, there seems to be a prevailing mentality among Finnish parents that choosing a ‘good-enough’ school is good enough, and there is no need to seek the most prestigious or selective one (Kosunen, 2014).

In Singapore, school choice also depends on parental social and economic capital in the case of primary school admission. Parents use their alumni connections for their children to gain entry into their alma mater; some buy access to prestigious primary schools by locating their homes within the catchment area of such schools (Ng, 2011).

Subsequent educational transitions are based on merit but that does not discourage parents' efforts to translate their cultural and economic capital into educational advantage – through such means as involvement in their children's studies, paying for extra tuition and enrichment, and enrolling their children in better, and often more expensive, independent schools (Ng, 2011) – to secure academic success and educational credentials for their children.

Class Habitus

Thus far, we can see how parental capital plays a great role in the reproduction of social class inequalities in education, and perhaps also glimpse class habitus at work behind the different cultural logic of child-rearing. This is illustrated by a 'concerted cultivation' parenting approach of middle-class parents, characterized by active parental involvement and intervention in their children's education as they position their children for comparable class status in adulthood; by comparison, working-class parents' 'accomplishment of natural growth' parenting style underscores the mindset that their children's education is the responsibility of professional educators (as cited in Weis, 2010).

In addition, Bourdieu argued – using the concept of habitus and class-based self-selection –that students' decisions to pursue studies or drop out, and their choices of studies are largely dispositional, depending on their expectations of the chances of educational success for members of their social class (as cited in Swartz, 1997). The course of action is chosen according to one's perceptions of what is 'for us' and what is not. Bourdieu (1999) described 'the order of things' for the disadvantaged as:

> […] collective bad luck that attaches itself, like a fate, to all those that have been put together in those sites of social relegation, where the personal suffering of each is augmented by all the suffering that comes from coexisting and living with so many suffering people together – and, perhaps more importantly, of the destiny effect from belonging to a stigmatized group. (Bourdieu, 1999, pp. 64)

Students' self-beliefs and aspirations are influenced by the cultural capital and educational experience of their parents and other references within their social class. Such logic of selection is apparent from Finnish students' choices of major that lead to

occupations with social statuses comparable to that of their parents' class background (Berisha et al., 2017). Reay (2004) highlighted the powerful influence of a family history of educational successes to illustrate how the middle-class further leverages on cultural capital to gain educational advantage. Children from such a background display academic confidence and a sense of entitlement to wider educational horizon. This insight was reiterated in her later work. She noted that, besides collective class trajectories, family histories of educational marginalization and academic inferiority have led to low expectations of social mobility through education in the working-class (Reay, 2010).

Here, let us go back briefly to Weis's point about youth social identity construction in school (in the previous section). Perhaps, even more powerful than parental capital in the reproduction of social class inequalities in education is how class habitus and dispositions shape youths' self-beliefs and concepts of their social identity. This is manifested as resistance to schooling and oppositional behavior by underprivileged, disenfranchised youths (Weis, 2010) as they sink into "failure and the vicious cycle of rejection [of schooling] that multiplies that failure – a paradoxical way to make a virtue out of necessity" (Bourdieu, 1999, pp. 61).

In his argument for inclusive education, Thomas (2013) attributed educational inequality to the 'gradient effect' phenomenon. This notion of gradient – the extent of differences in one's family background, capital or social class, and its conspicuousness – damages the sense of worth and identity of individuals as they view themselves through social comparison with their peers. This 'gradient effect' argument could possibly also be applicable to achievement gaps between students in different academic streams that hold different levels of prestige.

2.3 Structure of Education System and Educational Inequality

After considering the role of parental capital in reproducing social inequality in education, let us now turn our attention to how educational inequality associated with socio-economic background is possibly accentuated by certain institutional characteristics, in particular the differential distribution of credentials and knowledge through school curriculum.

Characteristics of Education Systems

First, we will study the structures of education systems by using a typology for classifying education systems. There are several ways to classify education systems in comparative research. For instance, PISA classifies education systems according to three aspects of how students are selected and grouped: vertical differentiation for different grades, horizontal differentiation at the institutional level and school-level horizontal differentiation (OECD, 2011). Meanwhile, according to Lamb (2011), education systems differ in the provision of upper secondary education mainly in terms of program diversification and institutional segregation. For this comparative study, I adopted the model developed by Allmendinger (1989). In this typology, education systems are compared with respect to two dimensions: standardization and stratification.

Standardization of educational provisions is the extent to which the quality of education meets the same standards throughout a country. In a highly-standardized education system, there is usually a centralized administration to ensure uniformity in areas such as teacher training, national curriculum, school budgets and school-leaving examinations for transition to secondary or higher education so that schools are homogeneous and of equal standards nationwide.

Stratification of educational opportunities refers to the degree of differentiation within educational levels, and the proportion of a cohort attaining the maximum number of school years provided by an education system. A highly-stratified education system is characterized by the practice of tracking/streaming – typically involving selection procedures and screening mechanisms, like standardized testing at transition points, to differentiate students of different abilities – and a small proportion of a cohort attaining the maximum number of school years or a high attrition rate i.e., a large proportion of a cohort exiting at certain educational levels, especially transition points.

Using Allmendinger's typology, the education systems of Finland and Singapore are both considered highly-standardized in educational provisions. However, both countries differ in terms of stratification, with a low degree of differentiation in the Finnish comprehensive school system whereas Singapore's education system is more highly-differentiated (OECD, 2011).

Tracking/Streaming

The term tracking/streaming refers to the selection and grouping of students according to their ability and results. This includes within-school practices of assigning students to hierarchized classes according to their ability, and ability-grouping within/across classes for academic subjects as well as institutional-level practices of assigning students to hierarchized schools based on their assessment results, and establishment of different curricular pathways such as university-preparatory and vocational.

In this way, tracking/streaming results in a differential distribution of knowledge and credentials through school curriculum, thereby controlling future occupational and subsequent economic outcomes (Weis, 2010). This argument is in tune with Bourdieu's theory that, in spite of the meritocratic selection principles, education systems not only perform the function of social reproduction – by reinforcing the unequal distribution of cultural capital rather than redistributing it – but also legitimize social inequalities (Swartz, 1997). Bourdieu viewed an education system as:

> […] an institutionalized classifier which is itself an objectified system of classification reproducing the hierarchies of the social world in a transformed form, with its cleavages by "level" corresponding to social strata and its divisions into specialties and disciplines which reflect social divisions ad infinitum, such as the opposition between theory and practice, conception and execution, transforms social classifications into academic classifications, with every appearance of neutrality (as cited in Swartz, 1997, pp. 203).

The selection of students for "tracks toward different levels and qualifications leads to 'gentle' exclusionary practices" (Bourdieu, 1999, pp. 423). Thus, stratification in the form of curricular differentiation results in differential educational credentials which are

associated with inequalities in educational opportunities, occupational and economic outcomes, and related self-beliefs (Dumont et al., 2017). Oakes (1992) argued that the differentiation in curriculum, instruction and teachers leads to an unequal distribution of educational resources and opportunities, with low-track students falling even further behind, and that tracking strongly shapes students' educational attainment and life chances, with college-track students enjoying better prospects. Furthermore, in the same vein as the aforementioned 'gradient effect' (Thomas, 2013) in social comparison and social identity construction (Weis, 2010) with respect to class habitus (see Section 2.2 Role of Parental Capital), tracking/streaming – and the conspicuousness of the differences in achievement, future educational and career trajectories, and prestige between different streams – produces polarization of attitudes in relation to one's academic stream. Dumont et al. (2017) suggested that low self-beliefs and negative identity construction that is manifested as school disengagement may be associated with the social stigma of low educational qualifications, rather than belonging to a low-ability stream itself.

According to Gamoran (2010), stratification in the education system exacerbated educational inequality, with little contribution to raising the overall level of achievement of the student population. Tracking/streaming was associated with the widening of achievement gaps between students in a lower-ability stream and those in a higher-ability stream. This inequality could have arisen due to the implementation of differentiated instruction, rather than streaming per se. Moreover, while PISA 2009 reported that small performance gaps between advantaged and disadvantaged students were only found in education systems with low stratification (OECD, 2011), it was pointed out that even among those countries with low stratification, great variations in the mean-5^{th} percentile difference existed (Teh, 2014).

Weis (2010) argued that tracking/streaming works to the benefit of some but not others by valuing 'pure' and 'academic' knowledge whereas 'applied' and 'vocational' knowledge is marginalized. Such a selective process is "heavily implicated in the reproduction of social class" (Weis, 2010, pp. 416) since it determines, to a great extent, whom students interact with on a daily basis (Dumont et al., 2017), and schools tend to become "highly segregated along social as well as academic lines" (Lamb, 2011, pp. 49), especially if selection occurs early. Track placement is a strong predictor of educational

advancement and subsequent occupational and socio-economic outcomes; socio-economic background, in turn, is a strong predictor of track placements. This observation was shared by Reay (2010) who noted that tracking/streaming practices "result in inequitable outcomes for students that remain strongly related to social class" (Reay, 2010, pp. 397). They also lead to lower social mobility and a higher likelihood of perpetuating social inequalities (Lamb, 2011).

Patterns of social stratification in educational pathways are not entirely absent from inclusive, non-selective education systems either. A study on post-compulsory education in Finland found that general upper secondary schools were popular among girls and youths from advantaged family background; on the other hand, there were far more boys and disadvantaged youths – those who have working class parents with low educational levels and those from immigrant background – in vocational schools. It also found disadvantaged youths to be most at risk of dropping out of school and becoming unemployed (Rinne & Järvinen, 2010). However, vocational upper secondary education is offered in Finland as an alternative pathway in which assess to higher education is still kept open since vocational qualifications also provide eligibility for application to higher education. As a result of this permeability in the Finnish education system, vocational track is a rather attractive option taken by about 50% of the cohort in Finland (Lamb, 2011).

In Singapore, the education system operates on examination-based meritocratic principles, and is highly-stratified. For instance, students take the Primary School Leaving Examination (PSLE) at the age of 12 and are then selected for different academic tracks – Express Stream, Normal Academic Stream and Normal Technical Stream – and assigned to secondary schools according to their PSLE results. An enactment of the meritocracy ideology through stratification of educational opportunities could indirectly result in the reinforcement of social stratification and perpetuation of social inequalities. Children from families of higher socio-economic status who have better-educated parents with more parental capital tend to perform better than their disadvantaged peers in school. Rewarding these students from advantaged background for their scholastic achievement – merit that is not entirely independent of parental capital – with educational advancement, which leads to career and social advancement, and more access to capital that can then be invested to gain a

competitive advantage for their offspring, could result in a widening gap and social divide between the privileged and the disadvantaged.

> [… Singapore's education] system remains differentiated, putting students of different academic caliber into different tracks in different kinds of schools where their social lives do not mix. When translated into earnings, the greater the wage premium placed on the qualifications of the 'skilled' verses the 'technical', the further behind the earnings of the lower-skilled will trail. These tensions [between various 'actors' in the 'field'] are difficult knots to disentangle. Singapore's small and vulnerable economy necessitates a competitive education system to produce a competitive workforce. […] Unfortunately, such a system also has detrimental effects on mobility. (Ng, 2011)

In the next section, we will consider how different historical, social and cultural contexts, and different sets of constraints mean different interpretations of the concept of educational equality in different nations.

2.4 A Look at Two Nations – Finland and Singapore

> It is surely better to start from the premise that many education policies have a social justice agenda of making education less unequal, but that the ways in which this is to be done embody different assumptions about what counts as a socially just education system and what obstacles prevent this from being realized. (Power, 2012, pp. 489)

In this section, we will look at the historical, economic, and socio-cultural forces shaping the educational landscape in Finland and Singapore respectively. Both are young – Finland entered its 100th year of independence in 2017 while Singapore celebrated its 50th year of independence in 2015 – and small nations, each with a modest population of 5.5 million, as of 2015 (Statistics Finland, 2016a; Singapore Department of Statistics, 2016b). As such, both countries place a premium on human capital, and have succeeded in raising the standard of education in a relatively short period of time (Sahlberg, 2011; Teh, 2014; Deng & Gopinathan, 2016; Berisha et al., 2017).

Finnish Context

Post-World War II Finland was a largely agrarian nation – whose economy lagged behind other Nordic countries like Sweden, Norway and Denmark in 1950 (Sahlgren, 2015) – that underwent rapid industrialization, accompanied by mass expansion of education in the last few decades of the 20th century (Sahlberg, 2011; Berisha et al., 2017). Education became the vehicle for economic and social transformation in the post-war era.

The post-war period also gave rise to the call for equal educational opportunities. The birth of *peruskoulu* or the Finnish comprehensive school system in 1970 was hailed as a historical milestone in the development of Finland's education system (Sahlberg, 2011). To offer universal access to education and to provide equal opportunity for every child to receive high-quality education, the 9-year basic education is compulsory and education is free for all in the welfare state. Free school meals, textbooks and transportation (if deemed necessary for those who live more than 5 km away from their school), health care, psychological counseling and career guidance are standard provisions in schools (Finnish National Agency for Education, 2010). With the aim of removing barriers to learning, financial aid in the form of study grants and loans is

available for students in full-time upper secondary education and higher education (Finnish National Agency for Education, n.d.).

Values of equity and inclusiveness form the bedrock of the Finnish education system. In the Finnish context, the equity principle means equal opportunity to benefit from education so that every student has "a fair chance to be successful and enjoy learning" (Sahlberg, 2011, pp. 23). Thus, the old system of separating students into either grammar or civic tracks after four years of primary education was abolished – for such track placements resulted in unequal attainment and achievement strongly related to socio-economic background – and replaced by universal basic education in the 9-year comprehensive school system but with differentiated syllabi for mathematics and foreign languages. Eventually, ability grouping in these subjects was also abolished in 1985 (Sahlberg, 2011). In the current education system, lateral movement between the dual tracks of general upper secondary school and vocational institution after basic education is possible (see Figure 1). Admission to university is possible after completing vocational upper secondary education, and university entry is based on matriculation examination. Hence, "there are no dead-ends preventing progression to higher levels of education" (Finnish National Agency for Education, n.d.).

While the Finnish education system has a low degree of differentiation, it is highly-standardized – in terms of public provision of education, training and qualifications of teachers, and the National Curriculum Framework – to ensure schools nationwide provide equally high standards of education. However, there is considerable decentralization, and schools and teachers enjoy autonomy in designing their own school curriculum and assessment. External standardized testing is absent from the Finnish comprehensive school (Sahlberg, 2011; Berisha et al., 2017).

In view of equity in education, special education is an integral component of the Finnish comprehensive school system. The guiding principle is that students with special needs can succeed in school if learning difficulties or other special needs are identified early, and appropriate intervention and support promptly provided. In addition to permanent special education, situated in a special class or institution for students with more severe special needs or learning difficulties, there is also part-time special education to assist those who are included in a regular class (Sahlberg, 2011). It is also possible to extend

the duration of basic education by a year. Special education is extensive, with 7.3% of students receiving special support and 8.4% intensified support while 23% of students are in part-time special education in 2015 (Statistics Finland, 2016b).

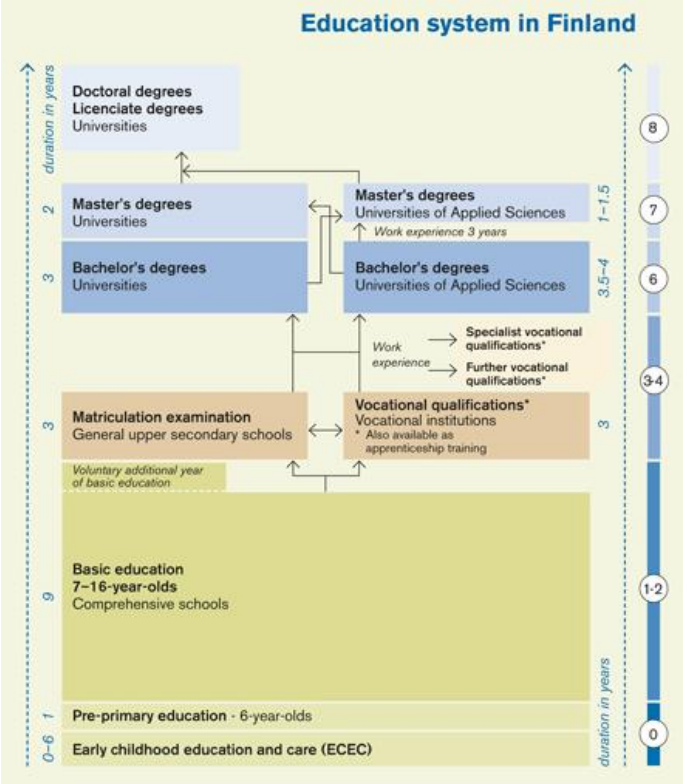

Figure 1 Education system in Finland (Finnish National Agency for Education, n.d.)

Finland's emphasis on equity and a culture of responsibility and trust run counter to the norms of competition and accountability in the prevailing global education reform (Sahlberg, 2011). Another unique cultural trademark is the ethos of 'good-enough' (Kosunen, 2014). Although education is highly-valued, Finns adopt a 'less is more' approach (Sahlberg, 2011).

Over a few decades, Finland had transformed itself from an agrarian nation to an economically advanced country with a GDP per capita of US$42 311 in 2015 (World Bank, 2017). Income distribution is quite equal, as indicated by a low Gini coefficient of 0.257 in 2014 (OECD, 2016). Government expenditure on education is about 7% of GDP, as of 2013 (World Bank, 2017). The change in mass education levels can be observed between generations. In 2015, more than 80% of Finnish in the 25-39 years old age group had completed at least upper secondary education whereas this percentage

was 64% for those who are 65-69 years old and only 44% for those aged 70 years and above (Statistics Finland, 2016a).

Singaporean Context

Singapore follows a similar trajectory of modernization, economic rise and rise of educational level. After gaining independence from the British Empire, post-colonial Singapore was an impoverished island state with no natural resources. Economic growth was integral to strengthening state legitimacy. For the transition to an industrialized economy, educational reforms and policies to build a high-quality education system was a priority in late 1950s-1980s (Deng & Gopinathan, 2016). There was a need to compensate for Singapore's lack of natural resources by developing superior human capital through education in order to produce a competitive workforce.

Like Finland, Singapore had also, over a few decades, become an economically advanced country with a GDP per capita of US$52 888.70 in 2015 (World Bank, 2017). The Gini coefficient of 0.358 in 2015 is indicative of an income gap in Singapore's society (Singapore Department of Statistics, 2016a). Government expenditure on education is about 3% of GDP, as of 2013 (World Bank, 2017). The intergenerational change in mass education levels is remarkable. Of Singaporeans who are aged 55 years and above in 2015, 56% had not even completed secondary education and only 8% had attained university qualifications. However, there was a complete reversal by the next generation as 95% of those in the 25-39 years old age group had completed at least secondary education, with 51% having completed university education as well (Singapore Department of Statistics, 2016b).

Unlike Finland whose population had been ethnically fairly homogeneous until the recent influx of immigrants in the current century, Singapore was a multi-racial, multi-religious migrant society with the three main ethnic groups Chinese, Malays and Indians constituting 74%, 13% and 9% of the population respectively in 2015 (Singapore Department of Statistics, 2016b). Besides a vehicle for economic development, education also served to enhance social cohesion for nation-building. In the development of an education system founded on meritocracy, the equal, non-discriminatory treatment of all three ethnic groups' language rights was enacted through

the bilingual policy, with English being designated as the medium of instruction in schools (Deng & Gopinathan, 2016).

Egalitarian principles are also applied through equality of educational opportunities with respect to access and provision. To make education accessible to the masses and to provide every child with the opportunity to receive at least ten years of basic education, primary and secondary schools – including independent schools – to post-secondary institutions and universities in Singapore are predominantly publicly funded. Virtually all Singaporean students attend such public schools; very few go to private schools (Teh, 2014). The 6-year primary education is compulsory and free for all citizens[1] (Singapore Ministry of Education, 2017a). While the 4-year secondary education is not free, it is heavily subsidized at government schools[2] (Singapore Ministry of Education, 2017b). In addition, health and dental care, psychological counseling and career guidance are standard provisions in all public schools. Financial assistance such as free textbooks, meal vouchers and transport allowance is available for needy students. Singaporeans going on to further studies at publicly-funded post-secondary institutions and universities continue to enjoy subsidies on school fees.

The education system in Singapore is characterized by a high level of standardization and centralization. There is a standardized national curriculum – with great emphasis on mathematics, science subjects and English language – geared towards an industrialized economy in the 20th century, and currently a knowledge economy in the 21st century (Deng & Gopinathan, 2016). Besides allocating school budgets, the Ministry of Education also oversees the recruitment, deployment and remuneration of teachers and principals in publicly-funded schools, except for independent and specialized schools (Teh, 2014). Teachers-to-be have to undergo teacher training conducted by the National Institute of Education to attain teaching qualifications. The centralized administration ensures allocation of adequate resources and qualified, well-trained teachers to all schools so that schools are homogeneous, and even the schools serving disadvantaged student populations can provide high-quality education. The education system upholds meritocracy through national school-leaving examinations – Primary School Leaving Examination (PSLE), General Certificate of Education (GCE) Ordinary Level (O-level)

1. There is, however, a monthly miscellaneous fee of S$6.50.
2. The monthly school fees after subsidy is S$5 and miscellaneous fee S$10. However, independent schools charge school fees of S$200-300 per month.

and Advanced Level (A-level) examinations – for transition to secondary or higher education (Deng & Gopinathan, 2016).

In contrast to the abolishment of tracking in Finland, the system of streaming students was introduced in 1980. Prior to 1980, secondary students universally received education with a common curriculum (Teh, 2014; Deng & Gopinathan, 2016). However, the attrition rate was high, and differences in ability were identified as the cause. Hence, three different academic streams – Express Stream, Normal Academic Stream (NA) and Normal Technical (NT) Stream – with differentiated curricula were established at the secondary school level to arrest the problem of school dropout (Deng & Gopinathan, 2016). After primary education, students are selected for different streams based on their PSLE results. In 2015, about 63% of the secondary 1 students are placed in the more academically-challenging 4-year Express Stream leading to GCE O-level examination and 24% in the NA Stream leading to GCE N(A)-level examination in the 4th year, the passing of which is required to progress to GCE O-level examination in the 5th year. The remaining 13% are in the 4-year NT Stream that aims to prepare students for vocational training (Singapore Ministry of Education, 2016).

In recognition of different abilities and learning needs, the current education system offers diversified educational pathways (Deng & Gopinathan, 2016). Although the education system is highly-stratified, lateral transfers between the three different academic streams are possible mid-term. However, the proportion of students who actually do so is quite small. In addition to the three academic streams, independent schools offer the 6-year Integrated Programme, which leads straight to GCE A-level examination, to the top 10% of the cohort. Another recent development is specialized schools, among others, that cater to less academically-inclined students by offering a combination of academic and vocational education (Singapore Ministry of Education, 2016).

After secondary education, there are three main educational pathways: pre-university course, polytechnic course and vocational education. Selection for the 2- or 3-year pre-university course at junior college/centralized institute and the polytechnic course is based on GCE O-level examination results. Entry to university is through GCE A-level examination on completion of pre-university course. Typically, a student has to go

through an examination at every stage of schooling, at which success is a prerequisite for access to the next stage. Various policies have also been introduced gradually to improve the flexibility for progression to higher education (see Figure 2).

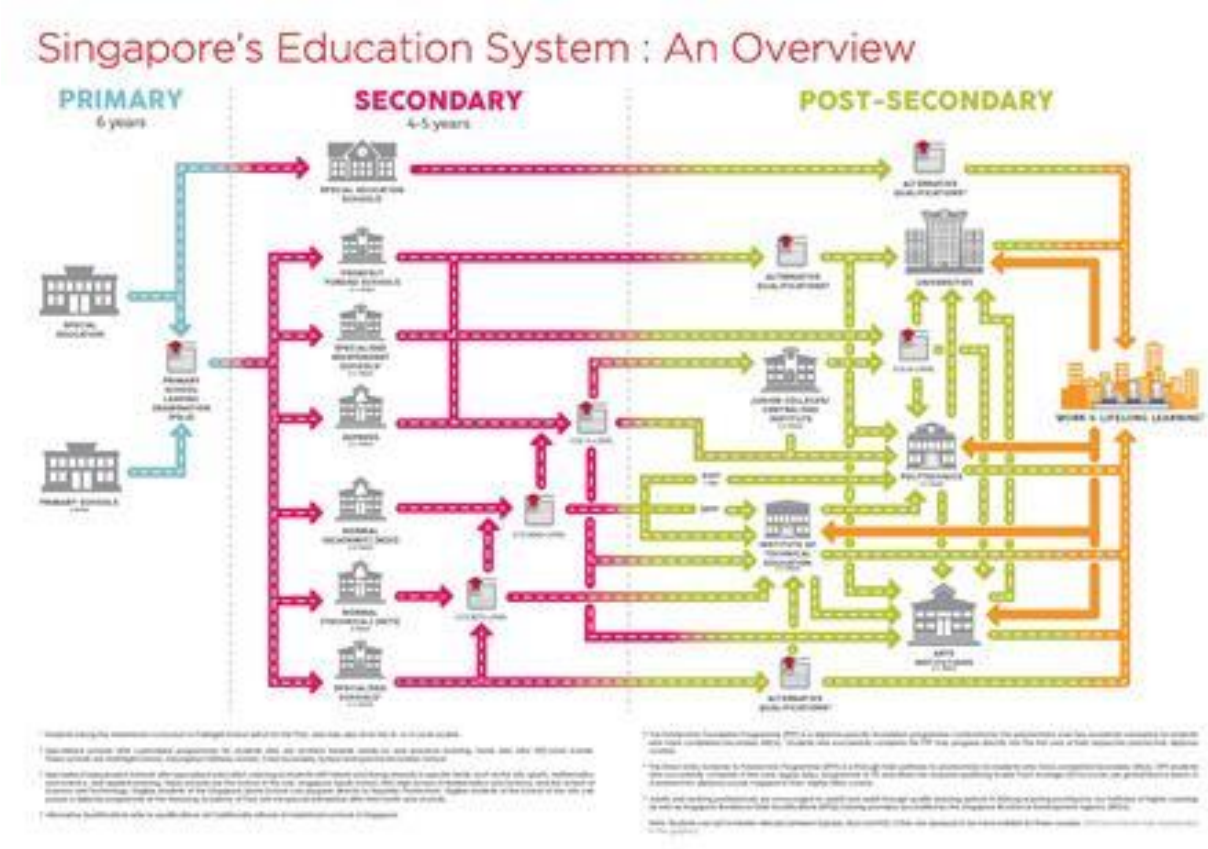

Figure 2 Education system in Singapore (Singapore Ministry of Education, 2016)

The system of competitive, high-stakes national examinations that are tied to the selection of students for admission to secondary school, university or other tertiary education institutes results in great pressure to excel (Deng & Gopinathan, 2016). These examinations are seen as important gateways since educational trajectory is closely linked to future career and life chances. In fact, the parents of the present student generation are those who had benefited greatly from educational expansion. Such is the middle-class anxiety that great demand for tuition and enrichment has spawned a lucrative shadow education industry as parents are willing to invest large sums of money to secure an educational advantage for their children (Deng & Gopinathan, 2016). This phenomenon is not unlike those observed in East Asian societies like South Korea, Japan, China and Taiwan where Confucian values are deeply-rooted, and high educational aspirations are typical of Asian families (Kuan, 2011). However, the great

importance attached to academic pursuits could become an excessive preoccupation with academic excellence (Waldow, Takayama & Sung, 2014).

An understanding of the historical contexts of educational policies and the social, cultural, economic and institutional factors is essential to understanding the persistence of performance gap that mirrors the rich-poor gap in society, and the extents to which educational success, trajectories and self-beliefs display patterns of social stratification. In light of a lack of comparative studies on Finland and Singapore, this study attempts to explore whether the achievement and self-beliefs of secondary school students are related to their socio-economic background – against a backdrop of differences in levels of stratification in the education systems as well as in levels of income inequality and in mindsets towards education in these two countries.

3. RESEARCH QUESTIONS

The focus of this study is social class inequality in education. The purpose is to explore the relationship between family socio-economic background and secondary school students' academic achievement along with their self-beliefs in two different national contexts – low stratification in the Finnish education system compared to high stratification in Singapore, hence a comparative research design (see Figure 3).

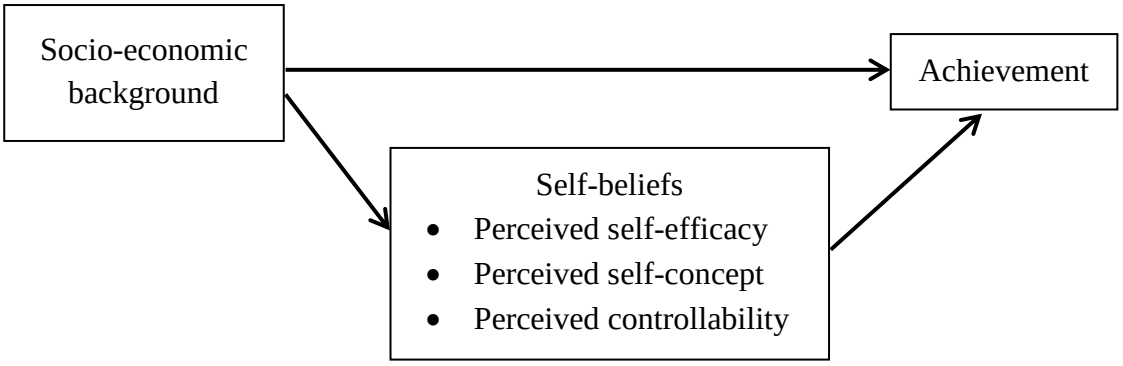

Figure 3 Research model

This comparative study seeks to address the following research questions.

1) Is the ***socio-economic background*** of secondary school students related to their ***achievement*** in Finland and Singapore respectively?

2) Is the ***socio-economic background*** of secondary school students related to their ***self-beliefs*** in Finland and Singapore respectively?

3) To what extent do the ***self-beliefs*** and ***socio-economic background*** of secondary school students predict their ***achievement*** in Finland and Singapore respectively?

4. METHODS

4.1 Sample

In this comparative study, the sample consists of 15-year-old Finnish (n = 8829) and Singaporean (n = 5546) secondary school students – from 311 and 172 schools sampled in Finland and Singapore respectively – who participated in 2012 PISA study conducted by the Organization for Economic Co-operation and Development (OECD). It should be noted that a typical 15-year-old in Finland attends 'lower secondary school' whereas a typical 15-year-old in Singapore is in the 'upper secondary' level[1]. Thus, for the purpose of this research, the generic term 'secondary school students' is used to refer to the sample.

Due to the rotation design of the student questionnaire (see Section 4.2 Instrumentation), items pertaining to the self-beliefs variable were answered by sub-samples (OECD, 2013a). 'Perceived self-efficacy' and 'perceived self-concept' items were answered by approximately two-thirds of the sample. 'Perceived controllability' items comprised items from two rotated sections so complete data was only obtained from approximately one-third of the sample.

4.2 Instrumentation

This study uses pre-existing 2012 PISA cross-sectional data from Finland and Singapore. PISA is a triennial international student assessment of 15-year-olds. Test-score data on the domains of reading, mathematics and science literacy was collected from 15-year-old school students across 65 participating countries and economies in 2012 PISA, with mathematical literacy being the major domain tested in detail. In addition, problem-solving and financial literacy were included in 2012 PISA.

Paper-based tests were administered. The assessment lasted two hours, and consisted of four 30-minute booklets of test items for each student. The test items covering the domains of reading, mathematics and science included a mixture of multiple-choice items and free-response items, with different students taking different combinations of test items. There were 13 test booklets (seven on mathematics, three on reading and three on science) and about 390 minutes of items altogether (OECD, 2013a). In addition,

1. In Finland, 'lower secondary' refers to grades7-9 and 'upper secondary' to grades 10-12. In Singapore, the equivalent of grades 7-8 constitutes 'lower secondary' and grades 9-10 'upper secondary' while 'junior college' refers to the equivalent of grades 11-12.

there was an optional 40-minute computer-based assessment of reading and mathematics in 2012 PISA.

Besides the paper-based tests, students also answered a 30-minute background questionnaire that obtained information about themselves and their family background as well as their school experiences. Similar to the assessment of cognitive domains, a rotation design was used for the student questionnaire. It comprised a common part to be completed by all, and a rotated part answered by sub-samples (OECD, 2013a). The common part contained questions about students, and their family and home whereas the rotated part contained questions about their school experiences, learning of mathematics, and problem-solving.

4.3 Data

The PISA questionnaire was designed to collect information on an extensive range of educational inputs for comparison at multiple levels: students, classrooms, schools and countries. However, this study will only focus on those questionnaire items pertaining to the variables socio-economic background and self-beliefs – specifically three aspects 'perceived self-efficacy', 'perceived self-concept' and 'perceived controllability'.

Socio-economic Background

In this study, the PISA Index of economic, social and cultural status (ESCS) was used as a measure of students' socio-economic background. The Index took into consideration parents' occupation and educational level as well as the number of books, cellular phones, televisions, computers, cars and rooms with a bath or shower at home, along with whether students have other home possessions such as a desk to study at, a room of their own, a quiet place to study, a computer that can be used for school work, educational software, a link to the Internet, classic literature, books of poetry, works of art, books to help with school work, reference books, a dictionary, a dishwasher, a DVD player and three other country-specific wealth items – laptop, flat-screen television and home alarm system in the case of Finland; and cable television, air-conditioning and domestic helper in the case of Singapore. The PISA Index of economic, social and cultural status has been standardized to an OECD mean of zero and a standard deviation of one (OECD, 2013a). The higher the index, the more affluent the student's family is

and the more economic, social and cultural capital his/her family has. Conversely, the more negative the index, the more disadvantaged the student's background is.

Achievement

Since the major domain tested in 2012 PISA was mathematics, mathematics test-score plausible values were used as a measure of students' achievement in this study. The PISA mathematics score has been standardized to an OECD mean of 500 and a standard deviation of 100 points (OECD, 2013a).

Self-beliefs

Three aspects of students' self-beliefs, 'perceived self-efficacy', 'perceived self-concept' and 'perceived controllability', were measured using students' responses to 25 items on a four-point Likert scale. 'Perceived self-efficacy' and 'perceived self-concept' items were particular to the domain of mathematics whereas 'perceived controllability' items included some related to mathematics and others to school work in general.

'Perceived self-efficacy' was measured using students' responses to 8 items. Students rated their confidence levels – 1) very confident, 2) confident, 3) not very confident and 4) not at all confident – in eight mathematical tasks: a) using a train timetable to work out how long it would take to get from one place to another; b) calculating how much cheaper a TV would be after a 30% discount; c) calculating how many square metres of tiles you need to cover a floor; d) understanding graphs represented in newspapers; e) solving an equation like $3x+5=17$; f) finding the actual distance between two places on a map with a 1:10000 scale; g) solving an equation like $2(x+3)=(x+3)(x-3)$ and h) calculating the petrol consumption rate of a car.

In addition, students responded – 1) strongly agree, 2) agree, 3) disagree and 4) strongly disagree – to five items measuring 'perceived self-concept': "I am just not good at mathematics"; "I get good grades in mathematics"; "I learn mathematics quickly"; "I have always believed that mathematics is one of my best subjects" and "In my mathematics class, I understand even the most difficult work".

'Perceived controllability' was similarly measured using students' responses – 1) strongly agree, 2) agree, 3) disagree and 4) strongly disagree – to 12 items: "If I put in

enough effort, I can succeed in mathematics"; "Whether or not I do well in mathematics is completely up to me"; "Family demands or other problems prevent me from putting a lot of time into my mathematics work"; "If I had different teachers, I would try harder in mathematics"; "If I wanted to, I could do well in mathematics", "I do badly in mathematics whether or not I study for my exams", "If I put in enough effort, I can succeed in school"; "It is completely my choice whether or not I do well at school"; "Family demands or other problems prevent me from putting a lot of time into my school work"; "If I had different teachers, I would try harder at school"; "If I wanted to, I could perform well at school" and "I perform poorly at school whether or not I study for my exams".

4.4 Data Analysis

In this study, the quantitative data from 2012 PISA tests and questionnaire was analyzed using the IBM Statistical Package for the Social Sciences (SPSS) software.

Socio-economic Background

Based on the PISA Index of economic, social and cultural status (ESCS), students were separated into high-SES (top quartile), low-SES (bottom quartile) or average-SES groups, as shown in Table 1, which were then used for one-way ANOVA for Finland and Singapore respectively.

Table 1 Respective SES groups in each country

Finland			**Singapore**		
SES group	PISA Index of economic, social and cultural status (ESCS)	Number of students	SES group	PISA Index of economic, social and cultural status (ESCS)	Number of students
Low SES	$-4.22 \leq x \leq -0.22$	2200	Low SES	$-5.02 \leq x \leq -0.92$	1380
Average SES	$-0.22 < x < 1.00$	4278	Average SES	$-0.92 < x < 0.43$	2754
High SES	$1.00 \leq x \leq 2.58$	2207	High SES	$0.43 \leq x \leq 2.55$	1385
	Missing	144		Missing	27
	Total	8829		Total	5546

Achievement

As a result of each student only answering a subset of the total assessment items due to the rotation design, five plausible values (PVs) in mathematics were computed for each student in PISA. Cronbach's alpha for the five plausible values in mathematics was .99.

A common error of computing the mean of the five plausible values was cautioned against (OECD, 2009). However, analysis involving five plausible values requires 405 estimates and even the suggested unbiased shortcut involves 85 estimates. The complexity is beyond the scope of the present study. Thus, in this study, only one of the five plausible values – Plausible Value 1 (PV1) – was used for analysis since "analyzing one plausible value instead of five plausible values provides unbiased population estimates as well as unbiased sampling variances on these estimates" (OECD, 2009, pp. 129).

Self-beliefs

First, all the 'perceived self-efficacy' items were reverse-coded so that students' responses 1) very confident, 2) confident, 3) not very confident and 4) not at all confident corresponded to 4) very positive self-beliefs, 3) positive self-beliefs, 2) negative self-beliefs and 1) very negative self-beliefs respectively. In addition, 'perceived self-concept' items like "I get good grades in mathematics"; "I learn mathematics quickly"; "I have always believed that mathematics is one of my best subjects" and "In my mathematics class, I understand even the most difficult work" as well as 'perceived controllability' items such as "If I put in enough effort, I can succeed in mathematics"; "Whether or not I do well in mathematics is completely up to me"; "If I wanted to, I could do well in mathematics"; "If I put in enough effort, I can succeed in school"; "It is completely my choice whether or not I do well at school" and "If I wanted to, I could perform well at school" were also reverse-coded so that students' responses 1) strongly agree, 2) agree, 3) disagree and 4) strongly disagree thus reflected 4) very positive self-beliefs, 3) positive self-beliefs, 2) negative self-beliefs and 1) very negative self-beliefs respectively.

Next, principal components analysis (PCA) with varimax rotation was performed. It revealed that the 25 items could be reduced into four main dimensions, as shown in Table 2. The first component, 'Perceived self-efficacy', included high loading on items

measuring perceived ability to solve mathematical tasks. The second component, 'Perceived self-concept', included items measuring perceptions of self in mastery of mathematics. Another component, 'Perceived controllability (internal)', included items measuring perceptions of control over mathematical performance and academic success in school. The last component, 'Perceived controllability (external)', included items related to external locus of control. One of the items "I do badly in mathematics whether or not I study for my exams" was found to have low loading and thus excluded. These four components accounted for 56.3% of the total variance.

After PCA, component-based mean scores were generated by calculating the sum scores of items loading strongly on the respective components and then returning the scores to the scale of the original items. Hence, each component-based mean score varied between one and four. The higher the score of a component, the stronger and more positive the student's self-beliefs in that particular dimension are.

To address the research questions, subsequent analyses described below were performed as split-file analyses for us to compare and contrast the analysis results between the Finnish and Singaporean student samples.

Socio-economic Background and Achievement

To investigate whether the socio-economic background of secondary school students is related to their achievement in Finland and Singapore respectively, students' achievement was analyzed through comparison of means using one-way ANOVA to determine if there were differences in Plausible Value 1 (PV1) in mathematics between the high, average and low socio-economic groups in each country respectively. This was followed by post-hoc pairwise comparisons (Tukey test) to find out where the differences existed. Since large sample sizes are more likely to indicate statistically significant results, partial eta squared (η_p^2) was also calculated as a measure of effect size.

Table 2 PCA with varimax rotation of self-beliefs items

		Component			
		1	2	3	4
Component 1: Perceived Self-efficacy	Using a <Train Timetable>	**.569**	.065	.075	.203
	Calculating TV Discount	**.704**	.183	.168	-.013
	Calculating Square Metres of Tiles	**.757**	.268	.092	.027
	Understanding Graphs in Newspapers	**.696**	.123	.107	.060
	Solving Equation 1	**.592**	.251	.166	.099
	Distance to Scale	**.717**	.231	.097	-.063
	Solving Equation 2	**.599**	.353	.156	-.001
	Calculate Petrol Consumption Rate	**.716**	.211	.105	-.079
Component 2: Perceived Self-concept	Good <Grades>	.274	**.771**	.141	.192
	Learn Quickly	.290	**.787**	.155	.095
	One of Best Subjects	.295	**.790**	.092	-.022
	Understand Difficult Work	.265	**.758**	.120	.041
	Not good at Math	.291	**.745**	.096	.268
Component 3: Perceived Controllability (Internal)	Can Succeed with Enough Effort (Math)	.228	.324	**.678**	.016
	Doing Well is Up to Me (Math)	.135	.277	**.710**	-.006
	If I Wanted I Could Do Well (Math)	.190	.333	**.681**	-.062
	Can Succeed with Enough Effort (School)	.114	-.014	**.656**	.098
	My Choice Whether I Do Well (School)	.044	-.017	**.715**	.054
	Could Perform Well if I Wanted (School)	.113	-.001	**.703**	.030
Component 4: Perceived Controllability (External)	Family demands and problems (Math)	-.006	-.032	.015	**.787**
	Different teachers (Math)	-.002	.139	-.046	**.577**
	Do badly whether or not I study (Math)	.256	.489	.194	.462
	Family demands and problems (School)	.013	-.034	.045	**.784**
	Different teachers (School)	-.020	.089	-.024	**.589**
	Perform poorly whether or not I study (School)	.194	.230	.245	**.567**
	Cronbach's alpha	.87	.90	.82	.71

Note: Figures in bold indicate the individual items grouped together for each component.

Socio-economic Background and Self-beliefs

To investigate whether students' socio-economic background is related to their self-beliefs in Finland and Singapore respectively, the four dimensions of self-beliefs were similarly analyzed through comparison of means using one-way ANOVA, followed by post-hoc pairwise comparisons (Tukey test) to determine if, and where, differences in self-beliefs between the high, average and low socio-economic groups existed in each country respectively. Partial eta squared (η_p^2) was also calculated as a measure of effect size.

Self-beliefs, Socio-economic Background and Achievement

To investigate the extent that the self-beliefs and socio-economic background of secondary school students predict their achievement in Finland and Singapore respectively, a multiple regression analysis was performed. In addition to the mean-scores of the four components of self-beliefs – perceived self-efficacy, perceived self-concept, perceived controllability (internal) and perceived controllability (external), the PISA Index of economic, social and cultural status (ESCS) was entered as the socio-economic background variable.

5. RESULTS

5.1 Socio-economic Background and Achievement

The results of one-way ANOVA analysis to determine whether secondary school students' socio-economic background is related to their achievement in Finland and Singapore respectively are illustrated in Figure 4.

Post-hoc analyses indicated statistically significant differences between the means of all socio-economic groups in Finland, $F(2, 8682) = 489$, $p < .001$, $\eta_p^2 = .10$, and in Singapore, $F(2, 5516) = 389$, $p < .001$, $\eta_p^2 = .12$. In both countries, students from high SES scored higher than those from average SES ($p < .001$) and low SES ($p < .001$), and students from low SES scored lower than those from average SES ($p < .001$) and high SES ($p < .001$).

The greatest difference existed between the top and bottom SES quartiles. The difference in achievement between the top and bottom SES quartiles in Singapore was 103 points, greater than the 79-point difference in Finland whereas the PISA average performance difference between the top and bottom SES quartiles was 90 points (OECD, 2013b).

Hence, while secondary school students' socio-economic background was found to be related to their achievement in both countries – the more advantaged the student's family background, the better his/her academic performance is – the achievement gap between the disadvantaged students and the privileged was wider in Singapore than in Finland or the PISA average. On the other hand, the high level of equity in the Finnish education system was evident in the smaller achievement gap, when compared to the PISA average.

One note-worthy point is that, despite the wide achievement gap, the mean achievement scores of all SES groups in Singapore were above the OECD mean of 500. This suggests that students, regardless of socio-economic status or family background, benefited from a high-quality education in the domain of mathematics. The extent to which students benefited, however, varied across socio-economic groups.

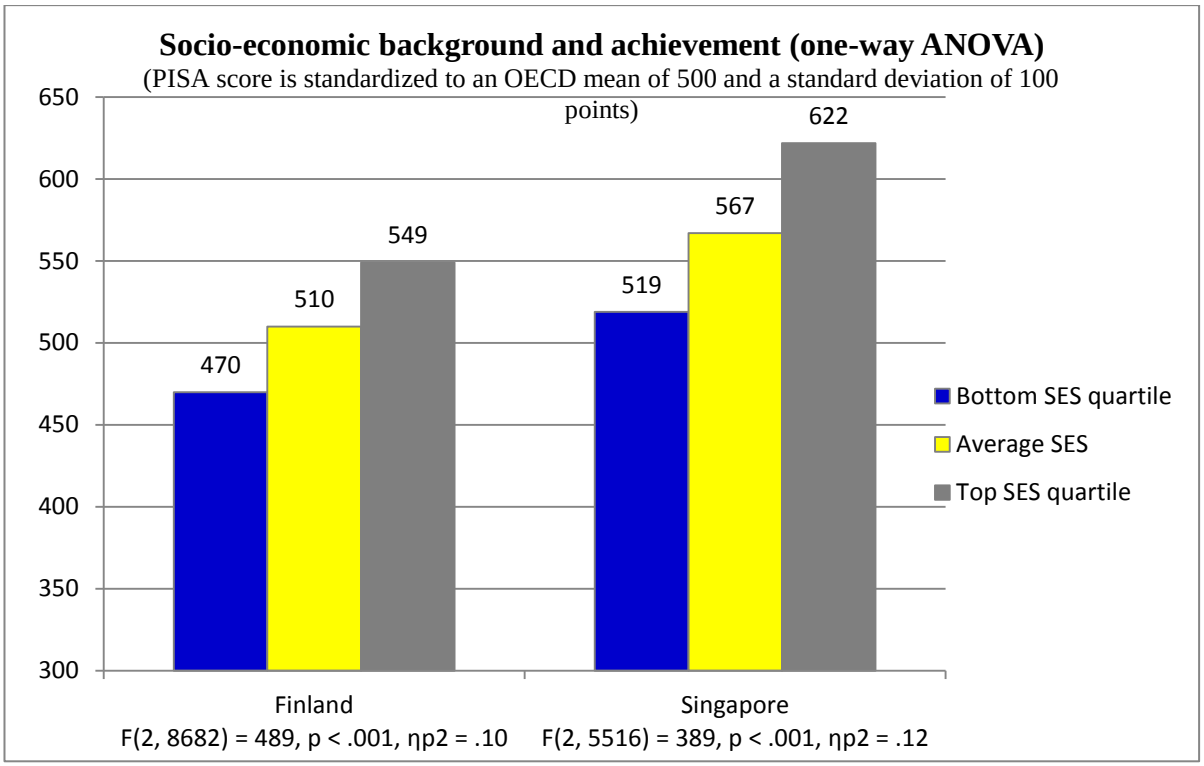

Figure 4 Achievement of different SES groups (one-way ANOVA)

Note: These results are based on only Plausible Value 1 (PV1) in mathematics. For detailed analyses on all five plausible values, PV1 to PV5, see Appendix A.

5.2 Socio-economic Background and Self-beliefs

Figures 5-8 show the results of one-way ANOVA analysis to determine whether the four dimensions of secondary school students' self-beliefs are related to their socio-economic background in Finland and Singapore respectively (see Appendix B for the tabulated results).

Perceived Self-efficacy and Self-concept

In terms of perceived self-efficacy and self-concept, one-way ANOVA indicated statistically significant differences between the means of all socio-economic groups in both countries, as shown in Figures 5 and 6. Post-hoc analyses indicated an effect of SES on self-efficacy in Finland, $F(2, 5649) = 184$, $p < .001$, $\eta_p^2 = .061$, and in Singapore, $F(2, 3655) = 180$, $p < .001$, $\eta_p^2 = .090$, as well as an effect of SES on self-concept in Finland, $F(2, 5529) = 77.2$, $p < .001$, $\eta_p^2 = .027$, and in Singapore, $F(2, 3642) = 48.2$, $p < .001$, $\eta_p^2 = .026$. In both countries, students from high SES rated themselves higher in these two dimensions of self-beliefs than those from average SES ($p < .001$)

and low SES ($p < .001$) while students from low SES rated themselves lower than those from average SES ($p < .001$) and high SES ($p < .001$).

The greatest difference was observed between the top and bottom SES quartiles. The difference in self-ratings of perceived self-efficacy between the top and bottom SES quartiles was slightly greater in Singapore (0.47), compared to Finland (0.42). However, the difference in self-ratings of perceived self-concept between the top and bottom SES quartiles in Finland was 0.35, slightly greater than that in Singapore (0.32).

Hence, secondary school students' socio-economic background was found to be related to their perceived self-efficacy and self-concept in both countries. The more advantaged the student's family background, the better his/her perceptions of self-efficacy and self-concept are. Of these two dimensions of self-beliefs, a greater gap between the disadvantaged students and the privileged was observed in perceived self-efficacy. Like achievement gap, the gap in self-efficacy beliefs between the disadvantaged students and the privileged was greater in Singapore than in Finland.

In spite of the greater gap, the mean self-ratings of perceived self-efficacy of all SES groups in Singapore were quite high (above 3 on a scale of 1-4). This suggests that students, regardless of socio-economic status or family background, were quite confident about their ability to perform mathematical tasks. The level of confidence, however, varied across socio-economic groups.

It is interesting to note that self-ratings of perceived self-concept were the lowest among the four dimensions of self-beliefs in both countries (see Figures 5-8 or Appendix B), despite generally high performance in the domain of mathematics. Across all socio-economic groups, the mean self-ratings of perceived self-concept trailed behind those of self-efficacy by 0.33-0.41 in Finland and by 0.58-0.73 in Singapore.

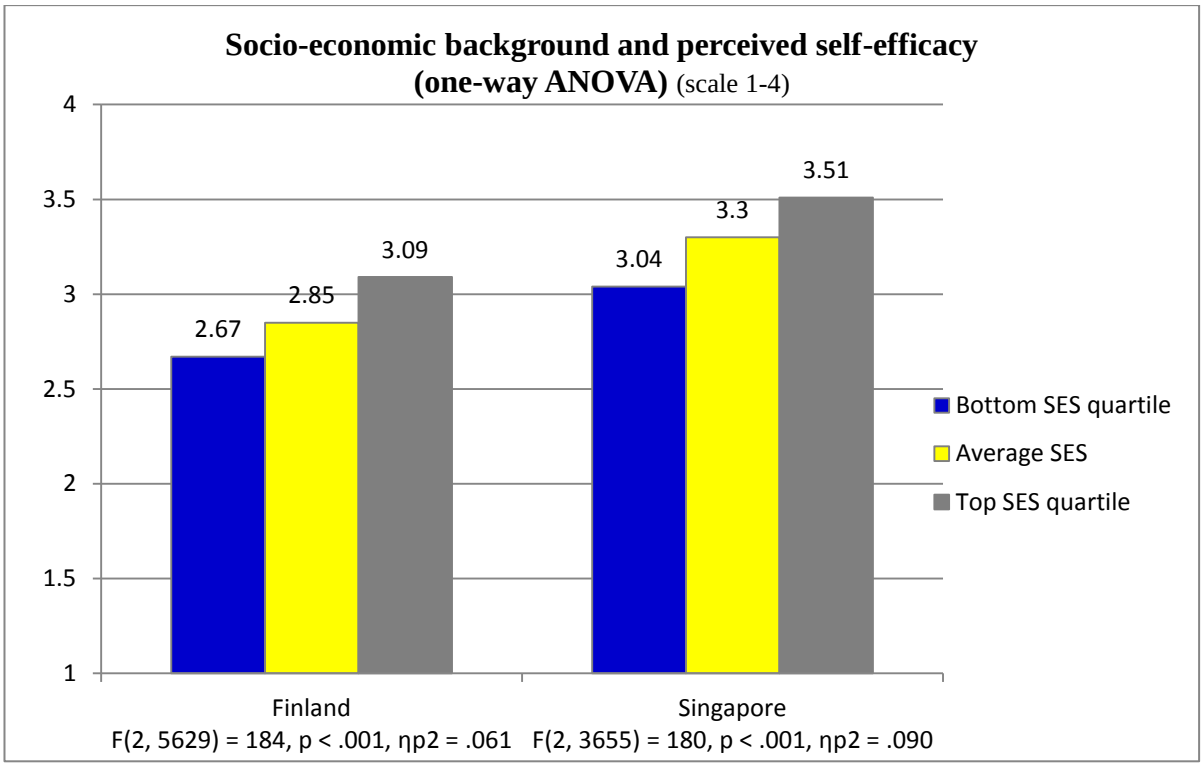

Figure 5 Perceived self-efficacy of different SES groups (one-way ANOVA)

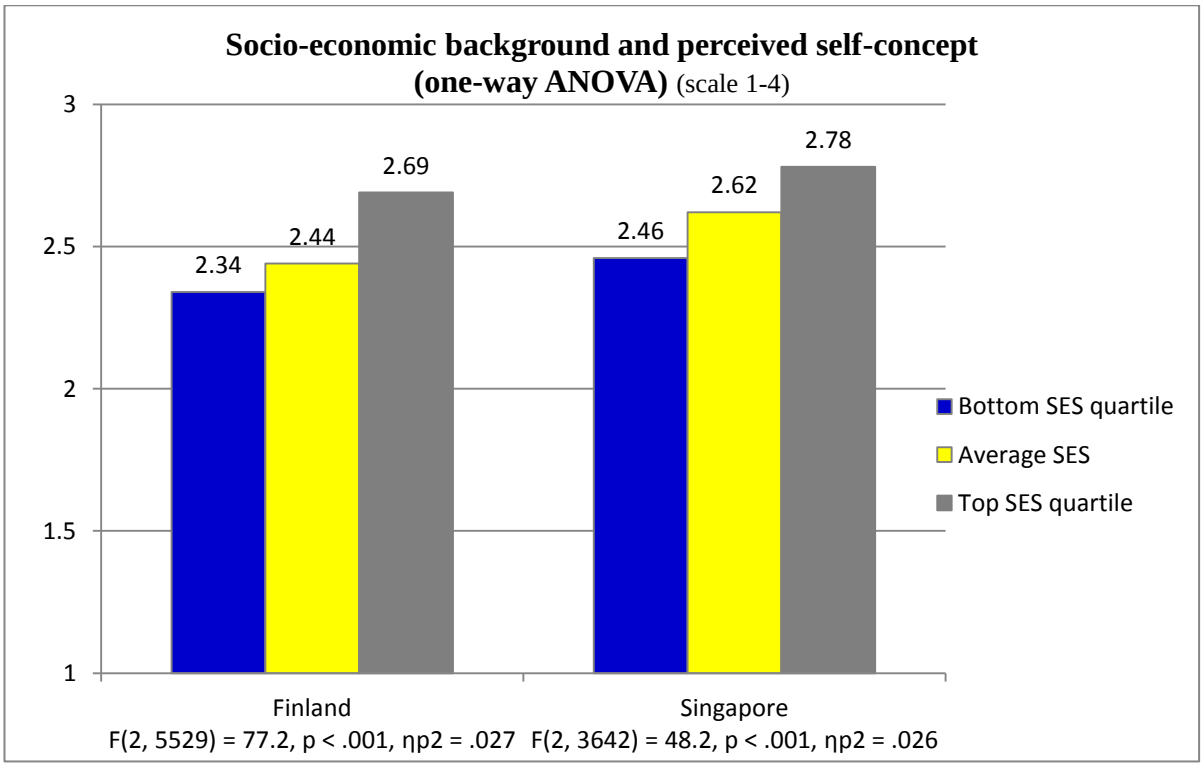

Figure 6 Perceived self-concept of different SES groups (one-way ANOVA)

Perceived Controllability

In terms of perceived controllability (internal), post-hoc analyses indicated slight differences associated with socio-economic groups in Finland, $F(2, 2760) = 12.7$, $p < .001$, $\eta_p^2 = .009$, with the greatest difference being only 0.13 observed between the top and bottom SES quartiles. Finnish students from high SES rated themselves higher than those from average SES ($p = .003$) and low SES ($p < .001$) whereas students from low SES rated themselves lower than those from average SES ($p = .036$) and high SES ($p < .001$).

However, one-way ANOVA indicated no effect of SES on perceived controllability (internal) in Singapore, $F(2, 1822) = 1.51$, $p = .22$, $\eta_p^2 = .002$. Post-hoc analyses indicated that self-ratings of perceived controllability (internal) did not differ significantly between students from average SES and those from high SES ($p = .86$) or low SES ($p = .19$), or between students from high and low SES ($p = .54$).

In terms of perceived controllability (external), one-way ANOVA indicated a small effect of SES in Singapore, $F(2, 1817) = 13.8$, $p < .001$, $\eta_p^2 = .015$, but the effect was almost negligible in Finland, $F(2, 2748) = 7.91$, $p < .001$, $\eta_p^2 = .006$, with the greatest difference between the top and bottom SES quartiles. The difference in self-ratings of perceived controllability (external) between the top and bottom SES quartiles in Singapore was 0.20, greater than that in Finland (0.11).

Post-hoc analyses indicated that Singaporean students from low SES rated themselves lower than those from average SES ($p = .001$) and high SES ($p < .001$) while Finnish students from low SES also rated themselves lower than those from average SES ($p = .039$) and high SES ($p < .001$). However, self-ratings of perceived controllability (external) did not differ significantly between students from high SES and those from average SES, whether in Finland ($p = .092$) or in Singapore ($p = .051$).

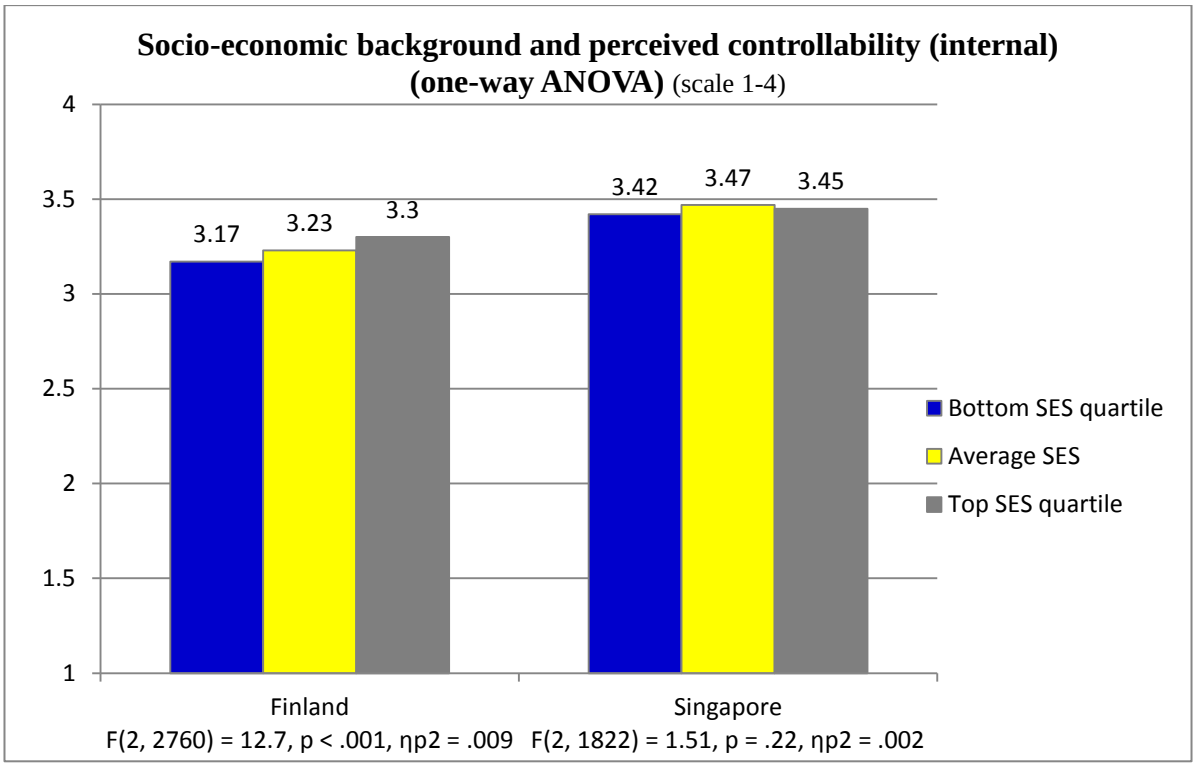

Figure 7 Perceived controllability (internal) of different SES groups (one-way ANOVA)

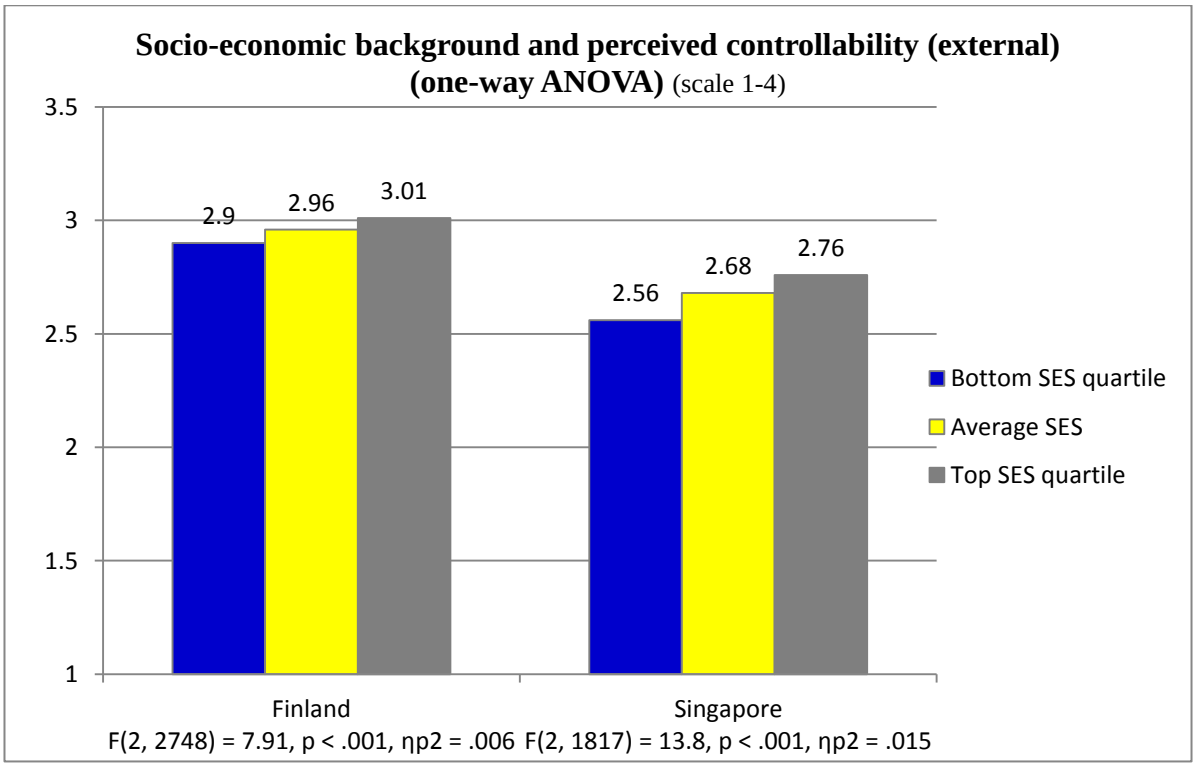

Figure 8 Perceived controllability (external) of different SES groups (one-way ANOVA)

Hence, only a weak link between secondary school students' socio-economic background and their perceived controllability was found in Finland. Only slight differences in perceived controllability beliefs were observed between the disadvantaged students and the privileged, and there were also no significant differences in perceived controllability (external) between the privileged and the average Finnish students. On the other hand, although there was a bigger difference in perceived controllability (external) between the disadvantaged students and the privileged in Singapore, perceived controllability (internal) did not vary across socio-economic groups.

Interestingly, self-ratings of perceived controllability (internal) were the highest among the four dimensions of self-beliefs in both countries (see Figures 5-8 or Appendix B). In fact, the mean self-ratings of perceived controllability (internal) of all SES groups in both countries were quite high (above 3 on a scale of 1-4). This suggests that students, regardless of socio-economic status or family background, felt capable of exercising control over their learning.

In contrast, mean self-ratings of perceived controllability (external) were well below those of controllability (internal) by 0.69-0.86 in Singapore, and by a smaller extent of 0.27-0.29 in Finland. The mean self-ratings of perceived controllability (external) of all SES groups in Singapore were also lower than those in Finland. This could suggest that Singaporean students felt less in control over external environmental factors that may hinder their learning.

5.3 Self-beliefs, Socio-economic background and Achievement

Tables 3 and 4 show the results of multiple regression analysis to determine the extent to which secondary school students' self-beliefs and socio-economic background predict their achievement in Finland and Singapore respectively.

Table 3 Summary of multiple regression on predictors of achievement: Finland[1]

Predictors	B	SE_B	β
(Constant)	319	10.5	
Perceived self-efficacy	29.9	3.16	.21***
Perceived self-concept	41.8	2.44	.38***
Perceived controllability (internal)	-14.2	3.08	-.081***
Perceived controllability (external)	15.3	2.59	.097***
Socio-economic background	21.7	1.64	.21***

Note: B = unstandardized regression coefficient; SE_B = standard error of coefficient;
β = standardized coefficient

*** $p < .001$

Table 4 Summary of multiple regression on predictors of achievement: Singapore

Predictors	B	SE_B	β
(Constant)	311	17.9	
Perceived self-efficacy	87.0	4.05	.47***
Perceived self-concept	8.04	2.96	.058**
Perceived controllability (internal)	-30.1	4.17	-.14***
Perceived controllability (external)	22.8	3.23	.13***
Socio-economic background	23.3	2.08	.22***

Note: B = unstandardized regression coefficient; SE_B = standard error of coefficient;
β = standardized coefficient

** $p < .01$. *** $p < .001$

Note: These results are based on only Plausible Value 1 (PV1) in mathematics. For detailed analyses on the other four plausible values, PV2 to PV5, see Appendix C.

1. The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were met. However, there was an issue with multicollinearity due to the high correlation between self-efficacy and self-concept in Finland ($r = .705$, $p < .001$) but the tolerance value & VIF were within acceptable range.

In Finland, the five predictors – which include socio-economic background and the four dimensions of self-beliefs – together explained 39.6% of the total variance in achievement, $F(5, 2638) = 348$, $p < .001$, adjusted $R^2 = .40$, with Durbin-Watson value of 1.84. Although all variables contributed statistically significantly to the prediction of achievement ($p < .001$), perceived self-efficacy, perceived self-concept and socio-economic background were found to predict achievement to greater extents.

In Singapore, the five predictors together explained 39.9% of the total variance in achievement, $F(5, 1797) = 241$, $p < .001$, adjusted $R^2 = .40$, with Durbin-Watson value of 1.66. All variables contributed significantly to the prediction of achievement ($p < .001$), with the exception of perceived self-concept ($\beta = .058$, $p = .007$). Perceived self-efficacy and socio-economic background were found to predict achievement to greater extents.

It is interesting to note that perceived self-concept was a far more statistically significant predictor of Finnish students' achievement than that of their Singaporean counterparts. Instead, in Singapore, perceived self-efficacy strongly predicted achievement but not self-concept.

Another interesting observation is the negative coefficients for perceived controllability (internal) (see Tables 3 and 4), indicating that greater perceptions of controllability (internal) somehow predicted lower performance.

6. DISCUSSION AND CONCLUSION

This study aims to examine the relationship between family socio-economic background and secondary school students' academic achievement and their self-beliefs in two different national contexts – low stratification in the Finnish education system and high stratification in Singapore's – using 2012 PISA data collected from 15-year-old school students. The findings for Finland and Singapore are summarized in Figures 9 and 10 respectively.

As expected, a strong relationship between students' socio-economic background and their achievement was found in both countries. Socio-economic background was found to predict achievement. These results are consistent with previous studies that found that students from advantaged families perform better than their disadvantaged peers (Gamoran & Long, 2006; Reay, 2006; Chudgar & Luschei, 2009). The finding of a stronger relationship between students' background and achievement in Singapore – where students are not only selected for different academic streams but also assigned to hierarchized secondary schools according to their results at an early age of 12 – as opposed to a smaller achievement gap between the advantaged students and the disadvantaged in Finland – where no tracking occurs in the 9-year comprehensive school system – is also consistent with findings that education systems with high stratification exacerbate this inequality (Oakes, 1992; Gamoran, 2010; Weis, 2010; Lamb, 2011). However, the bigger performance gap in Singapore could also be seen as a reflection of the greater income inequality in society.

Also, students' socio-economic background was found to be related to their perceived self-efficacy and, to a smaller extent, self-concept in both countries. Students from advantaged background have higher self-efficacy and self-concept than their disadvantaged peers. This finding is in line with the observation that family background exerts a strong influence on students' self-beliefs (Reay, 2004). Self-efficacy was found to be a predictor of achievement in both countries, in accordance with previous research showing self-efficacy beliefs to be instrumental in predicting academic achievement (Pajares & Kranzler, 1995; Bandura et al., 1996; Pajares & Graham, 1999). In Singapore, both the relationship between students' background and self-efficacy beliefs, and that between self-efficacy and achievement were stronger than in Finland. These results corroborate the argument that the impact of socio-economic background on

students' academic achievement is mediated through parental educational aspirations for their children which, in turn, influence children's self-efficacy beliefs (Bandura et al., 1996).

Quite unexpectedly, perceived self-concept was not found to predict achievement in Singapore although it was a strong predictor of achievement in Finland. Moreover, despite generally high mathematics achievement, perceptions of mathematics self-concept were less positive than what self-efficacy suggested. This was the case for both countries but more so for Singapore. In spite of the bigger achievement gap and bigger difference in self-efficacy beliefs observed in Singapore, the difference in self-concept was smaller than that in Finland. These findings may suggest a possible big-fish–little-pond effect (BFLPE) – high-achievers tend to have lower academic self-concepts when placed in competitive high-ability streams or schools, and vice versa – and that the BFLPE is stronger in early-selection education systems like Singapore's, as pointed out by Salchegger (2016).

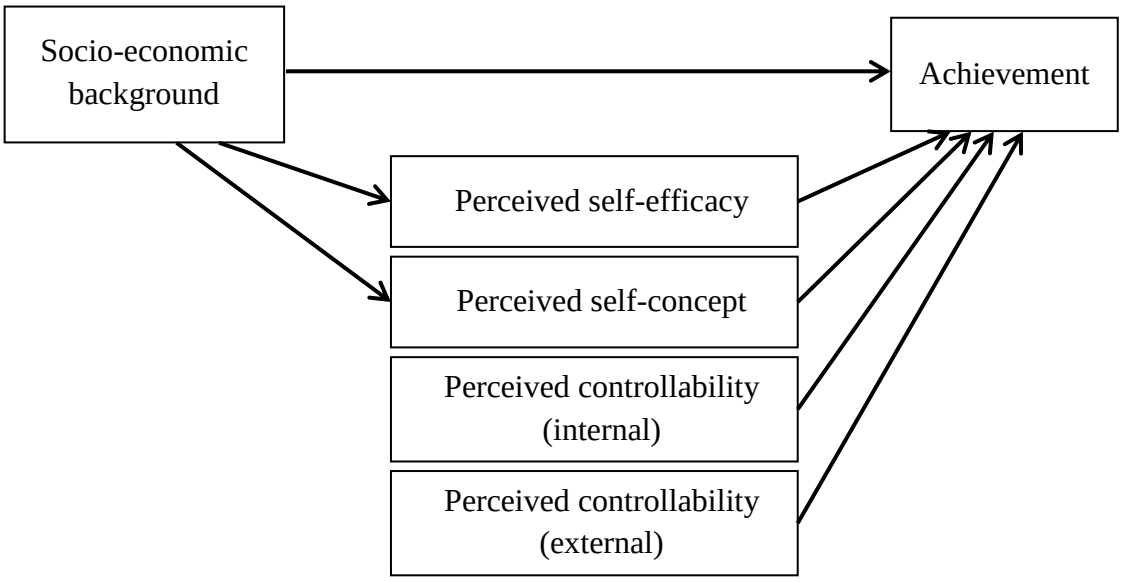

Figure 9 Relationship between family socio-economic background, academic achievement and self-beliefs in Finland

In addition, Finnish students' perceived controllability was not found to be strongly related to their socio-economic background. Only slight differences in controllability beliefs were observed between the advantaged students and the disadvantaged in Finland. In Singapore, no relationship was found between students' socio-economic background and their perceived internal controllability either. Furthermore, students in both countries have rather high perceptions of internal controllability. These results are likely to be due to the predominance of public schools with highly-standardized educational provisions so that every school is able to provide high-quality education nationwide. With respect to this, we can say that both countries have achieved educational equality because students, regardless of socio-economic status or family background, generally felt capable of exercising control over their learning.

However, unlike in Finland, external controllability beliefs were found to be related to one's socio-economic background in Singapore. Singaporean students from disadvantaged background perceived lower external controllability than their peers while there were no significant differences between the advantaged and the average students. Not only could this finding possibly reflect the rich-poor material gap in Singapore's society, but also it may indicate a strong influence of class habitus on youths' self-beliefs. Such a collective perception of what is 'for us' or "destiny effect" arising from belonging to a lower socio-economic strata (Bourdieu, 1999) – augmented by the placement of many disadvantaged youths together in the low-ability stream – may explain why disadvantaged students in Singapore felt less in control over external environmental factors that affect their learning.

In the present study, while both types of perceived controllability contributed to the prediction of achievement – but to smaller extents, compared to socio-economic background and self-efficacy – internal controllability beliefs seemed to counteract external controllability. It is unclear why higher perceptions of internal controllability predicted lower achievement. A possible explanation is that a higher perception of internal controllability could lead to a sense of complacency, thus resulting in poor performance. Another alternative explanation could be that low achievers, nonetheless, feel strongly that they have much control over their own learning – that doing well is entirely *up to them* and *if they had chosen* to put in effort, they could have performed well. However, further studies are required to ascertain this finding.

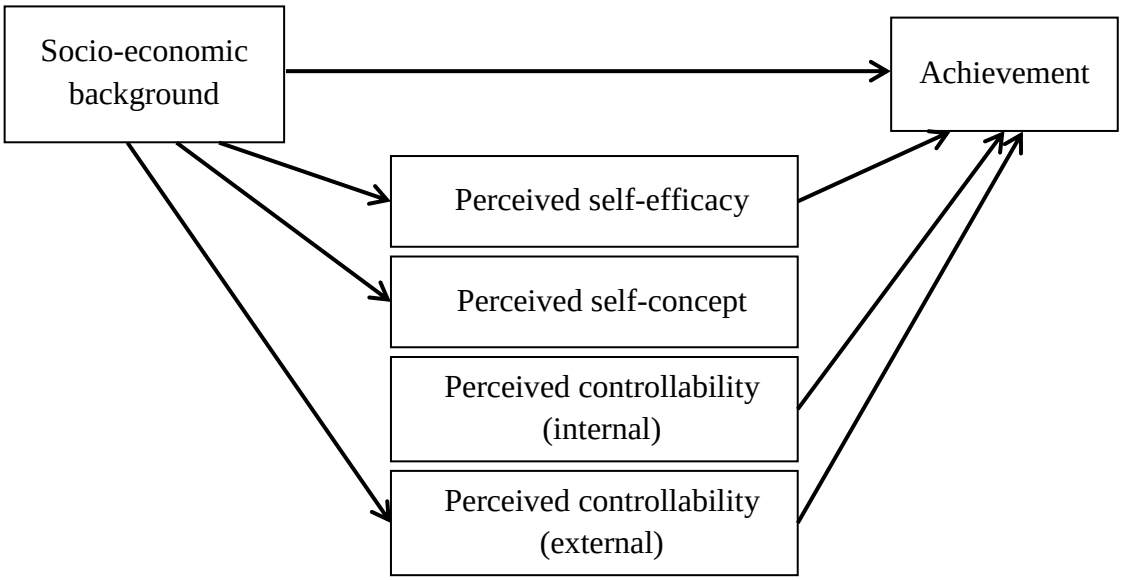

Figure 10 Relationship between family socio-economic background, academic achievement and self-beliefs in Singapore

6.1 Limitations

The results of this comparative study should be interpreted with caution. First, the present study was based on correlational data; hence, the need to avoid equating correlation with causation and making causality inferences.

Secondly, self-report data was used to measure self-beliefs in this study. A shortcoming of self-reports is that they do not always accurately capture respondents' perceptions because of possible cross-cultural differences in response behavior or social desirability of certain responses.

The third limitation lies in the rotation design applied to 2012 PISA assessment and student questionnaire. In the case of the assessment, each respondent answered only a subset of the total test items (four out of 13 test booklets), with different combinations of test items for different students so the five test-score plausible values are only estimates of students' achievement. Moreover, only one plausible value (PV1) was used for the analysis in the present study. In the case of the questionnaire, except for items about family background that were answered by all, the items were split up into three rotated parts, of which each respondent only completed two. Therefore, each item on self-beliefs was answered by only a sub-sample (approximately two-thirds of the sample). In addition, items pertaining to perceived controllability comprised items from two rotated parts so complete data could only be obtained from approximately one-third of the sample.

Lastly, this comparative study was based on only two national cases, precluding generalizations about the results of this study. However, the corroboration of some of these findings with existing literature lends weight to these findings. Also, when conducting cross-national research, one has to bear in mind the different historical, social, cultural and institutional contexts in which a phenomenon is embedded.

6.2 Recommendations for Future Research

The present study explored the relationship between socio-economic background, self-beliefs and academic achievement. It must be noted that the results were based on mathematics achievement only. The study should be extended to other domains to investigate if the relationship between socio-economic background, self-beliefs and achievement also exists, and whether the relationship is stronger or weaker. The findings of this study lead to a new question: Why is self-concept, which is found to be related to socio-economic background, not a predictor of achievement in one country but strongly predicts achievement in another? I cited the stronger big-fish–little-pond effect (BFLPE) in competitive early-selection education systems as a plausible explanation. However, this aspect of self-concept requires further study. In addition, this study focused on only four dimensions of self-beliefs. Future studies might also include other dimensions of self-beliefs and systematically investigate the underlying mechanisms of self-beliefs in relation to achievement as well as whether different education systems impact students' self-beliefs differently.

Although socio-economic background is strongly related to academic achievement, there are resilient disadvantaged students from the bottom SES quartile – 8.1% of Finnish students and 15.1% of Singaporean students – who beat the odds and are in the top quartile of achievers (OECD, 2013b). Thus, it is worthwhile for future research to examine the attributes of such students, such as perseverance and aptitude for problem-solving, to determine which factors may moderate the relationship between socio-economic background and achievement.

This comparative study can also be extended beyond the present two national cases to other countries. A possibility is comparison with a third reference society like South Korea that shares similarities with Singapore – high-stakes national examination systems, examination-based meritocracy and common Confucian values (Kuan, 2011) – but, at the same time, is like Finland in successfully combining high achievement with small achievement gaps between students from different social backgrounds (Waldow, Takayama & Sung, 2014). Other alternatives include comparison of countries clustered according to socio-cultural characteristics, such as Asian versus Nordic, or according to the levels of standardization and stratification in the education systems, such as comprehensive versus differentiated.

6.3 Conclusion

The challenge of dealing with student diversity while maintaining high standards of education is one faced by policy makers in all nations. How can education systems achieve the social justice agenda of promoting social mobility in spite of the global trend of widening income and wealth gap?

The present study suggests that high stratification in the education system has consequences not only for academic or social outcomes but also for students' self-beliefs. In Singapore's society, meritocracy is the basis of social equality. For the sake of our social fabric, it is therefore important that we guard against elitism and not let a meritocratic education system veer towards the entrenchment of social stratification.

The findings on self-concept may also have implications for both countries in terms of attracting students to future careers in the field of science, technology, engineering and mathematics (STEM). When high achievers in mathematics with lower self-concepts perceive their own potential inaccurately and think that they are *not* as good as they *actually* are, it can affect their career aspirations, and result in possible loss of talents from the STEM field.

As policy makers and practitioners around the world seek to improve their own education systems, a degree of caution against becoming obsessed with the 'education race' that is fueled by rankings in international league tables of comparative studies like PISA and TIMSS is necessary. While findings from such large-scale assessment can serve to inform decision-making, it would be prudent to bear in mind that they, however, measure only a few particular aspects of education. An uncritical acceptance of these studies as the chief yardstick for measuring the quality of an education system could lead to a narrowing of the function of education to global economic competitiveness or economic efficiency goals underpinning PISA, for instance, and overlooking other equally important purposes of education like human and social enlightenment, inculcation of values and ethics, collective social good and equity.

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Appendix A

One-way ANOVA analysis of students' achievement: Finland

	Bottom SES quartile	**Average SES**	**Top SES quartile**	
PV1	470	510	549	$F(2, 8682) = 489$, $p < .001$, $\eta_p^2 = .101$
PV2	469	510	548	$F(2, 8682) = 487$, $p < .001$, $\eta_p^2 = .101$
PV3	470	510	549	$F(2, 8682) = 491$, $p < .001$, $\eta_p^2 = .102$
PV4	470	509	549	$F(2, 8682) = 493$, $p < .001$, $\eta_p^2 = .102$
PV5	470	509	549	$F(2, 8682) = 490$, $p < .001$, $\eta_p^2 = .101$
Average	470	510	549	

One-way ANOVA analysis of students' achievement: Singapore

	Bottom SES quartile	**Average SES**	**Top SES quartile**	
PV1	519	567	622	$F(2, 5516) = 389$, $p < .001$, $\eta_p^2 = .123$
PV2	520	567	622	$F(2, 5516) = 383$, $p < .001$, $\eta_p^2 = .122$
PV3	519	567	622	$F(2, 5516) = 382$, $p < .001$, $\eta_p^2 = .122$
PV4	520	568	622	$F(2, 5516) = 373$, $p < .001$, $\eta_p^2 = .119$
PV5	519	566	623	$F(2, 5516) = 387$, $p < .001$, $\eta_p^2 = .123$
Average	519	567	622	

Appendix B

One-way ANOVA analysis of students' self-beliefs: Finland

	Bottom SES quartile	**Average SES**	**Top SES quartile**	
Perceived self-efficacy	2.67	2.85	3.09	$F(2, 5629) = 184$, $p < .001$, $\eta_p^2 = .061$
Perceived self-concept	2.34	2.44	2.69	$F(2, 5529) = 77.2$, $p < .001$, $\eta_p^2 = .027$
Perceived controllability (internal)	3.17	3.23	3.30	$F(2, 2760) = 12.7$, $p < .001$, $\eta_p^2 = .009$
Perceived controllability (external)	2.90	2.96	3.01	$F(2, 2748) = 7.91$, $p < .001$, $\eta_p^2 = .006$

One-way ANOVA analysis of students' self-beliefs: Singapore

	Bottom SES quartile	**Average SES**	**Top SES quartile**	
Perceived self-efficacy	3.04	3.30	3.51	$F(2, 3655) = 180$, $p < .001$, $\eta_p^2 = .090$
Perceived self-concept	2.46	2.62	2.78	$F(2, 3642) = 48.2$, $p < .001$, $\eta_p^2 = .026$
Perceived controllability (internal)	3.42	3.47	3.45	$F(2, 1822) = 1.51$, $p = .22$, $\eta_p^2 = .002$
Perceived controllability (external)	2.56	2.68	2.76	$F(2, 1817) = 13.8$, $p < .001$, $\eta_p^2 = .015$

Appendix C

Multiple regression on students' achievement (PV2-PV5): Finland

	Predictors	B	SE_B	β
PV2	(Constant)	313	10.7	
	Perceived self-efficacy	33.6	3.19	.23***
	Perceived self-concept	39.1	2.47	.35***
	Perceived controllability (internal)	-15.2	3.11	-.085***
	Perceived controllability (external)	16.8	2.62	.11***
	Socio-economic background	21.8	1.66	.21***
$F(5, 2638) = 342$, $p < .001$, adjusted $R^2 = .39$, Durbin-Watson value =1.85				
PV3	(Constant)	314	10.6	
	Perceived self-efficacy	33.0	3.17	.23***
	Perceived self-concept	39.3	2.45	.36***
	Perceived controllability (internal)	-14.4	3.09	-.081***
	Perceived controllability (external)	16.4	2.60	.10***
	Socio-economic background	21.5	1.65	.20***
$F(5, 2638) = 344$, $p < .001$, adjusted $R^2 = .39$, Durbin-Watson value =1.82				
PV4	(Constant)	311	10.6	
	Perceived self-efficacy	34.8	3.17	.24***
	Perceived self-concept	39.4	2.45	.36***
	Perceived controllability (internal)	-13.7	3.10	-.077***
	Perceived controllability (external)	15.0	2.60	.094***
	Socio-economic background	21.2	1.65	.20***
$F(5, 2638) = 351$, $p < .001$, adjusted $R^2 = .40$, Durbin-Watson value = 1.87				
PV5	(Constant)	308	10.6	
	Perceived self-efficacy	32.8	3.18	.23***
	Perceived self-concept	39.8	2.46	.36***
	Perceived controllability (internal)	-14.0	3.10	-.079***
	Perceived controllability (external)	17.7	2.61	.11***
	Socio-economic background	21.2	1.66	.20***
$F(5, 2638) = 348$, $p < .001$, adjusted $R^2 = .40$, Durbin-Watson value = 1.85				

Note: B = unstandardized regression coefficient; SE_B = standard error of coefficient;
β = standardized coefficient

*** $p < .001$

Multiple regression on students' achievement (PV2-PV5): Singapore

	Predictors	B	SE_B	β
PV2	(Constant)	311	17.7	
	Perceived self-efficacy	85.3	4.01	.46***
	Perceived self-concept	7.79	2.93	.058**
	Perceived controllability (internal)	-29.8	4.14	-.14***
	Perceived controllability (external)	24.8	3.20	.15***
	Socio-economic background	23.2	2.06	.22***
$F(5, 1797) = 242$, $p < .001$, adjusted $R^2 = .40$, Durbin-Watson value = 1.70				
PV3	(Constant)	320	17.9	
	Perceived self-efficacy	87.0	4.06	.47***
	Perceived self-concept	7.32	2.96	.053*
	Perceived controllability (internal)	-32.1	4.18	-.15***
	Perceived controllability (external)	23.1	3.24	.14***
	Socio-economic background	22.3	2.08	.21***
$F(5, 1797) = 234$, $p < .001$, adjusted $R^2 = .39$, Durbin-Watson value = 1.68				
PV4	(Constant)	312	18.0	
	Perceived self-efficacy	86.6	4.07	.47***
	Perceived self-concept	7.64	2.97	.055*
	Perceived controllability (internal)	-28.9	4.19	-.13***
	Perceived controllability (external)	22.4	3.25	.13***
	Socio-economic background	22.8	2.09	.21***
$F(5, 1797) = 233$, $p < .001$, adjusted $R^2 = .39$, Durbin-Watson value = 1.69				
PV5	(Constant)	307	18.1	
	Perceived self-efficacy	90.7	4.11	.48***
	Perceived self-concept	5.19	3.00	.037
	Perceived controllability (internal)	-31.4	4.23	-.14***
	Perceived controllability (external)	24.5	3.28	.14***
	Socio-economic background	23.3	2.11	.21***
$F(5, 1797) = 243$, $p < .001$, adjusted $R^2 = .40$, Durbin-Watson value = 1.72				

Note: B = unstandardized regression coefficient; SE_B = standard error of coefficient;
β = standardized coefficient

* $p < .05$. ** $p < .01$. *** $p < .001$