4

Immigrant students' approaches to learning

INTRODUCTION[1]

While previous chapters have focused on student performance and its relationship with student background, it is also important to examine how well education systems are serving immigrant students in other aspects of learning. School systems not only need to provide students with essential literacy skills, but also with other fundamental skills and dispositions necessary to manage their own learning. These include interest in learning, motivation and confidence (OECD, 2004a). Positive attitudes towards school help foster these learning fundamentals (Blum and Libbey, 2004). Students who feel alienated from school are at risk of performing poorly in school as well as later on in life (OECD, 2003c). Adolescents with a positive attitude to learning are more likely to leave school with a better chance of successfully adapting and acquiring new skills throughout their lives.

Educational studies have stressed the importance of motivation and attitude in relation to achievement and success in school and work (*e.g.* OECD, 2003b; OECD, 2003c; Eccles, Wigfield and Schiefele, 1998; Zimmerman, 2000). Motivation is essential for learning throughout life, both in professional contexts and in less directed learning environments (OECD, 2003b). In addition, Willms (in OECD 2003c) links engagement in school with student achievement and points to several studies on child development indicating that children who feel detached from school not only compromise their potential levels of achievement, but also tend to behave badly in school, risk dropping out of school and developing poor physical and mental health (Coie and Jacobs, 1993; Hawkins, Doueck and Lishner, 1988; Power, Manor and Fox, 1991; Pulkkinen and Tremblay, 1992; Rodgers, 1990; Rumberger, 1995; Yoshikawa, 1994).

Overall previous research suggests that desirable "non-achievement outcomes of schooling" such as strong motivation, positive self-perception and a good level of school engagement are critical for students' potential for lifelong learning, as well as their future financial success and general well-being and should therefore be considered along with academic achievement as key schooling outcomes (OECD, 2003b; OECD, 2003c). Despite the importance of these factors, however, there is very little research focusing on immigrant students' motivation and perceptions of school from an international perspective. In turn, this chapter seeks to examine these learning dispositions as part of considering immigrant students' success in school.

Previous chapters indicate that in many countries, immigrant students tend to lag behind their native peers in the subject areas assessed by PISA. This, however, may not be the case for motivation and perception of school. Some research suggests that the willingness and initiative of a family to emigrate may be associated with immigrant students and their parents being optimistic about the future and highly motivated to take advantage of new opportunities in their new home (Suárez-Orozco and Suárez-Orozco, 1995). The desire to succeed may cause students to have a relatively positive attitude towards schooling. First-generation students should have more of a tendency to have these attitudes, as they themselves have experienced immigration and the hope that may be associated with it.

At the same time, however, immigrant students often perform poorly. This can dampen their initial motivation over time. Similarly, children from immigrant families may perceive their new and unfamiliar school environments as hostile, which could lead to less engagement in school. For example, studies of immigrants in the United States indicate that length of residency in the country

appears to be associated with lower levels of achievement, motivation, aspirations and health (Conchas, 2001; Portes and Rumbaut, 2001; Rumbaut, 1995; Steinberg, 1996; Suárez-Orozco, 2001; Suárez-Orozco and Suárez-Orozco, 1995; Waters, 1999). It is therefore possible that second-generation students show lower levels of motivation and less positive attitudes towards school than first-generation students.

This chapter seeks to explore these non-achievement outcomes of learning to provide new insights into how immigrant students' motivational orientations and attitudes related to learning and school compare to those of their peers from native families and how these relationships differ across countries. PISA provides a unique opportunity to examine these characteristics, which are essential for learning throughout life, by exploring broader learning profiles of immigrant and non-immigrant students at age 15. This includes information on students' motivation, engagement and confidence. Since mathematics was the focus of PISA 2003, many of the questions are analysed in relationship to this domain. This chapter first reviews the measures available and then presents the results of analyses organised around the four categories below (for a more in-depth description of these categories see Figure 4.1):

- *Students' interest and motivation in mathematics.* Subject motivation is frequently viewed as the essential force for learning and is related to both students' interest and enjoyment in the subject along with external incentives for learning.
- *Students' beliefs about themselves.* Students' views about their competence and ability to learn influence the way they set goals, whether or not they use effective learning strategies and how well they perform.
- *Students' anxiety about mathematics*. Students often experience fear associated with mathematics which tends to negatively affect performance.
- *Students' engagement and perceptions of school.* Students' attitudes towards school and sense of belonging are closely associated with performance, as well as long-term outcomes ranging from economic success to health.

While including analyses of the relationship between these characteristics and performance, this chapter emphasises motivation, self-perception and engagement as critical non-achievement outcomes of schooling for immigrant and non-immigrant students. These are all qualities in students which can be improved and could be targeted by parents, teachers and policy makers.

Previous research suggests that immigrants tend to be optimistic and may therefore possess more positive learning characteristics. These characteristics may be especially strong for first-generation students, who themselves experience immigration. They may be less strong among second-generation students, as the challenges of succeeding in the host country might be more apparent to parents and students who have been in the country longer. Furthermore, assimilation tendencies may also lead second-generation students to show characteristics more similar to native students than to first-generation students. To the extent that immigrant students show more positive learning characteristics, educators may be able to use these to improve achievement scores. For example, schools could make better use of the motivational characteristics of immigrant students to encourage them to engage in additional activities aimed at improving language skills or lessening achievement differences.

Chapter 3 of *Learning for Tomorrow's World – First Results from PISA 2003* (OECD, 2004a) states that there are limitations that must be taken into account when considering the analyses in this chapter. First, all of the measures related to non-achievement outcomes are based on a questionnaire filled out by students themselves rather than through direct measures, which would require interview or observation methods impossible to employ in a large-scale international survey (Artelt, 2000). Instead, PISA collects student information on characteristics that have been shown to be associated with students who thrive as learners. Research suggests that 15-year-old students have sufficient knowledge about their learning and are able to provide relatively accurate information on the non-achievement outcomes measured in PISA (OECD, 2004a; Schneider, 1996).

A second limitation is that students in the various countries may interpret the survey questions on school-related motivations and attitudes differently. These questions require subjective judgments, which may be shaped by students' cultural backgrounds. In fact, focusing on immigrant children brings another level of cultural complexity to the analyses, which may further influence these students' responses. However, analyses of PISA 2000 and 2003 data indicate that for most characteristics, including self-related beliefs and sense of belonging, valid cross-country comparisons can be made, as analyses of PISA 2003 data confirmed comparability and found similar relationships between self-reported characteristics and student performance both within and across countries (OECD, 2004a). For other characteristics, such as motivation, cross-country comparisons of country averages should be interpreted with caution. More importantly for this chapter, it is possible to make valid comparisons among sub-groups within countries for all characteristics (OECD, 2004a). Therefore, this chapter mainly compares immigrant sub-groups within countries and makes cross-national comparisons with caution, especially for more problematic variables, such as motivation.

A further limitation is that PISA is a cross-sectional survey (*i.e.* data are collected at one moment in time as opposed to over time), which does not allow for the examination of causal relationships. For example, previous research shows that academic performance and motivation are related and that the two factors are mutually reinforcing (Marsh, Trautwein, Lüdtke, Köller and Baumert, 2005). While this type of analysis cannot be carried out with the PISA data, it is possible to use PISA data to examine learning characteristics of students that are associated with better performance in school (OECD, 2004a).

PISA investigated characteristics that indicate whether or not students are likely to have positive feelings and attitudes related to learning and school. Students who participated in PISA responded to a series of questions about each of these characteristics. The focus of PISA 2003 was mathematics and consequently most of these questions were placed in the context of learning mathematics. These characteristics represent four broad categories namely motivation, self-related beliefs, emotions and student attitudes towards and perceptions of school. Figure 4.1 provides an overview of the characteristics included in each category, a brief description of the reason for its inclusion and example questions that students answered. Box 4.1 explains the indices used to represent these characteristics. Each index is scaled with the average score across all OECD countries set at 0 with a standard deviation of 1 (*i.e.* two-thirds of the students score between 1 and -1). The full set of questions can be found in Annex A1 of *Learning for Tomorrow's World – First Results from PISA 2003* (OECD, 2004a). These categories, scales and specific survey questions form the basis for the analysis in this chapter.

Figure 4.1 ■ **Characteristics and attitudes of students as learners of mathematics**

Category of characteristics and rationale for inclusion	Student characteristics used to report results
A. Motivational factors Motivation is often considered the driving force behind learning. There are internally generated motives, such as interest in a particular subject area; there are also external motives deriving from external rewards for good performance, such as praise or future prospects (Deci and Ryan, 1985).	*1. Interest and enjoyment of mathematics.* Students were asked about their interest in mathematics as a subject as well as their enjoyment of learning mathematics. Interest and enjoyment of a subject is an orientation that affects the intensity and continuity of engagement in learning situations, as well as the selection of learning strategies. *2. Instrumental motivation in mathematics.* Students were asked to what extent they are encouraged to learn by external rewards such as good job prospects. Studies carried out over time indicate that motivation influences both what students study and how they perform (Wigfield, Eccles and Rodriguez, 1998).
B. Self-related beliefs in mathematics Learners form views about their own abilities and learning characteristics. These influence the way they set goals, their strategies and their achievement (Zimmerman, 1999). Two ways of defining these beliefs are: self-efficacy - how well students think they can handle even difficult tasks (Bandura, 1994); and self concept – students beliefs in their own abilities (Marsh, 1993). Each of these closely associated characteristics is critical for independent learning. Self-related beliefs are sometimes referred to in terms of self-confidence, indicating that such beliefs are positive. In both cases, confidence in itself has important benefits for motivation and the way in which students approach learning tasks.	*3. Self-efficacy in mathematics.* Students were asked to what extent they believe in their own ability to handle learning situations and overcome difficulties in mathematics effectively. This affects students' willingness to take on challenging tasks and persist in tackling them. In turn, this has significant implications for motivation (Bandura, 1994). *4. Self-concept in mathematics.* Students were asked about their beliefs in their own competence in mathematics. Belief in one's own abilities is highly relevant to successful learning, as well as being a goal in its own right (Marsh, 1986).
C. Emotional dispositions in mathematics Students' avoidance of mathematics due to emotional stress is reported to be widespread in many countries. It is often associated with achievement and choice of study (Meece, Wigfield, and Eccles, 1990).	*5. Anxiety in mathematics.* Students were asked to what extent they feel helpless and under emotional stress when dealing with mathematics.
D. Student attitudes and perceptions of schools Students' engagement in school is seen as a disposition towards learning, cooperating with others and having the ability to successfully function in a social institution (OECD, 2003c). It has relevant implications for learning both in school and beyond.	*6. Attitudes toward school.* Students were asked to think about what they had learned at school in relation to how the school had prepared them for adult life, given them confidence to make decisions, taught them things that could be useful in their job or a waste of time. *7. Sense of belonging at school.* Students were asked to express their perceptions about whether their school was a place where they felt like an outsider, made friends easily, felt like they belonged, felt awkward and out of place or felt lonely.

Adapted from Figure 3.1 OECD, 2004a, p.115 and OECD, 2003b, p. 13-14).

Box 4.1 ■ **Interpreting the PISA indices**

The measures are presented as indices that summarise student responses to a series of related questions constructed on the basis of previous research (Annex A1). The validity of comparisons across countries was explored using structural equation modelling. In describing students in terms of each characteristic (*e.g.* interest in mathematics), scales were constructed on which the average OECD student (*i.e.* the student with an average level of interest) was given an index value of zero, and about two-thirds of the OECD student population are between values of -1 and 1 (*i.e.* the index has a standard deviation of 1). Negative values on an index do not necessarily imply that students responded negatively to the underlying questions. Rather, a student with a negative score replied less positively than the OECD average. Likewise, a student with positive scores responded more positively than the OECD average. As each indicator is introduced below, a diagram shows more precisely which scores are associated with a particular response with an emphasis on the three sub-groups of this report: first-generation, second-generation and native students.

In this report, the OECD average is the average across the OECD countries included in this study; however, the scaling described above is used based on all OECD countries which participated in PISA 2003.

From Box 3.2 OECD, 2004a, p. 117.

STUDENTS' INTEREST AND MOTIVATION IN MATHEMATICS

This section examines interest and motivational characteristics related to learning and how these may differ between immigrant and non-immigrant students. Interest and motivation are two main forces driving learning. These characteristics often affect students' satisfaction with life in adolescence and have particular bearing on their educational and work pursuits (OECD, 2004a; OECD, 2003b). As mathematical literacy and the ability to gain new skills are critical for students' future success in work and life, educators need to ensure that students possess both the interest and motivation to continue learning mathematics when they leave school. These dispositions are of particular importance for immigrant students, as many lag behind their native peers in performance. It is therefore likely that they will have an even greater need to continue learning beyond school.

Students' interest in and enjoyment of mathematics

The first characteristic explored in this area investigates students' intrinsic motivation – their interest in and enjoyment of a subject domain. Intrinsic motivation affects the level of engagement in learning and the level of understanding. In addition, interest and motivation in a particular subject have been shown to function independently of motivation to learn in general (OECD, 2004a). As a result, it is necessary to consider students' interest in and enjoyment of mathematics separately from their general motivation. Analyses of these factors can indicate whether education systems are successful in encouraging intrinsic motivation in mathematics among different groups of students, in this case immigrant and non-immigrant students.

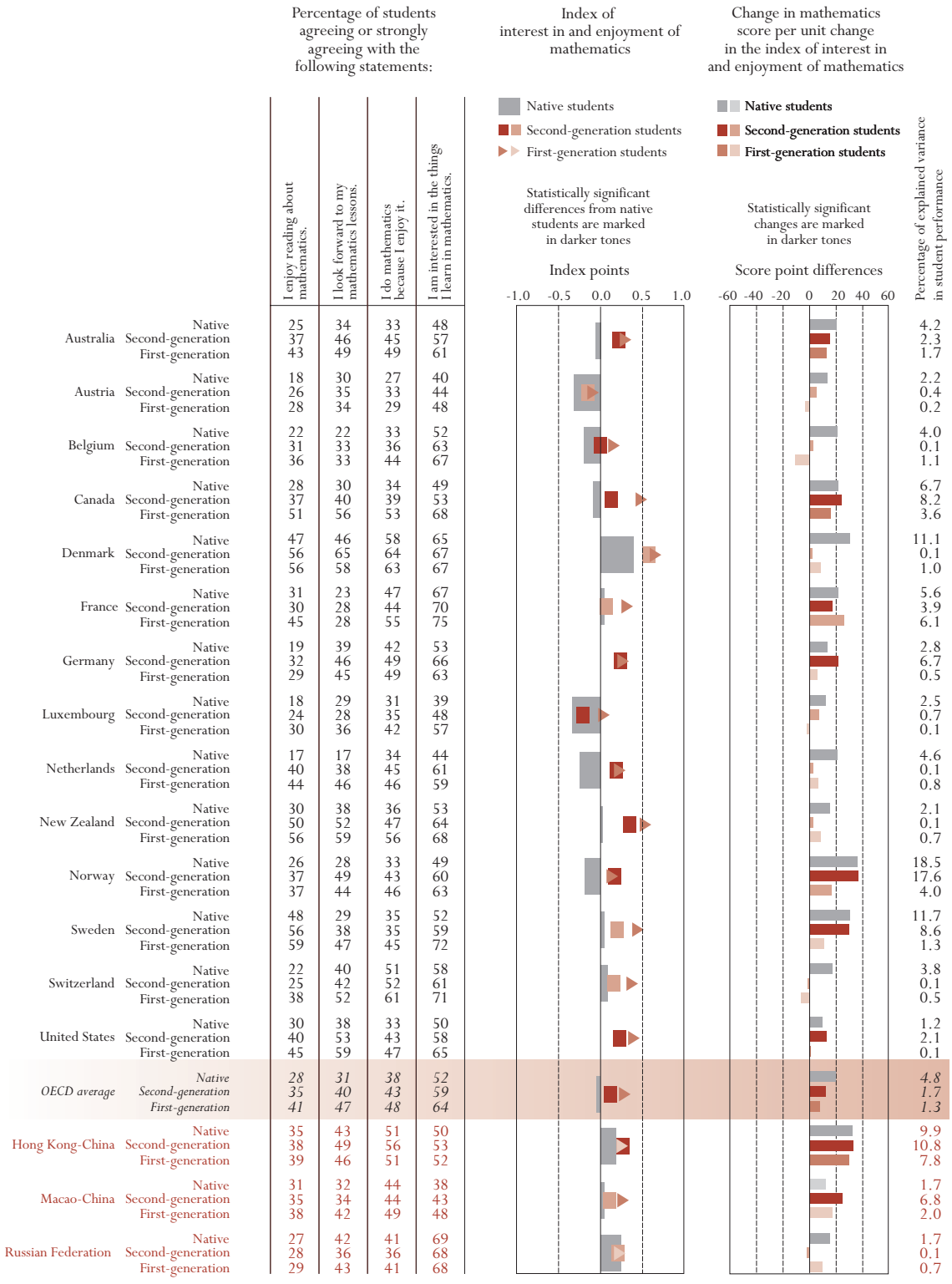
Across the OECD countries in this study, 38% of native, 43% of second-generation and 48% of first-generation students report that they do mathematics because they enjoy it (see the first panel of Figure 4.2). This indicates that a higher percentage of immigrant students enjoy mathematics with the percentage being even higher among first-generation students than among second-generation students. Similarly, 52% of native students, 59% of second-generation students and 64% of first-generations students agree or strongly agree with the statement that they are interested in what they learn in mathematics. The index variable summarising the answers to these questions also indicates that first-generation and second-generation students display significantly higher levels of interest in and enjoyment of mathematics.

While the OECD average provides a useful glimpse at differences in interest in and enjoyment of mathematics among first-generation, second-generation and native students across the case countries, it does not reveal whether this pattern holds in each of the countries. The second panel of Figure 4.2 shows both the level of interest in and enjoyment of mathematics for each sub-group in the case countries. The large bar represents the averages for native students, while the triangle and square represent the average level for first-generation and second-generation students respectively. If there are significant differences between first-generation and native students, the triangle is shaded in a darker tone. Similarly, significant differences between second-generation and native students are indicated by a square shaded in a darker tone. The same type of figure is used throughout the chapter to show significant differences between immigrant and non-immigrant students.

Based on the patterns of responses to the survey questions described above, in the majority of countries, there are significant differences between immigrant and non-immigrant students. The second panel of Figure 4.2 indicates that in all OECD countries and Macao-China, first-generation students report a significantly higher interest in and enjoyment of mathematics. Although the differences between native and second-generation students tend to be somewhat smaller than between native and first-generation students, in 10 out of 17 countries – Australia, Belgium, Canada, Germany, Luxembourg, the Netherlands, New Zealand, Norway, the United States and Hong Kong-China – second-generation students show greater interest in and enjoyment of mathematics than native students. Even after accounting for socio-economic background, both first-generation and second-generation students still tend to show significantly higher levels of motivation than their native peers in most of the countries (see Table 4.1). Furthermore, after accounting for students' mathematics performance, the level of motivation tends to be even higher for both immigrant sub-groups compared to their native peers (see Table 4.1). In none of the countries do first-generation or second-generation students show significantly lower levels of intrinsic motivation than their native peers.

To illustrate the extent of the differences, it is useful to consider students' responses to individual questions related to interest in and enjoyment of mathematics displayed in the first panel of Figure 4.2. In 12 of the 17 countries in this report, the percentage of students who agree or strongly agree that they are interested in the things they learn in mathematics is at least 10 percentage points higher in the first-generation group than in the native group. In Sweden, the figure for first-generation students is even 20 percentage points higher. For second-generation students, the level of agreement is at least ten percentage points higher compared to native students in Belgium, Germany, the Netherlands, New Zealand and Norway. Again, these findings show that immigrant students tend to report more often that they have an interest in the things they learn in mathematics than native students.

Figure 4.2 ■ Students' interest in and enjoyment of mathematics by immigrant status



		I enjoy reading about mathematics.	I look forward to my mathematics lessons.	I do mathematics because I enjoy it.	I am interested in the things I learn in mathematics.	Percentage of explained variance in student performance
Australia	Native	25	34	33	48	4.2
	Second-generation	37	46	45	57	2.3
	First-generation	43	49	49	61	1.7
Austria	Native	18	30	27	40	2.2
	Second-generation	26	35	33	44	0.4
	First-generation	28	34	29	48	0.2
Belgium	Native	22	22	33	52	4.0
	Second-generation	31	33	36	63	0.1
	First-generation	36	33	44	67	1.1
Canada	Native	28	30	34	49	6.7
	Second-generation	37	40	39	53	8.2
	First-generation	51	56	53	68	3.6
Denmark	Native	47	46	58	65	11.1
	Second-generation	56	65	64	67	0.1
	First-generation	56	58	63	67	1.0
France	Native	31	23	47	67	5.6
	Second-generation	30	28	44	70	3.9
	First-generation	45	28	55	75	6.1
Germany	Native	19	39	42	53	2.8
	Second-generation	32	46	49	66	6.7
	First-generation	29	45	49	63	0.5
Luxembourg	Native	18	29	31	39	2.5
	Second-generation	24	28	35	48	0.7
	First-generation	30	36	42	57	0.1
Netherlands	Native	17	17	34	44	4.6
	Second-generation	40	38	45	61	0.1
	First-generation	44	46	46	59	0.8
New Zealand	Native	30	38	36	53	2.1
	Second-generation	50	52	47	64	0.1
	First-generation	56	59	56	68	0.7
Norway	Native	26	28	33	49	18.5
	Second-generation	37	49	43	60	17.6
	First-generation	37	44	46	63	4.0
Sweden	Native	48	29	35	52	11.7
	Second-generation	56	38	35	59	8.6
	First-generation	59	47	45	72	1.3
Switzerland	Native	22	40	51	58	3.8
	Second-generation	25	42	52	61	0.1
	First-generation	38	52	61	71	0.5
United States	Native	30	38	33	50	1.2
	Second-generation	40	53	43	58	2.1
	First-generation	45	59	47	65	0.1
OECD average	*Native*	*28*	*31*	*38*	*52*	*4.8*
	Second-generation	*35*	*40*	*43*	*59*	*1.7*
	First-generation	*41*	*47*	*48*	*64*	*1.3*
Hong Kong-China	Native	35	43	51	50	9.9
	Second-generation	38	49	56	53	10.8
	First-generation	39	46	51	52	7.8
Macao-China	Native	31	32	44	38	1.7
	Second-generation	35	34	44	43	6.8
	First-generation	38	42	49	48	2.0
Russian Federation	Native	27	42	41	69	1.7
	Second-generation	28	36	36	68	0.1
	First-generation	29	43	41	68	0.7

Source: OECD PISA 2003 database, Table 4.1.

The initial PISA 2003 results indicate that within each country, students with higher levels of interest in and enjoyment of mathematics tend to show higher levels of performance than students with relatively lower levels of interest and enjoyment (OECD, 2004a). These results also indicate that the strength of this relationship varies across countries. When considering the association separately for native, first-generation and second-generation students, a different pattern emerges. The third panel of Figure 4.2 displays the association between interest in and enjoyment of mathematics and performance in mathematics for each of the three sub-groups. The length of each bar indicates the increase in mathematics scores associated with each unit increase in the index of interest in and enjoyment of mathematics (in this case one OECD standard deviation). In addition, the values to the right of the panel indicate the percentage of variation in the mathematics performance scores explained by the interest and enjoyment index.

These findings indicate that in only three of the case countries, Australia, Canada and Hong Kong-China is there a significant positive relationship between interest in and enjoyment of mathematics and mathematics performance for first-generation students. In seven OECD countries, Australia, Canada, France, Germany, Norway, Sweden, the United States, as well as Hong Kong-China and Macao-China there is a significant positive relationship for second-generation students. In comparison, native students in all of the countries, except Macao-China, show a strong positive relationship ranging from about 10 score points per unit increase on the index of interest in and enjoyment of mathematics in the United States to over 30 score points in Denmark, Norway, Sweden and Hong Kong-China. This result may partially be attributable to the smaller sample size (and therefore larger standard errors for immigrant students), but the sizes of the coefficients, while generally positive, also tend to be smaller. Furthermore, in most countries, the percentage of variation in student performance that is explained by students' interest in and enjoyment of mathematics is also substantially lower for first-generation and second-generation students compared to native students (see fourth panel of Figure 4.2).

These findings seem to indicate that although immigrant students display higher levels of interest in and enjoyment of mathematics, this does not necessarily mean they perform better. This may indicate that motivation is not related to performance for these students. This may be the case especially amongst first-generation students, who experience challenges related to academic success, such as language problems or lack of familiarity with the school system. The relationship between interest and enjoyment in a subject and performance is clearly complex and cannot be determined through these analyses (OECD, 2004a). The findings do indicate, however, that first-generation and second-generation students show higher levels of interest in and enjoyment of mathematics, with first-generation students showing the highest levels of intrinsic motivation. This is also the case in countries where both groups of immigrants perform relatively poorly in the mathematics assessment (see Figure 2.1a). The findings therefore point to immigrant students' potential in terms of their positive attitude to mathematics learning that could perhaps be better exploited to improve these students' performance.

Instrumental motivation and future expectations

In addition to interest and enjoyment as components of intrinsic motivation, external factors can also be important driving forces for learning and school success. Individuals with higher levels of instrumental motivation (motivation related to external factors) tend to show higher levels of performance (OECD, 2003b). Furthermore, instrumental motivation is a significant predictor of important non-achievement schooling outcomes, including course selection and career choices

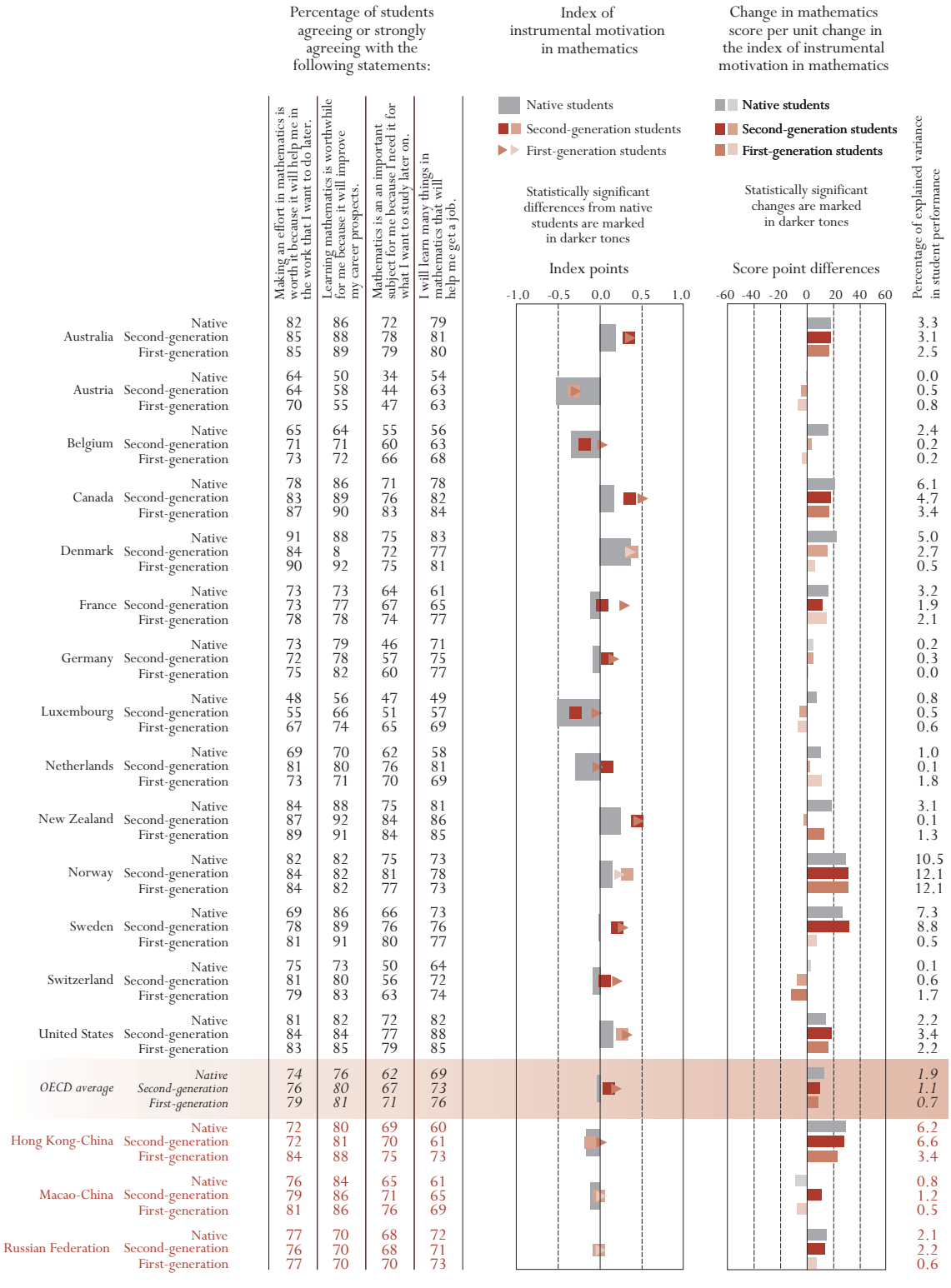
(Wigfield *et al.*, 1998). Across the OECD countries in this report, the vast majority of students report that mathematics is highly relevant for their future lives – at least 60% of students in all sub-groups agree or strongly agree with questions related to the importance of mathematics for school and work. This tends to be particularly the case for immigrant students. Compared to native students, higher percentages of first-generation and second-generation 15-year-olds agree or strongly agree with statements about the importance of mathematics in their future lives. The level of agreement is especially high among first-generation students. For example, across the OECD countries in this report, 79% of first-generation students, 76% of second-generation students and 74% of native students agree or strongly agree that making an effort in mathematics is valuable because it will help them in the work they want to do later. The same trend can be seen across all of the questions related to students' instrumental motivation in mathematics (see first panel of Figure 4.3a).

The index of instrumental motivation in mathematics summarises the responses to the four questions related to external motivation and reflects the findings described above. Among most of the OECD countries in this report, both first-generation and second-generation students show significantly higher levels of instrumental motivation than native students. First-generation students display slightly higher instrumental motivation than second-generation students. This pattern of first-generation and second-generation students reporting similar or higher levels of instrumental motivation compared to their native peers holds in every country included this study. In fact instrumental motivation is usually higher for first-generation students – only in Denmark, Norway, Macao-China and the Russian Federation do first-generation students display similar instrumental motivation to native students. In the other 13 case countries, first-generation students report significantly higher levels of instrumental motivation. Moreover, in 10 of the 17 countries – Australia, Belgium, Canada, France, Germany, Luxembourg, the Netherlands, New Zealand, Sweden and Switzerland – second-generation students report significantly more instrumental motivation than native students.

Although first-generation and second-generation students show equivalent or higher instrumental motivation in each country, there are substantial differences among countries in the degree to which students report having instrumental motivation. For example, students in Austria and Luxembourg demonstrate the lowest levels of instrumental motivation among the countries in this report (OECD, 2004a). Within these two countries first-generation and second-generation immigrant students also display higher instrumental motivation than native students, yet their results are still relatively low compared to first-generation and second-generation students in countries with relatively high levels of motivation, such as Denmark or New Zealand. In other words, while immigrant students within each country generally appear to show greater or similar motivation compared to their native peers, immigrant students' results appear to reflect the level of motivation among native students.

Like intrinsic motivation, the association between instrumental motivation and performance is weaker for first-generation and second-generation students than for native students across the OECD case countries, with first-generation students showing the weakest association (see the third panel of Figure 4.3a). Not surprisingly, the OECD averages mask variations among the case countries. In Australia, Canada, New Zealand, Norway, the United States and Hong Kong-China, there is a significant positive relationship between instrumental motivation and performance for first-generation students. Within these countries, the association among first-generation students ranges from an increase of 13 score points per unit (*i.e.* standard deviation) of instrumental motivation in New Zealand to almost 31 score points in Norway.

Figure 4.3a ■ Students' instrumental motivation in mathematics by immigrant status

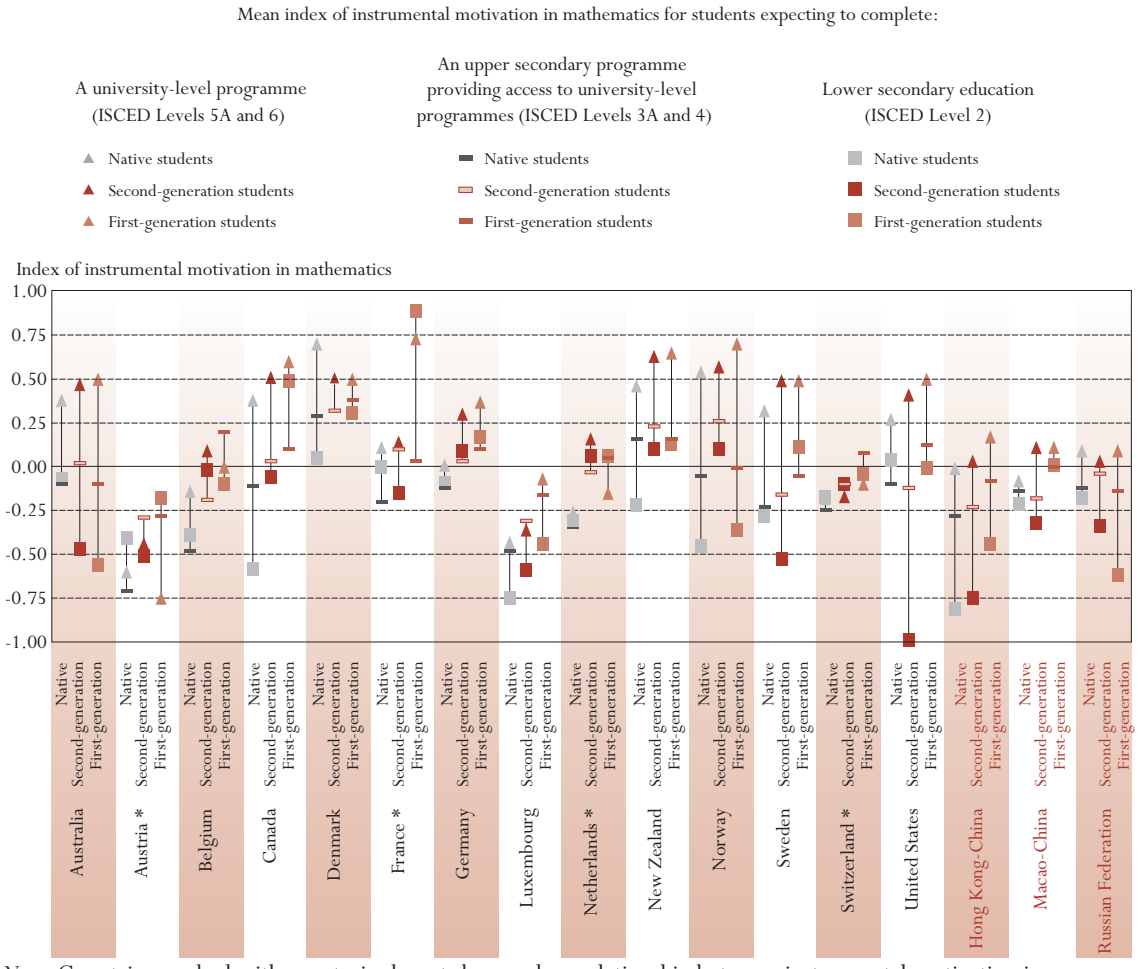


		Making an effort in mathematics is worth it because it will help me in the work that I want to do later.	Learning mathematics is worthwhile for me because it will improve my career prospects.	Mathematics is an important subject for me because I need it for what I want to study later on.	I will learn many things in mathematics that will help me get a job.	Percentage of explained variance in student performance
Australia	Native	82	86	72	79	3.3
	Second-generation	85	88	78	81	3.1
	First-generation	85	89	79	80	2.5
Austria	Native	64	50	34	54	0.0
	Second-generation	64	58	44	63	0.5
	First-generation	70	55	47	63	0.8
Belgium	Native	65	64	55	56	2.4
	Second-generation	71	71	60	63	0.2
	First-generation	73	72	66	68	0.2
Canada	Native	78	86	71	78	6.1
	Second-generation	83	89	76	82	4.7
	First-generation	87	90	83	84	3.4
Denmark	Native	91	88	75	83	5.0
	Second-generation	84	8	72	77	2.7
	First-generation	90	92	75	81	0.5
France	Native	73	73	64	61	3.2
	Second-generation	73	77	67	65	1.9
	First-generation	78	78	74	77	2.1
Germany	Native	73	79	46	71	0.2
	Second-generation	72	78	57	75	0.3
	First-generation	75	82	60	77	0.0
Luxembourg	Native	48	56	47	49	0.8
	Second-generation	55	66	51	57	0.5
	First-generation	67	74	65	69	0.6
Netherlands	Native	69	70	62	58	1.0
	Second-generation	81	80	76	81	0.1
	First-generation	73	71	70	69	1.8
New Zealand	Native	84	88	75	81	3.1
	Second-generation	87	92	84	86	0.1
	First-generation	89	91	84	85	1.3
Norway	Native	82	82	75	73	10.5
	Second-generation	84	82	81	78	12.1
	First-generation	84	82	77	73	12.1
Sweden	Native	69	86	66	73	7.3
	Second-generation	78	89	76	76	8.8
	First-generation	81	91	80	77	0.5
Switzerland	Native	75	73	50	64	0.1
	Second-generation	81	80	56	72	0.6
	First-generation	79	83	63	74	1.7
United States	Native	81	82	72	82	2.2
	Second-generation	84	84	77	88	3.4
	First-generation	83	85	79	85	2.2
OECD average	*Native*	*74*	*76*	*62*	*69*	*1.9*
	Second-generation	*76*	*80*	*67*	*73*	*1.1*
	First-generation	*79*	*81*	*71*	*76*	*0.7*
Hong Kong-China	Native	72	80	69	60	6.2
	Second-generation	72	81	70	61	6.6
	First-generation	84	88	75	73	3.4
Macao-China	Native	76	84	65	61	0.8
	Second-generation	79	86	71	65	1.2
	First-generation	81	86	76	69	0.5
Russian Federation	Native	77	70	68	72	2.1
	Second-generation	76	70	68	71	2.2
	First-generation	77	70	70	73	0.6

Source: OECD PISA 2003 database, Table 4.2.

As noted earlier, instrumental motivation is an important educational outcome because it is not just associated with academic achievement. Students with strong instrumental motivation often choose more challenging courses and have higher educational and career aspirations (Wigfield, *et al.*, 1998). While it is not possible to examine these choices based on the PISA 2003 assessment, the 15-year-old students who took the PISA test were asked about the education level they expect to attain. Figure 4.3b shows that in most countries, instrumental motivation is higher among students expecting to complete at least a secondary programme (ISCED Levels 3A and 4) that will give them access to a tertiary education programme compared to students expecting to complete lower secondary programmes (ISCED Level 2). It is even higher among students who expect to complete a university-level programme (ISCED Levels 5A and 6) (see Figure 4.3b and Table 4.3). This general trend can be seen for native, first-generation and second-generation students. Once more, however, there are exceptions to this trend. In Figure 4.3b, countries in which there is no clear association between students' instrumental motivation in mathematics and their expected level of education are

Figure 4.3b ■ Students' instrumental motivation in mathematics and their educational expectations by immigrant status



Note: Countries marked with an asterix do not show a clear relationship between instrumental motivation in mathematics and students' expected level of education (OECDa, 2004, p.124). In other countries where there is a clear relationship at the country level this relationship may not exist for some of the subgroups by immigrant background.
Source: OECD PISA 2003 database, Table 4.3.

noted with an asterisk. They include Austria, France, the Netherlands and Switzerland. There are also countries where the immigrant sub-groups do not follow the expected trend. This is the case for first-generation students in Belgium, Canada, Germany and Sweden and for second-generation students in Belgium, Denmark, Germany and Luxembourg. In these countries and for these sub-groups, there is no definitive positive association between instrumental motivation and expected educational attainment.

In most countries, immigrant and non-immigrant students with higher educational expectations appear also to have higher levels of motivation, yet remarkable differences emerge among the three sub-groups when examining students' expected educational level alone. These analyses compare native students with first-generation and second-generation students in terms of the likelihood that they report expecting to complete a tertiary level education programme. The statistical method employed here is logistic regression (see Box 4.2). This allows for a comparison of the occurrence of certain traits in different groups, in this case the level of education immigrant and non-immigrant students expect to complete.

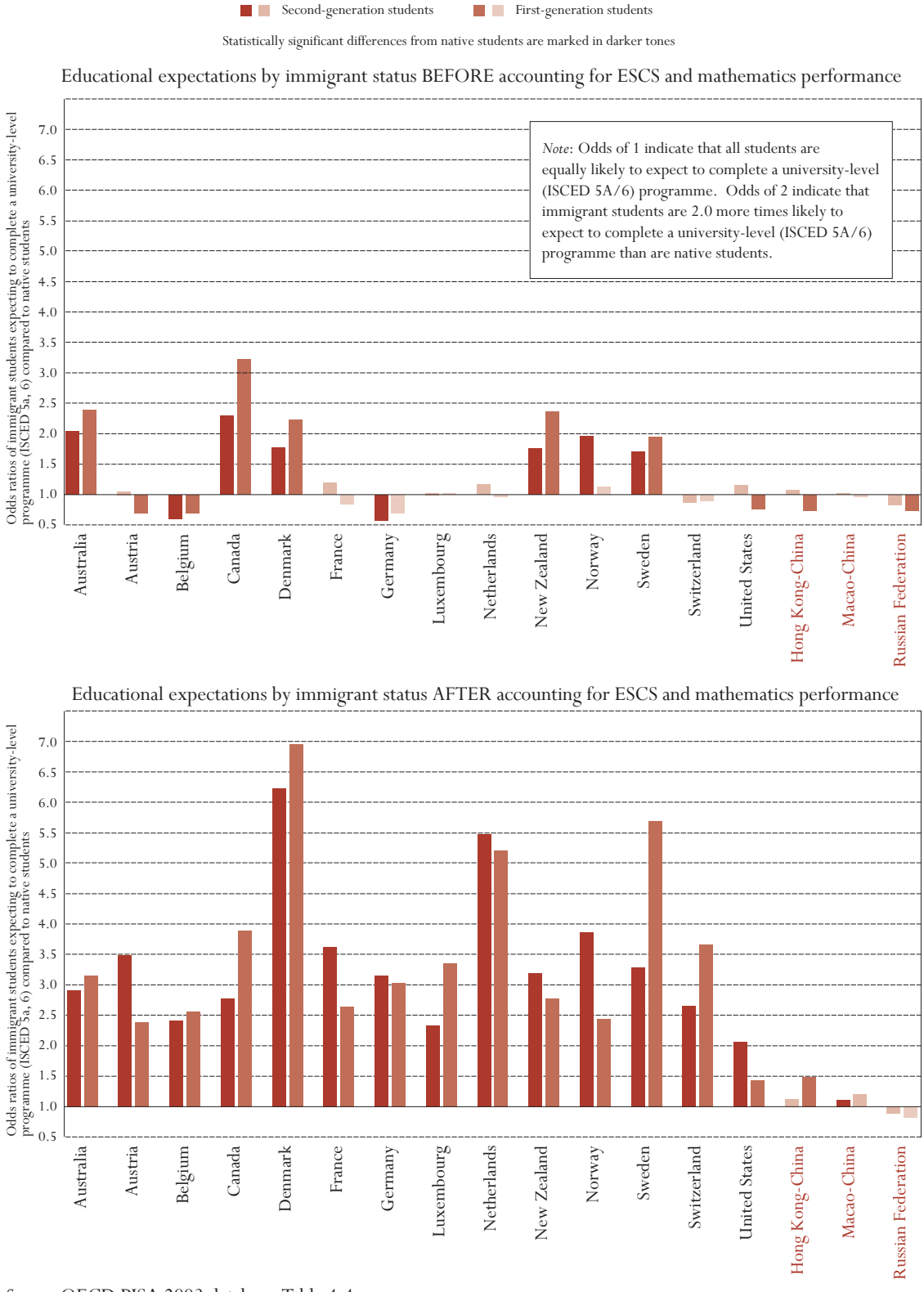
Box 4.2 ■ Logistic Regression and Odds Ratios

Multiple regression is appropriate when the outcome variables are continuous, such as the measures of reading, mathematics and science performance used in PISA. However, when the outcome variable is dichotomous, such as whether or not a child repeated a grade at school, a variant of multiple regression called logistic regression is appropriate. It is useful to policy research, because of frequent interest in binomial traits, such as expecting to finish a university degree. The policy analyst is interested in the likelihood of the student having the trait and how various characteristics of the child, such as age, immigrant status or family income, influence that likelihood. The regression coefficients from a logistic regression can be easily transformed to odds ratios, which can be interpreted simply for policy purposes.

An odds ratio is the ratio of the odds for two different sets of circumstances. For example, if an event has a 75% chance of occurring, then the odds of it occurring are [0.75/(1-0.75)], which is 3.0. An event with the odds of 1.0 has an equal chance of occurring or not. For example, the odds of an event occurring for girls and for boys could be assessed, and the ratio of the odds could be calculated. Odds ratios are interpreted in a similar way to multiple regression coefficients: they stand for the ratio of the odds of an event occurring after a one-unit change in the independent variable, compared to what it was previously, given all other independent variables in the model are held constant. (Adapted from OECD, 2003c, p. 36).

The upper panel of Figure 4.3c displays the odds ratios of first-generation and second-generation students compared to native students expecting to complete a university-level programme in the future (see Table 4.4 also). Statistically significant differences from native students are marked using darker tones. An event with an odds ratio of 1.0 has an equal chance of occurring or not within the sub-groups. For example, the results indicate that in the Netherlands, the odds of first-generation students expecting to complete a university-level programme (ISCED Levels 5a and 6) are 0.97 relative to native students. This is close to 1.0 and not statistically

Figure 4.3c ■ Educational expectations by immigrant status before and after accounting for students' economic, social and cultural status (ESCS) and mathematics performance



Source: OECD PISA 2003 database, Table 4.4.

significant, indicating that first-generation and native students in the Netherlands are equally likely to expect to complete a university-level education programme. In contrast, the odds ratio for first-generation students in Australia is 2.39, indicating that the odds of a first-generation student expecting to complete a tertiary education programme are 2.39 times higher than the odds for native students.

In examining the results, compared to native students, immigrant students in the majority of the 17 countries in this report have similar or somewhat lower odds of reporting that they expect to complete a tertiary programme. There are a few countries, however, where first-generation and second-generation students are significantly more likely to expect to complete a tertiary programme than their native peers. In Australia, Canada, Denmark, New Zealand and Sweden, the odds that first-generation students expect to complete their education at the tertiary level range from 1.93 in Sweden to 3.22 in Canada. In these same countries and in Norway, second-generation students also have higher odds of expecting to complete a university-level programme, yet the odds for this subgroup are somewhat smaller ranging from 1.7 in Sweden to 2.29 in Canada.

These results shift considerably when accounting for students' level of performance and socio-economic background. Based on Chapters 2 and 3, it is clear that immigrants tend to have both lower levels of performance and also come from less advantaged families, which may make it less likely for immigrant students to have high educational expectations. This does not seem to be the case, however. The second panel of Figure 4.3c shows the odds ratios of first-generation and second-generation students after accounting for their mathematics performance and socio-economic background. In all of the countries, except Hong Kong-China, Macao-China and the Russian Federation, first-generation and second-generation students have significantly higher odds of expecting to complete university programmes than native students with comparable performance levels and socio-economic backgrounds. For first-generation students, the odds range from 1.43 in the United States to 6.96 in Denmark. For second-generation students, the odds range from 2.05 in the United States to 6.23 in Denmark.

Based on these results, it is clear that immigrant students have much higher educational aspirations than their native counterparts, especially after accounting for performance and socio-economic background. One might suggest that first-generation and second-generation students possibly have unrealistic expectations, perhaps because they only have a limited understanding of the education systems in the receiving countries. Nevertheless, these results confirm that immigrant students tend to be optimistic about their future educational prospects. Although some immigrant students may experience long-term disappointment if they do not meet their goals, high expectations are likely to be positive in terms of their motivation and willingness to make an effort at school. Furthermore, findings in this section suggest that first-generation and second-generation students generally have relatively high intrinsic and instrumental motivation, with first-generation students in many countries showing the most motivation. These characteristics should help support their learning throughout their adolescent and adult lives.

STUDENTS' SELF-RELATED BELIEFS

Students' beliefs about themselves play a critical role in their ability to learn independently. In order to be able to engage in effective learning, students need to have a pragmatic understanding of the difficulty of a task and the ability to adopt effective strategies to complete it. Independent learning

skills are essential for successfully tackling the various challenges adults encounter throughout their lives. Through school and life experiences, students develop views about their ability and learning characteristics. Previous research shows that these beliefs substantially influence students' goal setting and engagement in effective learning strategies (Zimmerman, 1999). They are also related to students' performance (OECD, 2004a). Two types of beliefs are often distinguished: *self-concept* – the belief in one's own academic abilities and *self-efficacy* – the belief in one's ability to handle tasks effectively and overcome challenges. PISA 2003 asked questions related to both aspects in the area of mathematics. This section examines immigrant students' beliefs about themselves compared to those of their native peers, as well as the associations between these beliefs and performance.

Students' self-concept in mathematics

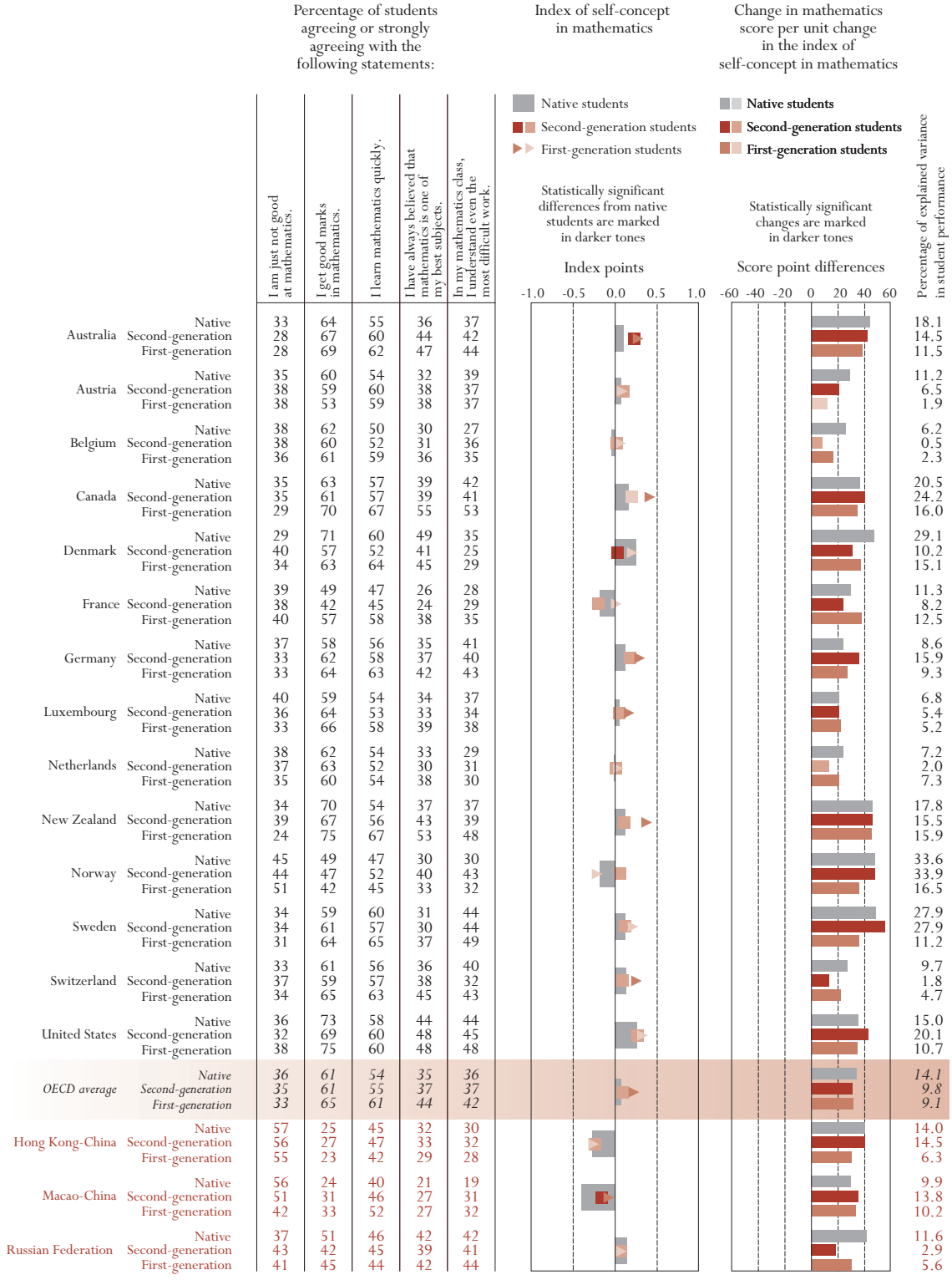
Students' academic self-concept is often associated with student success. It is also a valuable outcome of education in itself, as individuals with higher self-concept believe in their ability and are more likely to look for learning opportunities. In addition, belief in one's ability is vital to successful learning (Marsh, 1986). Self-concept is also significantly related to overall well-being and personality development – outcomes shown to be especially significant for less advantaged students (*e.g.* Becker and Luthar, 2002).

One might expect immigrant students to develop lower levels of self-concept in mathematics, as they tend to be less successful academically than non-immigrant students. However, this does not appear to be the case when examining how immigrant students across the OECD case countries responded to questions related to their self-concept in mathematics. One illustration of this is that 61% of first-generation students, 55% of second-generation students and 54% of native students agree or strongly agree that they learn mathematics quickly (see first panel of Figure 4.4). Also, 44% of first-generation, 37% of second-generation and 35% of native students in the OECD case countries agree or strongly agree that they believe mathematics is one of their best subjects. This may partially reflect that immigrant students feel they do relatively better in mathematics compared to reading where they may struggle more with a foreign language (Marsh, 1986; Shajek, Lüdtke and Stanat, forthcoming). In line with this idea, first-generation students have significantly higher levels of self-concept in mathematics compared to their native peers across the OECD case countries. There is no significant difference between second-generation and native students however (see the second panel of Figure 4.4).

When looking at the index which summarises the questions related to students' self-concept in mathematics, country variations in the differences between immigrant and non-immigrant students emerge (see Figure 4.4). The self-concept of first-generation and second-generation students tends to be similar or slightly higher than that of their native peers. Only in Denmark do second-generation students score significantly lower than native students. In seven case countries – Australia, Canada, Germany, Luxembourg, New Zealand, Switzerland and Macao-China – first-generation students show significantly higher levels of self-concept than native students. In Australia and Macao-China second-generation students also have higher scores than their native peers.

After accounting for students' socio-economic background, immigrant students tend to have similar or more positive reported self-concepts than native students. Specifically, first-generation students show significantly higher levels of self-concept than their native peers in 11 countries: Australia, Belgium, Canada, France, Germany, Luxembourg, New Zealand, Sweden, Switzerland, the

Figure 4.4 ■ Self-concept in mathematics by immigrant status



		I am just not good at mathematics.	I get good marks in mathematics.	I learn mathematics quickly.	I have always believed that mathematics is one of my best subjects.	In my mathematics class, I understand even the most difficult work.	Percentage of explained variance in student performance
Australia	Native	33	64	55	36	37	18.1
	Second-generation	28	67	60	44	42	14.5
	First-generation	28	69	62	47	44	11.5
Austria	Native	35	60	54	32	39	11.2
	Second-generation	38	59	60	38	37	6.5
	First-generation	38	53	59	38	37	1.9
Belgium	Native	38	62	50	30	27	6.2
	Second-generation	38	60	52	31	36	0.5
	First-generation	36	61	59	36	35	2.3
Canada	Native	35	63	57	39	42	20.5
	Second-generation	35	61	57	39	41	24.2
	First-generation	29	70	67	55	53	16.0
Denmark	Native	29	71	60	49	35	29.1
	Second-generation	40	57	52	41	25	10.2
	First-generation	34	63	64	45	29	15.1
France	Native	39	49	47	26	28	11.3
	Second-generation	38	42	45	24	29	8.2
	First-generation	40	57	58	38	35	12.5
Germany	Native	37	58	56	35	41	8.6
	Second-generation	33	62	58	37	40	15.9
	First-generation	33	64	63	42	43	9.3
Luxembourg	Native	40	59	54	34	37	6.8
	Second-generation	36	64	53	33	34	5.4
	First-generation	33	66	58	39	38	5.2
Netherlands	Native	38	62	54	33	29	7.2
	Second-generation	37	63	52	30	31	2.0
	First-generation	35	60	54	38	30	7.3
New Zealand	Native	34	70	54	37	37	17.8
	Second-generation	39	67	56	43	39	15.5
	First-generation	24	75	67	53	48	15.9
Norway	Native	45	49	47	30	30	33.6
	Second-generation	44	47	52	40	43	33.9
	First-generation	51	42	45	33	32	16.5
Sweden	Native	34	59	60	31	44	27.9
	Second-generation	34	61	57	30	44	27.9
	First-generation	31	64	65	37	49	11.2
Switzerland	Native	33	61	56	36	40	9.7
	Second-generation	37	59	57	38	32	1.8
	First-generation	34	65	63	45	43	4.7
United States	Native	36	73	58	44	44	15.0
	Second-generation	32	69	60	48	45	20.1
	First-generation	38	75	60	48	48	10.7
OECD average	*Native*	*36*	*61*	*54*	*35*	*36*	*14.1*
	Second-generation	*35*	*61*	*55*	*37*	*37*	*9.8*
	First-generation	*33*	*65*	*61*	*44*	*42*	*9.1*
Hong Kong-China	Native	57	25	45	32	30	14.0
	Second-generation	56	27	47	33	32	14.5
	First-generation	55	23	42	29	28	6.3
Macao-China	Native	56	24	40	21	19	9.9
	Second-generation	51	31	46	27	31	13.8
	First-generation	42	33	52	27	32	10.2
Russian Federation	Native	37	51	46	42	42	11.6
	Second-generation	43	42	45	39	41	2.9
	First-generation	41	45	44	42	44	5.6

Source: OECD PISA 2003 database, Table 4.5.

United States and Macao-China (see Table 4.5). In Australia, Belgium, Norway and Macao-China, second-generation students have significantly higher self-concept in mathematics after accounting for socio-economic background. In many countries, immigrant students come from relatively less advantaged backgrounds and after accounting for this, first-generation students show higher levels of self concept.

After taking student performance in PISA 2003 into account, both first-generation and second-generation students tend to have substantively more positive self-concept (see Table 4.5). Specifically, first-generation students show significantly higher self-concept in every country, except the Russian Federation. This same result occurs for second-generation students in all of the case countries, except Canada, Denmark, Hong Kong-China and the Russian Federation. One may argue that these students have unrealistic self-concepts or that they might have relatively higher self-concepts in this subject which is less language intensive (Marsh, 1986). Nevertheless, this should be viewed as a positive sign as it indicates that immigrant students have this essential prerequisite for learning. Despite the challenges that immigrant students face, such as lower socio-economic status or lower mathematics achievement, they generally do not appear to have lower levels of self-concept. In fact, first-generation immigrant students often have higher levels of self-concept than their native peers.

Despite immigrant students' similar or even more positive self-concept, they tend to lag behind their native peers in performance. The results indicate, however, that there is still a significant association between self-concept and performance for both first-generation and second-generation students (see the third panel of Figure 4.4). Across the OECD case countries, the relationship is more than 30 score points per unit of self-concept. With only a few exceptions, there is a significant positive relationship between self-concept in mathematics and performance within all student subgroups and countries. A one unit (or standard deviation) increase in self-concept in mathematics is associated with a significant increase in mathematics performance ranging from 16 score points in Belgium to nearly 45 score points in New Zealand for first-generation students and from more than 12 score points in Switzerland to almost 55 score points in Sweden for second-generation students.

More research is needed to better understand how to channel this positive self-concept to lessen differences between immigrant and non-immigrant student performance. While it may be encouraging that many immigrant students report similar or even higher levels of self-concept compared to their native peers, it may also be true that immigrant students are in situations where there are lower expectations or where they feel relatively better about themselves in mathematics than in reading and in turn show comparatively high levels of self-concept.

Students' self-efficacy in mathematics

A second key aspect of students' beliefs about themselves as learners is self-efficacy. Students not only need to feel able to pursue specific learning objectives, they must also have confidence in their ability to overcome the challenges that they may face in trying to reach their goal. Students who lack this confidence are at risk of failing both in school and in their adult lives (OECD, 2004a). Self-efficacy has been linked to improved learning, which helps students acquire new knowledge and skills in school and throughout their lives. Furthermore, increases in self-efficacy are associated with improvements in student performance (Bandura, 1994; OECD, 2004a). In PISA 2003, the questions related to self-efficacy examine students' confidence in their ability to master a number of specific mathematics tasks.

The PISA 2003 survey asked students to answer a series of questions about their confidence in being able to solve various mathematics problems. The index of self-efficacy summarises students' answers to these questions. As for the other indices, the scale is defined so that the average score across all OECD countries is 0 with a standard deviation of 1, *i.e.* two thirds of the students score between 1 and -1. Figure 4.5 (second panel) indicates the average level of self-efficacy by immigrant sub-group. Across the OECD countries, there is no significant difference between the self-efficacy reported by first-generation and native students, yet second-generation students report significantly lower levels of self-efficacy than their native peers. Substantively, however, this difference is fairly small, at about 0.07 of a standard deviation.

Considering differences in the level of self-efficacy reported by non-immigrant and immigrant students in an international context reveals a substantial amount of variation among countries. First-generation students in Austria, Belgium, Germany, Luxembourg, Switzerland and Hong Kong-China, report significantly lower levels of self-efficacy compared to their native peers. In contrast, first-generation students in Australia, Canada and New Zealand report significantly higher levels of self-efficacy. For the remaining eight countries, the differences between first-generation and native students are not significant. A similar pattern emerges when comparing differences between second-generation and native students. Second-generation students report lower levels of self-efficacy than their native peers in Austria, Denmark, France, Germany, Luxembourg and Switzerland. Only in Australia does the opposite pattern emerge with reported self-efficacy being higher among second-generation students than among native students.

In over half of the countries in this report, first-generation and second-generation students report similar or higher levels of self-efficacy. At the same time, however, there is a group of countries where immigrant students report lower levels of confidence in tackling mathematics tasks, even though they show similar levels of self-concept in mathematics. In other words, relative to their native peers, immigrant students in many countries believe in their ability in mathematics, but when it comes to completing specific and potentially challenging tasks, they tend to lack confidence. It is useful to point out that after accounting for the socio-economic background of students, the differences between immigrant and non-immigrant students disappear in most countries (see Table 4.6). This may indicate that self-efficacy is generally lower among disadvantaged students. These findings point to a need for schools and educators to consider how they may work to bolster self-efficacy among immigrant students and disadvantaged children more generally. One potentially positive sign is that after accounting for mathematics performance, first-generation students and second-generation students in the majority of the case countries have significantly higher levels of self-efficacy than their native peers (Table 4.6).

The school and policy implications are reinforced when considering the association between self-efficacy and mathematics performance. The third panel of Figure 4.5 indicates that there is an even stronger relationship between self-efficacy and mathematics performance than there was with self-concept. Self-efficacy is one of the strongest predictors of student performance. Across the OECD case countries it explains 25% of the variation in mathematics performance for native students, 24% for second-generation students and 24% for first-generation students. Furthermore, analyses in *Learning for Tomorrow's World – First Results from PISA 2003* (OECD 2004a) indicate that even when considering other learning characteristics simultaneously, self-efficacy continues to have a strong and positive relationship with student performance.

Figure 4.5 ■ Students' self-efficacy in mathematics by immigrant status

Percentage of students agreeing or strongly agreeing with the following statements:

		Using a train timetable, how long it would take to get from Zedville to Zedtown.	Calculating how much cheaper a TV would be after a 30 per cent discount.	Calculating how many square metres of tiles you need to cover a floor.	Understanding graphs presented in newspapers.	Solving an equation like $3x+5=17$.	Finding the actual distance between two places on a map with a 1:10,000 scale.	Solving an equation like $2(x+3)=(x+3)(x-3)$.	Calculating the petrol consumption rate of a car.
Australia	Native	90	78	76	89	82	58	66	60
	Second-generation	92	83	74	90	88	59	74	63
	First-generation	87	84	76	85	90	62	76	63
Austria	Native	87	83	77	76	84	55	77	57
	Second-generation	82	75	61	66	77	47	73	48
	First-generation	78	72	76	68	81	48	76	55
Belgium	Native	81	79	66	74	82	66	65	54
	Second-generation	72	77	66	70	78	70	69	58
	First-generation	70	64	63	64	71	66	59	54
Canada	Native	81	80	78	87	91	61	80	60
	Second-generation	83	83	72	84	94	60	83	53
	First-generation	85	85	79	87	93	69	87	61
Denmark	Native	86	78	69	87	75	63	47	61
	Second-generation	76	78	54	76	75	62	51	65
	First-generation	83	88	68	81	71	72	50	66
France	Native	74	75	64	82	85	50	68	58
	Second-generation	69	73	56	76	84	47	67	56
	First-generation	65	73	59	75	86	46	71	55
Germany	Native	85	78	76	81	87	55	73	58
	Second-generation	74	76	65	62	79	48	71	60
	First-generation	76	74	74	70	81	51	70	57
Luxembourg	Native	83	75	70	76	91	61	80	55
	Second-generation	76	70	56	66	88	54	77	55
	First-generation	73	69	58	66	85	57	74	60
Netherlands	Native	80	87	72	84	73	64	54	63
	Second-generation	72	90	65	82	75	55	58	66
	First-generation	80	81	66	84	74	66	60	60
New Zealand	Native	86	79	75	90	83	53	59	53
	Second-generation	86	81	72	87	81	45	65	48
	First-generation	85	87	78	85	89	61	77	61
Norway	Native	85	83	60	71	74	64	47	61
	Second-generation	80	90	58	65	75	74	51	57
	First-generation	74	85	51	65	73	63	53	57
Sweden	Native	89	82	69	91	74	60	49	63
	Second-generation	92	86	65	90	79	66	57	67
	First-generation	79	82	64	82	74	67	55	58
Switzerland	Native	91	86	82	78	87	64	76	66
	Second-generation	82	85	70	69	85	59	72	64
	First-generation	81	83	75	67	81	65	72	70
United States	Native	72	82	80	89	91	62	81	75
	Second-generation	69	78	76	85	93	61	82	70
	First-generation	77	77	80	85	90	63	83	76
OECD average	*Native*	*83*	*80*	*74*	*83*	*85*	*60*	*70*	*60*
	Second-generation	*81*	*80*	*69*	*79*	*86*	*58*	*72*	*59*
	First-generation	*80*	*80*	*72*	*77*	*85*	*62*	*74*	*62*
Hong Kong-China	Native	76	91	79	75	92	65	77	45
	Second-generation	79	93	81	77	92	67	79	45
	First-generation	75	91	73	66	93	65	68	43
Macao-China	Native	69	92	70	60	95	56	85	33
	Second-generation	72	94	73	61	98	58	86	34
	First-generation	70	95	77	69	98	65	86	38
Russian Federation	Native	67	72	68	66	91	57	80	63
	Second-generation	66	68	69	56	90	57	75	64
	First-generation	67	71	67	57	90	58	72	69

Index of self-efficacy in mathematics

Native students
Second-generation students
First-generation students

Statistically significant differences from native students are marked in darker tones

Index points

-1.0 -0.5 0.0 0.5 1.0

Change in mathematics score per unit change in the index of self-efficacy in mathematics

Native students
Second-generation students
First-generation students

Statistically significant changes are marked in darker tones

Score point differences

-60 -40 -20 0 20 40 60

Percentage of explained variance in student performance

Australia	Native	27.4
	Second-generation	24.2
	First-generation	29.2
Austria	Native	26.6
	Second-generation	18.8
	First-generation	9.3
Belgium	Native	19.5
	Second-generation	15.9
	First-generation	12.9
Canada	Native	28.4
	Second-generation	33.9
	First-generation	30.3
Denmark	Native	28.6
	Second-generation	15.3
	First-generation	14.8
France	Native	25.8
	Second-generation	22.7
	First-generation	31.0
Germany	Native	26.5
	Second-generation	23.8
	First-generation	26.1
Luxembourg	Native	20.6
	Second-generation	20.4
	First-generation	25.3
Netherlands	Native	22.4
	Second-generation	11.7
	First-generation	21.1
New Zealand	Native	28.4
	Second-generation	28.7
	First-generation	22.9
Norway	Native	30.9
	Second-generation	36.7
	First-generation	20.8
Sweden	Native	35.0
	Second-generation	29.6
	First-generation	22.0
Switzerland	Native	31.5
	Second-generation	21.8
	First-generation	24.3
United States	Native	27.2
	Second-generation	37.7
	First-generation	22.6
OECD average	*Native*	*25.1*
	Second-generation	*24.0*
	First-generation	*24.1*
Hong Kong-China	Native	31.5
	Second-generation	31.3
	First-generation	25.3
Macao-China	Native	16.9
	Second-generation	19.3
	First-generation	22.8
Russian Federation	Native	20.5
	Second-generation	8.1
	First-generation	13.3

Source: OECD PISA 2003 database, Table 4.6.

The findings indicate that an increase of one index point (or one standard deviation) on the scale of self-efficacy in mathematics across the OECD case countries corresponds to 46 score points in mathematics performance for native students, 50 score points for first-generation students and 47 score points for second-generation students. This is equivalent to almost one mathematics proficiency level. Improving self-efficacy is therefore an area where teachers and policy makers may want to place additional emphasis, in an effort to reduce differences between immigrant and non-immigrant students. Furthermore, increasing immigrant students' confidence in their ability to overcome learning obstacles should be a goal alongside improving performance, as this characteristic is essential for long-term independent learning and closely related to students' motivation and the use of effective learning strategies (Bandura, 1994).

EMOTIONAL DISPOSITIONS IN MATHEMATICS

PISA 2003 also collected information on students' negative attitudes to mathematics. Many students experience emotional stress or anxiety in relation to school mathematics. It has been shown that these negative dispositions are associated with lower levels of mathematics achievement, lower grades in mathematics, course enrolment (*e.g.* choosing lower level mathematics courses or not enrolling in mathematics courses at all) and choice of academic speciality (Wigfield *et al.*, 1998; Pajares and Miller, 1994, 1995; Ramirez and Dockweiler, 1987; Schwarzer, Seipp and Schwarzer, 1989; Wigfield and Meece, 1988). The initial results from PISA 2003 indicate that a large percentage of 15-year-old students experience negative dispositions towards mathematics. For example, more than 50% of students in OECD countries report that they often worry that mathematics classes will be difficult and that they will get poor marks in these classes (OECD, 2004a). This section explores whether immigrant students report similar levels of anxiety compared to native students and how the patterns differ across case countries.

In the OECD countries in this report, 54% of first-generation students and 57% of second-generation students report concern about mathematics classes being difficult for them (see first panel of Figure 4.6). This compares to 48% of native students. Also across the OECD case countries, 58% of first-generation students and 62% of second-generation students report that they worry about receiving poor marks in mathematics. This compares to 52% of native students. Among all three immigrant subgroups, there is generally less concern about mathematics homework or doing mathematics problems. Yet, for each of these questions immigrant students also report more anxiety related to mathematics than native students.

Considering the overall index of anxiety in mathematics for the OECD case countries, immigrant students report significantly higher levels of anxiety compared to their native peers. At the same time, there is substantial variation across countries (see the second panel of Figure 4.6). For example, students in France, Hong Kong-China and Macao-China report the highest levels of anxiety related to mathematics, and students in Denmark, the Netherlands and Sweden report the least. While immigrant students may show significant differences compared to native students within these countries, the level of anxiety tends to mirror the degree of anxiety in overall country results (except for Macao-China). For example, in France, both native students and immigrant students report high levels of anxiety in mathematics. The opposite is true for native and immigrant students in the Netherlands and Sweden.

When exploring variations between immigrant and non-immigrant students within each country, there are either no significant differences between the groups or immigrant students report a significantly higher degree of anxiety. In none of the countries, except Macao-China, do immigrant students report significantly lower levels of anxiety in mathematics compared to their native peers. First-generation students in Austria, Belgium, Denmark, Luxembourg, the Netherlands, Norway, Sweden and Switzerland report significantly higher levels of anxiety in mathematics. This is also the case for second-generation students in Belgium, Denmark, France, Germany, Luxembourg, the Netherlands, New Zealand, Sweden and Switzerland (see second panel of Figure 4.6).

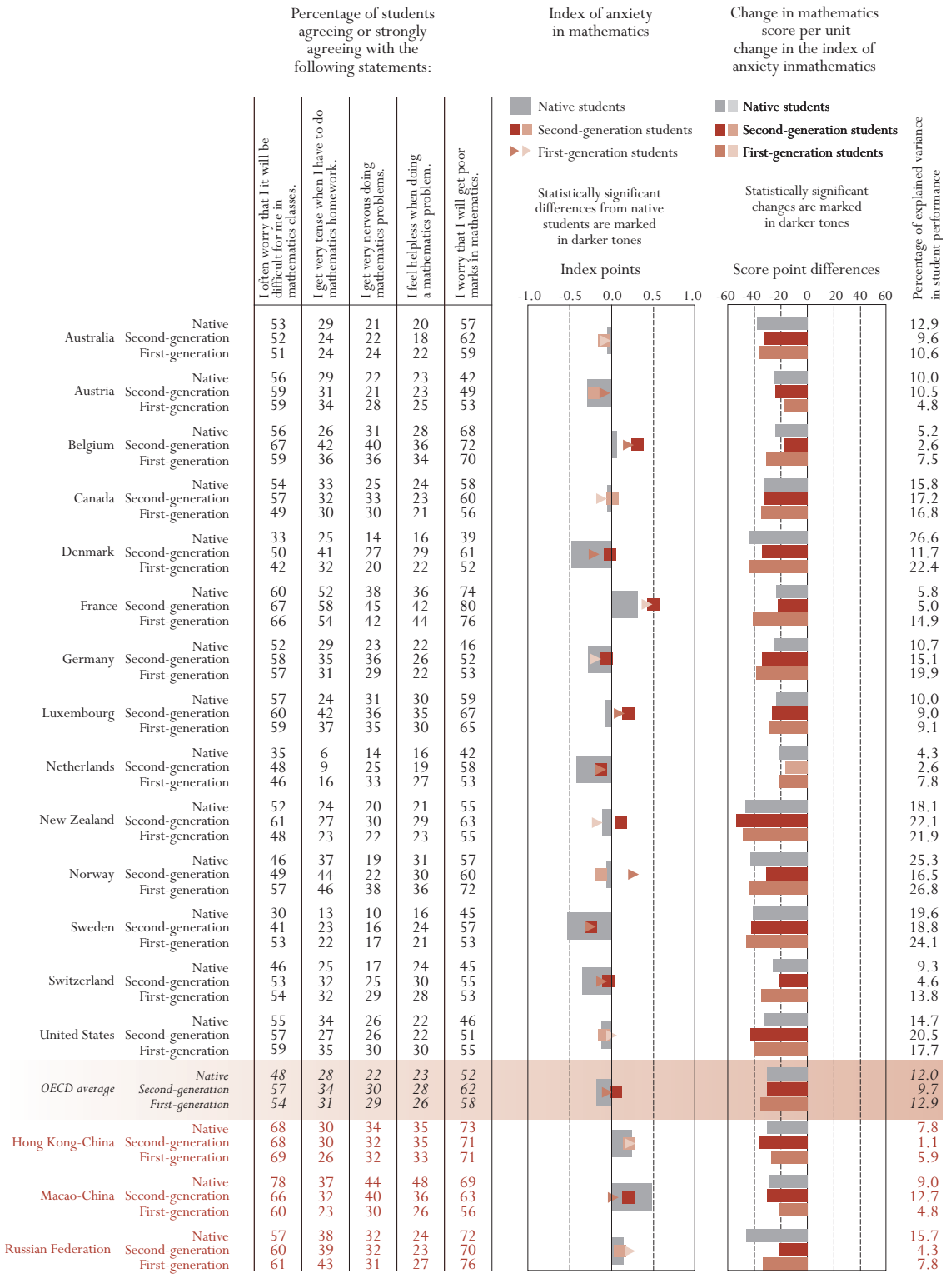
When the socio-economic background of students is taken into account, first-generation students in Austria, Belgium, the Netherlands, Sweden, Switzerland and Macao-China still show significantly higher levels of anxiety in mathematics than their native counterparts. For second-generation students, this is the case in Belgium, Denmark, France, Luxembourg, the Netherlands, New Zealand, Sweden, Switzerland and Macao-China. In countries where immigrant students report significantly higher levels of anxiety than native students, educators and administrators may need to pay particular attention to factors that may lead to this (see Table 4.7).

Not surprisingly, higher levels of anxiety in mathematics are generally associated with significantly lower scores in mathematics (see third panel in Figure 4.6). Among first-generation students, for every one unit (one standard deviation) increase in anxiety in mathematics the associated decline in student scores ranges from 18 score points in Austria to almost 49 score points in New Zealand. For second-generation students, the decrease ranges from just under 17 score points in Belgium to more than 50 score points in New Zealand. The strong association between anxiety in mathematics and performance coupled with the relatively high level of anxiety in mathematics among students in general, and the even higher levels experienced by immigrant students in a substantial number of countries, indicate a need for more policy focus in this area.

STUDENTS' ATTITUDES TOWARDS AND PERCEPTIONS OF SCHOOLS

This section moves beyond examining students' interests, beliefs and dispositions related to mathematics to a broader view of students' attitudes and perceptions of schools and examines whether these differ among immigrant and non-immigrant students. Students' *attitudes towards school* – the extent to which students perceive school as preparing them for life – will be explored in the first part of the section. Students with positive attitudes towards schooling are more likely to pursue their education beyond secondary school (OECD, 2003c). The second part of the section explores *students' sense of belonging at school*. A strong sense of belonging at school is a vital part of students' well-being during adolescence, as it is central to their daily experiences. Students who do not feel connected to school are at risk of a series of negative social and health outcomes, including school dropout, disruptive behaviour, school violence, substance use and emotional distress (Catalano, *et al.* 2004; Lonczak, *et al.* 2002). By exploring immigrant students' attitudes towards school and their sense of belonging it is possible to develop a broader understanding of how these non-academic school outcomes may differ across countries and among immigrant students within countries. In turn, the findings of the analyses will indicate whether it may be useful to pay particular attention to how immigrant students perceive their school experiences to help ensure their long-term success.

Figure 4.6 ■ Students' anxiety in mathematics by immigrant status



		I often worry that I it will be difficult for me in mathematics classes.	I get very tense when I have to do mathematics homework.	I get very nervous doing mathematics problems.	I feel helpless when doing a mathematics problem.	I worry that I will get poor marks in mathematics.	Percentage of explained variance in student performance
Australia	Native	53	29	21	20	57	12.9
	Second-generation	52	24	22	18	62	9.6
	First-generation	51	24	24	22	59	10.6
Austria	Native	56	29	22	23	42	10.0
	Second-generation	59	31	21	23	49	10.5
	First-generation	59	34	28	25	53	4.8
Belgium	Native	56	26	31	28	68	5.2
	Second-generation	67	42	40	36	72	2.6
	First-generation	59	36	36	34	70	7.5
Canada	Native	54	33	25	24	58	15.8
	Second-generation	57	32	33	23	60	17.2
	First-generation	49	30	30	21	56	16.8
Denmark	Native	33	25	14	16	39	26.6
	Second-generation	50	41	27	29	61	11.7
	First-generation	42	32	20	22	52	22.4
France	Native	60	52	38	36	74	5.8
	Second-generation	67	58	45	42	80	5.0
	First-generation	66	54	42	44	76	14.9
Germany	Native	52	29	23	22	46	10.7
	Second-generation	58	35	36	26	52	15.1
	First-generation	57	31	29	22	53	19.9
Luxembourg	Native	57	24	31	30	59	10.0
	Second-generation	60	42	36	35	67	9.0
	First-generation	59	37	35	30	65	9.1
Netherlands	Native	35	6	14	16	42	4.3
	Second-generation	48	9	25	19	58	2.6
	First-generation	46	16	33	27	53	7.8
New Zealand	Native	52	24	20	21	55	18.1
	Second-generation	61	27	30	29	63	22.1
	First-generation	48	23	22	23	55	21.9
Norway	Native	46	37	19	31	57	25.3
	Second-generation	49	44	22	30	60	16.5
	First-generation	57	46	38	36	72	26.8
Sweden	Native	30	13	10	16	45	19.6
	Second-generation	41	23	16	24	57	18.8
	First-generation	53	22	17	21	53	24.1
Switzerland	Native	46	25	17	24	45	9.3
	Second-generation	53	32	25	30	55	4.6
	First-generation	54	32	29	28	53	13.8
United States	Native	55	34	26	22	46	14.7
	Second-generation	57	27	26	22	51	20.5
	First-generation	59	35	30	30	55	17.7
OECD average	*Native*	*48*	*28*	*22*	*23*	*52*	*12.0*
	Second-generation	*57*	*34*	*30*	*28*	*62*	*9.7*
	First-generation	*54*	*31*	*29*	*26*	*58*	*12.9*
Hong Kong-China	Native	68	30	34	35	73	7.8
	Second-generation	68	30	32	35	71	1.1
	First-generation	69	26	32	33	71	5.9
Macao-China	Native	78	37	44	48	69	9.0
	Second-generation	66	32	40	36	63	12.7
	First-generation	60	23	30	26	56	4.8
Russian Federation	Native	57	38	32	24	72	15.7
	Second-generation	60	39	32	23	70	4.3
	First-generation	61	43	31	27	76	7.8

Source: OECD PISA 2003 database, Table 4.7.

Students' attitudes towards school

Education systems generally seek to provide children and adolescents not only with a strong foundation in terms of subject-related knowledge and skills, but also with a grounding for a smooth transition to adult life. As Figure 4.7 shows, the majority of students, including first-generation and second-generation students, report quite positive attitudes towards school. The index of attitudes towards school summarises the questions presented in the first panel of Figure 4.7. Across the OECD case countries, both first-generation and second-generation students report significantly higher levels of positive school perceptions compared to their native peers.

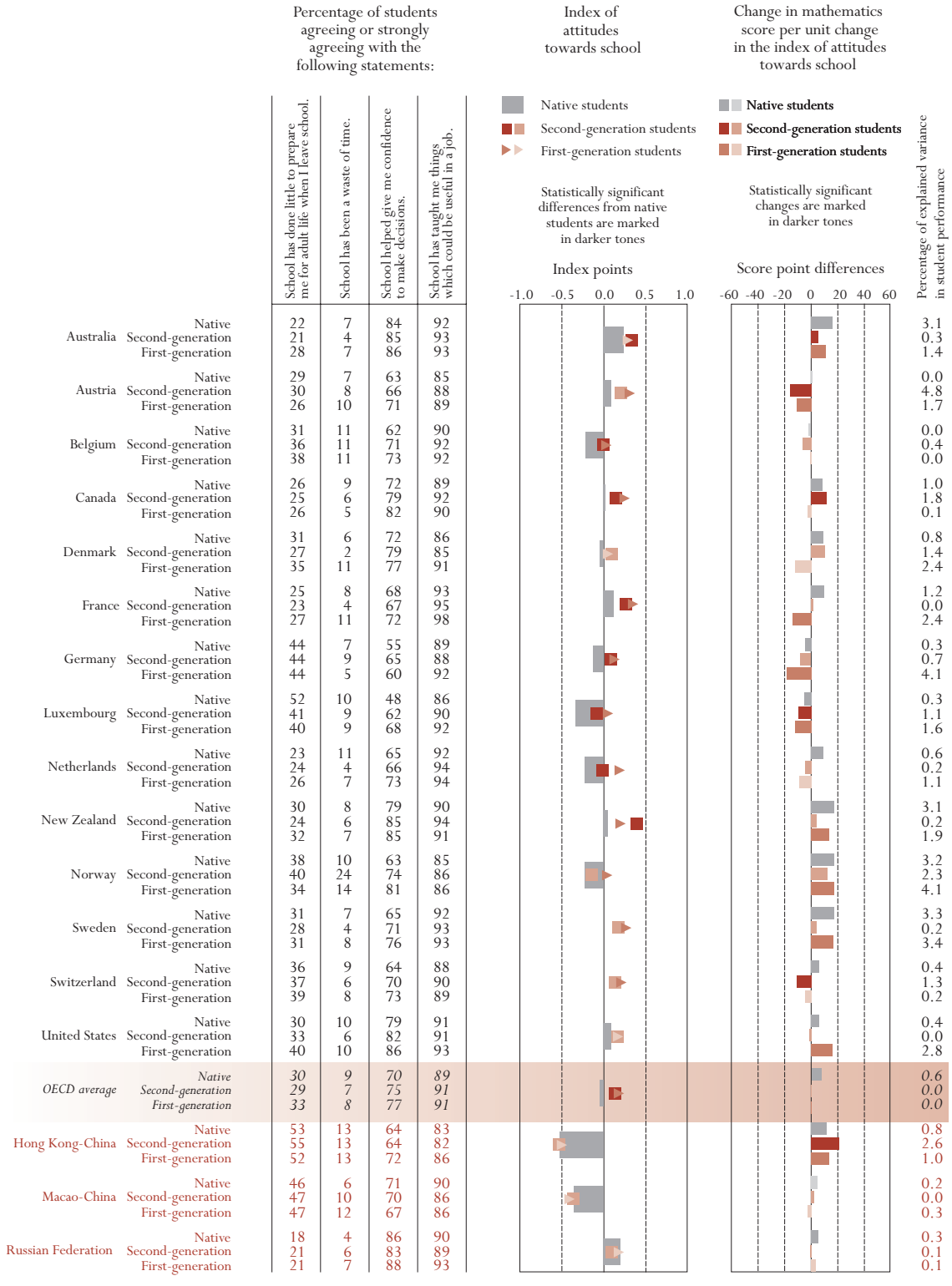
In examining sub-group differences at an international level, first-generation students in most of the OECD case countries report having more positive attitudes towards school. Only in a handful of case countries – Australia, Denmark, the United States, Hong Kong-China, Macao-China and the Russian Federation – are there no significant differences between first-generation and native students. In none of the 17 countries do first-generation or second-generation students have significantly less positive attitudes towards school. The number of countries where second-generation students report a significantly more positive attitude towards school than native students is smaller than when first-generation and native students are compared. More specifically in Australia, Belgium, Canada, France, Germany, Luxembourg, the Netherlands and New Zealand, second-generation students perceive school much more favourably. First-generation students report more positive attitudes towards school in all of the case countries except Australia, Denmark, New Zealand and the three partner countries. As with many other variables discussed in this chapter, first-generation students tend to have an even more positive attitude towards school than second-generation students (although, due to the relatively small sample sizes, the differences between first-generation and second-generation students are rarely statistically significant).

While it generally appears that immigrant students have similar or more positive attitudes towards school compared to their native peers, there is still a significant minority of students who report negative attitudes. There do not seem to be clear overall differences however in the percentage of immigrant and non-immigrant students reporting negative feelings towards school. For example, across OECD countries 33% of first-generation students agree or strongly agree with the statement "school has done little to prepare me for adult life when I leave school." This compares to 29% of second-generation students and 30% of native students. There is also a small but significant minority of students that agree that school has been a waste of time. This includes 8% of first-generation, 7% of second-generation and 9% of native students in the OECD case countries. While clear group differences between immigrant and non-immigrant students do not emerge, the small percentage of students who have strong negative perceptions of school should be of concern. These students may be at risk of other negative outcomes, including participating less in school activities, skipping class or dropping out. They may therefore need special attention to ensure that they will successfully complete school (OECD, 2003c). While there is no particular strong association between attitudes towards school and performance (see Figure 4.7), ensuring that students have a positive attitude towards school is valuable as it is closely related to dispositions necessary for lifelong learning (OECD, 2004a).

Sense of belonging at school

Another critical aspect of schooling is for students to feel that they belong at school. This can foster academic success by reducing barriers to learning as well as health and safety problems

Figure 4.7 ■ Students' attitudes towards school by immigrant status



Australia	Native	22	7	84	92	3.1
	Second-generation	21	4	85	93	0.3
	First-generation	28	7	86	93	1.4
Austria	Native	29	7	63	85	0.0
	Second-generation	30	8	66	88	4.8
	First-generation	26	10	71	89	1.7
Belgium	Native	31	11	62	90	0.0
	Second-generation	36	11	71	92	0.4
	First-generation	38	11	73	92	0.0
Canada	Native	26	9	72	89	1.0
	Second-generation	25	6	79	92	1.8
	First-generation	26	5	82	90	0.1
Denmark	Native	31	6	72	86	0.8
	Second-generation	27	2	79	85	1.4
	First-generation	35	11	77	91	2.4
France	Native	25	8	68	93	1.2
	Second-generation	23	4	67	95	0.0
	First-generation	27	11	72	98	2.4
Germany	Native	44	7	55	89	0.3
	Second-generation	44	9	65	88	0.7
	First-generation	44	5	60	92	4.1
Luxembourg	Native	52	10	48	86	0.3
	Second-generation	41	9	62	90	1.1
	First-generation	40	9	68	92	1.6
Netherlands	Native	23	11	65	92	0.6
	Second-generation	24	4	66	94	0.2
	First-generation	26	7	73	94	1.1
New Zealand	Native	30	8	79	90	3.1
	Second-generation	24	6	85	94	0.2
	First-generation	32	7	85	91	1.9
Norway	Native	38	10	63	85	3.2
	Second-generation	40	24	74	86	2.3
	First-generation	34	14	81	86	4.1
Sweden	Native	31	7	65	92	3.3
	Second-generation	28	4	71	93	0.2
	First-generation	31	8	76	93	3.4
Switzerland	Native	36	9	64	88	0.4
	Second-generation	37	6	70	90	1.3
	First-generation	39	8	73	89	0.2
United States	Native	30	10	79	91	0.4
	Second-generation	33	6	82	91	0.0
	First-generation	40	10	86	93	2.8
OECD average	*Native*	*30*	*9*	*70*	*89*	*0.6*
	Second-generation	*29*	*7*	*75*	*91*	*0.0*
	First-generation	*33*	*8*	*77*	*91*	*0.0*
Hong Kong-China	Native	53	13	64	83	0.8
	Second-generation	55	13	64	82	2.6
	First-generation	52	13	72	86	1.0
Macao-China	Native	46	6	71	90	0.2
	Second-generation	47	10	70	86	0.0
	First-generation	47	12	67	86	0.3
Russian Federation	Native	18	4	86	90	0.3
	Second-generation	21	6	83	89	0.1
	First-generation	21	7	88	93	0.1

Source: OECD PISA 2003 database, Table 4.8.

(Catalano *et al.*, 2004; Libbey, 2004; OECD, 2003c). This section explores immigrant and non-immigrant students' sense of belonging and how it compares to their native peers. One might expect this to be an area of particular concern for immigrant students, as first-generation students and second-generation students come from different cultural backgrounds and may therefore find it more challenging to feel like they belong in the schools of the receiving country.

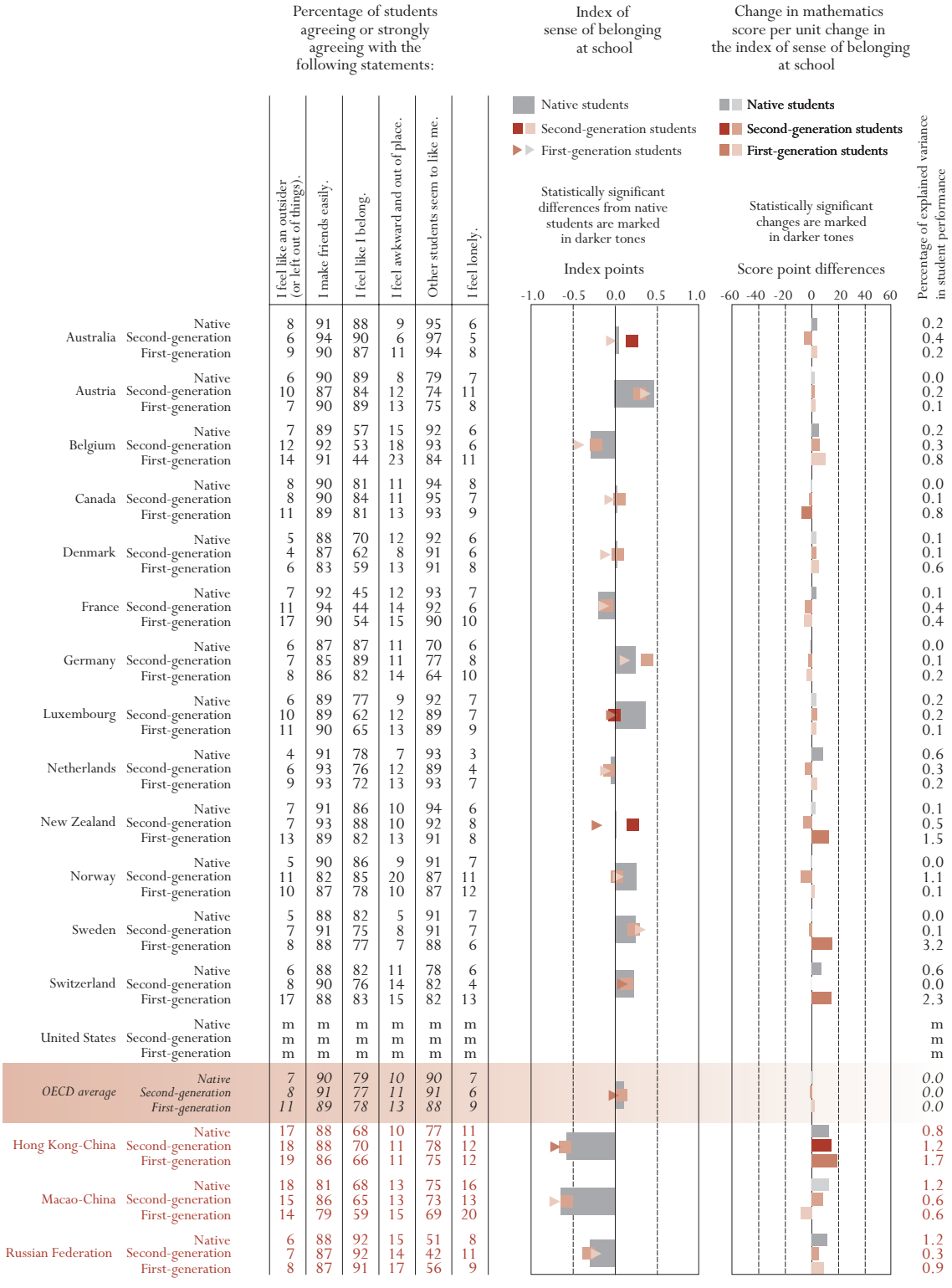
In PISA 2003 the majority of 15-year-old students responded positively to a series of questions related to sense of belonging at school. Across the OECD case countries, 78% of first-generation students, 77% of second-generation students and 79% of native students agree or strongly agree that they feel their school is a place where they belong. The percentages are even higher when students are asked about their interactions with other students. For example, 89% of first-generation students, 91% of second-generation students and 90% of native students agree or strongly agree with the statement indicating that they make friends easily.

At the same time, however, it appears that there is a substantial minority of students who feel lonely and left out and a slightly higher percentage of first-generation students who report having such feelings. For example, 11% of first-generation students and 8% of second-generation students report that they feel like an outsider or left out of things, while only 7% of native students report having these feelings. A similar trend appears in students' responses to feeling awkward and out of place (see the first panel of Figure 4.8).

As with the other variables described in this chapter, an index of sense of belonging at school summarises students' responses to the individual questions. Across the OECD case countries, first-generation students report significantly lower levels of sense of belonging than their native peers. This difference is substantively quite small, just over one-tenth of a standard deviation. There are no significant differences between second-generation and first-generation students. Across countries, first-generation and second-generation students' responses tend to be similar to the sense of belonging of native students in the individual countries *i.e.* if native students' sense of belonging is relatively high, immigrant students' sense of belonging is also relatively high. For example, in countries like Austria and Sweden, where native students tend to report relatively high levels of sense of belonging in comparison to the other case countries, first-generation and second-generation students also tend to have comparatively high levels of sense of belonging. Luxembourg is an exception to this trend. Native students in Luxembourg report a sense of belonging that is a quarter of a standard deviation higher than the OECD average, yet second-generation and first-generation students report feelings of belonging that are similar to the OECD averages for these groups.

In most of the case countries, there are no significant differences between immigrant and non-immigrant students in the extent to which they report feeling a sense of belonging at school, although immigrant students' responses tend to be less positive. There are, however, notable exceptions. In two countries, Australia and New Zealand, second-generation students report having a much higher sense of belonging than their native peers. In contrast, first-generation students in Luxembourg, New Zealand, Switzerland and Hong Kong-China report having a significantly lower sense of belonging than their native peers. This is also the case for second-generation students in Luxembourg. In these countries, focusing on helping immigrant students feel more like they belong at school may help indirectly to reduce the learning differences and also reduce possible behavioural problems (OECD, 2003c; OECD, 2004a). Furthermore, in countries where sense of belonging is

Figure 4.8 ■ Students' sense of belonging at school by immigrant status



Australia	Native	8	91	88	9	95	6	0.2
	Second-generation	6	94	90	6	97	5	0.4
	First-generation	9	90	87	11	94	8	0.2
Austria	Native	6	90	89	8	79	7	0.0
	Second-generation	10	87	84	12	74	11	0.2
	First-generation	7	90	89	13	75	8	0.1
Belgium	Native	7	89	57	15	92	6	0.2
	Second-generation	12	92	53	18	93	6	0.3
	First-generation	14	91	44	23	84	11	0.8
Canada	Native	8	90	81	11	94	8	0.0
	Second-generation	8	90	84	11	95	7	0.1
	First-generation	11	89	81	13	93	9	0.8
Denmark	Native	5	88	70	12	92	6	0.1
	Second-generation	4	87	62	8	91	6	0.1
	First-generation	6	83	59	13	91	8	0.6
France	Native	7	92	45	12	93	7	0.1
	Second-generation	11	94	44	14	92	6	0.4
	First-generation	17	90	54	15	90	10	0.4
Germany	Native	6	87	87	11	70	6	0.0
	Second-generation	7	85	89	11	77	8	0.1
	First-generation	8	86	82	14	64	10	0.2
Luxembourg	Native	6	89	77	9	92	7	0.2
	Second-generation	10	89	62	12	89	7	0.2
	First-generation	11	90	65	13	89	9	0.1
Netherlands	Native	4	91	78	7	93	3	0.6
	Second-generation	6	93	76	12	89	4	0.3
	First-generation	9	93	72	13	93	7	0.2
New Zealand	Native	7	91	86	10	94	6	0.1
	Second-generation	7	93	88	10	92	8	0.5
	First-generation	13	89	82	13	91	8	1.5
Norway	Native	5	90	86	9	91	7	0.0
	Second-generation	11	82	85	20	87	11	1.1
	First-generation	10	87	78	10	87	12	0.1
Sweden	Native	5	88	82	5	91	7	0.0
	Second-generation	7	91	75	8	91	7	0.1
	First-generation	8	88	77	7	88	6	3.2
Switzerland	Native	6	88	82	11	78	6	0.6
	Second-generation	8	90	76	14	82	4	0.0
	First-generation	17	88	83	15	82	13	2.3
United States	Native	m	m	m	m	m	m	m
	Second-generation	m	m	m	m	m	m	m
	First-generation	m	m	m	m	m	m	m
OECD average	*Native*	*7*	*90*	*79*	*10*	*90*	*7*	*0.0*
	Second-generation	*8*	*91*	*77*	*11*	*91*	*6*	*0.0*
	First-generation	*11*	*89*	*78*	*13*	*88*	*9*	*0.0*
Hong Kong-China	Native	17	88	68	10	77	11	0.8
	Second-generation	18	88	70	11	78	12	1.2
	First-generation	19	86	66	11	75	12	1.7
Macao-China	Native	18	81	68	13	75	16	1.2
	Second-generation	15	86	65	13	73	13	0.6
	First-generation	14	79	59	15	69	20	0.6
Russian Federation	Native	6	88	92	15	51	8	1.2
	Second-generation	7	87	92	14	42	11	0.3
	First-generation	8	87	91	17	56	9	0.9

Source: OECD PISA 2003 database, Table 4.9.

low across all immigrant sub-groups, special attention should be paid to raising all students' sense of belonging at school. While there may be only limited direct associations between sense of belonging and mathematics performance (see Figure 4.8), feeling connected to school is essential for students' long-term well-being and an important disposition for successful learning (OECD, 2003c).

SUMMARY OF DIFFERENCES BETWEEN IMMIGRANT AND NON-IMMIGRANT STUDENTS IN LEARNING CHARACTERISTICS

This section summarises the differences in learning characteristics between immigrant and non-immigrant students. Figure 4.9 and Table 4.10 show the results for each variable presented in this chapter. All results are expressed as effect sizes (*i.e.* estimates to the degree to which student groups differ) so that the results may be compared across the available measures and countries. As in other

Figure 4.9 ■ **Summary of main differences in learner characteristics by immigrant status**

Characteristics (based on index variable for each characteristic)	Number of OECD countries with significant differences between immigrant and native students for each variable	Average effect size across OECD countries[1]
Interest in mathematics	Second-generation *stronger* in 9 countries	**0.16**
	First-generation *stronger* in 14 countries	**0.32**
Instrumental motivation	Second-generation *stronger* in 10 countries	0.14
	First-generation *stronger* in 12 countries	**0.25**
Self-concept in mathematics	Second-generation *stronger* in 1 country and *weaker* in 1 country	0.01
	First-generation *stronger* in 6 countries	**0.16**
Self-efficacy in mathematics	Second-generation *stronger* in 1 country and *weaker* in 6 countries	**-0.06**
	First-generation *stronger* in 3 countries and *weaker* in 5 countries	-0.01
Anxiety related to mathematics	Second-generation *weaker* in 9 countries	**-0.24**
	First-generation *weaker* in 8 countries	**-0.11**
Attitudes towards school	Second-generation *stronger* in 8 countries	**0.17**
	First-generation *stronger* in 11 countries	**0.23**
Sense of belonging at school	Second-generation *stronger* in 2 countries and *weaker* in 1 country	-0.02
	First-generation *weaker* in 3 countries	**-0.09**

1. Positive scores = immigrant students higher; negative scores = native students higher. Graph based on Figure 4.5 in OECD 2003b. Native students are considered stronger on the anxiety measure, because they report less anxiety than immigrant students on average across the OECD case countries. Numbers in bold indicate significant differences between native students and the immigrant subgroup across OECD countries. As noted earlier, for the effect size to be meaningful it must be greater than 0.20.

Source: OECD PISA 2003 database, Table 4.10.

PISA reports, an effect size of 0.20 is used as a benchmark to indicate differences that may be considered important for policy makers. A striking finding is that in many countries immigrant students report having similar or even more positive learning characteristics. This trend is very different from the one that emerges when examining performance (see Chapters 2 and 3), where significant gaps between immigrant and non-immigrant students are found in almost every country.

Figure 4.9 indicates that of the three sub-groups, first-generation students tend to report the highest levels of non-achievement learning outcomes. Considering the 14 OECD countries in this report, first-generation students report higher levels of interest in mathematics in all 14 countries, higher levels of instrumental motivation in 12 countries, and higher levels of self-concept in 6 countries. First-generation students also report more positive attitudes towards school than their native peers in 11 countries. The average effect size across the OECD countries is greater than 0.20 for all of the variables noted above, except self-concept in mathematics. These findings suggest that first-generation students report at least similar if not stronger learning dispositions than their native peers in the majority of non-achievement outcomes measured in PISA 2003.

Second-generation students also tend to show stronger dispositions towards learning compared to native students, but these differences are smaller than those between first-generation and native students. Furthermore, there are fewer countries where the differences between second-generation and native students are significant. Again, considering the 14 OECD countries in this report, second-generation students in 9 countries report higher levels of interest in mathematics, in 10 countries they report higher levels of instrumental motivation and in 8 countries they report more positive attitudes towards school. The results are very different for self-concept and sense of belonging: second-generation students report higher levels in one and two OECD countries respectively and native students report higher levels in one OECD country. The average effect size across countries does not reach 0.20 for any of the variables, although this masks variation across countries. In many countries, the effect sizes for second-generation students on several variables is greater than 0.20. For example, the effect size for interest in mathematics is at least 0.20 in Australia, Belgium, Canada, Germany, the Netherlands, New Zealand, Norway and the United States (see Table 4.10). These findings indicate that in many countries second-generation students also report stronger non-achievement outcomes, but that these students are more similar to their native peers than first-generation students. The overall results seem to support hypotheses related to immigrant optimism and assimilation with first-generation students reporting the highest levels of interest and motivation. Among second-generation students, the levels of interest and motivation are lower and more similar to levels reported by native students.

There are two learning characteristics that do not fit this trend: self-efficacy in mathematics and anxiety related to mathematics. These two variables are also more strongly associated with performance than the other learning characteristics presented in the chapter (see Figures 4.5 and 4.6). Immigrant students in a considerable number of the OECD case countries report less positive values on these two characteristics (*i.e.* lower values for self-efficacy and higher values for anxiety). In the case of self-efficacy (as measured by questions about specific mathematics problems), this is of a less relative nature than some of the other measures. The intra-class correlation of these measures indicates that while there are only very low levels of variation between schools for most of the measures, self-efficacy does vary greatly between schools, and especially in the more differentiated school systems (see Table 3.15, p. 381 in OECD, 2004a).

This may mean that in school systems where immigrant students tend to be in the lower level school tracks, they may have less exposure to the mathematics curriculum necessary to feel confident about particular mathematics problems.

Native students report higher levels of self-efficacy than first-generation students in five of the OECD case countries and higher levels than second-generation students in six OECD countries. The average effect size across the OECD case countries is small, but this once again masks a pattern of country results where the effect size may be of concern to educators and policy makers. Among first-generation students, the effect size in absolute terms is greater than 0.20 in Austria, Luxembourg and Switzerland. This indicates that first-generation students have substantively lower levels of self-efficacy than native students in these countries. Second-generation students in Austria, Germany, Luxembourg and Switzerland also report substantively lower levels of self-efficacy than their native peers (see Table 4.10). These are the countries with some of the largest gaps in mathematics performance. While these immigrant students report high levels of motivation and interest in mathematics, in terms of confidence in their ability to solve mathematics tasks (and in their performance on the mathematics assessment) they fall short of their native peers.

First-generation and second-generation students also tend to report more anxiety in mathematics than their native peers. First-generation students report higher levels of anxiety in eight of the OECD case countries and second-generation students report higher levels in nine OECD countries. The average effect size across the OECD countries is 0.11 for first-generation students and greater than 0.20 for second-generation students. Among first-generation students the effect sizes are greater than 0.20 in Denmark, the Netherlands, Norway, Sweden and Switzerland. For second-generation students, this is the case in Belgium, Denmark, France, Luxembourg, the Netherlands, New Zealand, Sweden and Switzerland. Again, this may indicate that additional attention needs to be paid to lessening the anxiety that immigrant students experience in these countries. This may be beneficial for students' learning of mathematics in the long-term and for reducing the gap in achievement differences.

Furthermore, of the three sub-groups, second-generation students tend to report the lowest levels of self-efficacy and the highest levels of anxiety. These findings may support previous research indicating that second-generation students may have less positive non-achievement outcomes than first-generation students. These results indicate that schools and educators may need to pay special attention to raising second-generation students' self-efficacy in mathematics or reducing their mathematics anxiety, as this may lead to more positive outcomes for these students. This is especially the case in countries where second-generation students have substantively poorer outcomes in these areas. Further research could provide additional insight as to why these students report lower levels of non-achievement outcomes, as well as offer specific suggestions on ways of raising their levels.

It is also useful to move beyond individual characteristics to explore how first-generation and second-generation students compare to native students across the range of learning characteristics. Figure 4.10 summarises the results in each country related to significant differences between immigrant and native students on the seven learning and attitudinal characteristics included in this chapter. A general trend emerges across all of the case countries included in this study – there is not a single country where native students have higher scores than first-generation students on a majority of learning and school perception characteristics. This is also the case when second-generation and

Figure 4.10 ■ **Differences in learning characteristics between immigrant and native students by country**

Significant differences in seven reported learning characteristics compared to native students

	First-generation students			Second-generation students	
	Significantly HIGHER scores	Significantly LOWER scores		Significantly HIGHER scores	Significantly LOWER scores
Canada	5	0	Australia	6	0
New Zealand	5	1	New Zealand	5	0
Luxembourg	5	2	Belgium	4	0
Switzerland	5	2	Netherlands	4	0
Australia	4	0	Germany	4	1
Germany	4	1	Luxembourg	4	2
Netherlands	4	0	Canada	3	0
Sweden	4	0	France	3	1
Austria	4	1	Sweden	2	0
Belgium	4	1	Switzerland	2	1
France	3	0	Macao-China	1	1
Norway	3	0	Norway	1	0
Macao-China	2	1	United States	1	0
United States	2	0	Hong Kong-China	1	0
Denmark	2	0	Denmark	1	2
Hong Kong-China	1	2	Austria	0	1
Russian Federation	0	0	Russian Federation	0	0

Note: Countries are ranked in descending order of significantly higher scores on learning characteristics for first-generation and second-generation students.
Source: OECD PISA 2003 database, Table 4.10.

native students are compared. Given the relative differences in performance, it is encouraging to see that immigrant students generally do not report weaker learning characteristics than their native peers and in many cases may even report stronger learning characteristics.

In addition, distinctive patterns for each immigrant sub-group emerge. The left panel of Figure 4.10 shows that first-generation students in 10 OECD countries – Australia, Austria, Belgium, Canada, Germany, Luxembourg, New Zealand, the Netherlands, Sweden and Switzerland – report stronger dispositions for at least four of the seven characteristics. As with many areas explored in this report, first-generation students in the three settlement countries of Australia, Canada and New Zealand show very strong learning characteristics. More surprisingly though, in some of the countries with relatively large performance differences – Germany, Luxembourg and Switzerland – first-generation students also report higher levels for the majority of learning characteristics. In these countries, schools may want to consider focusing on programmes that build on these students' strong learning dispositions while trying to lessen the negative differences (such as high levels of anxiety in mathematics).

In six of the case countries – Australia, Belgium, Germany, Luxembourg, the Netherlands and New Zealand – second-generation students show more positive learning dispositions for a majority of the characteristics. Overall there appear to be fewer significant differences between second-generation and native students than between first-generation and native students. Yet when there are differences, second-generation students tend to show more positive dispositions than native

students. For example, second-generation students report significantly more positive levels for at least three of seven learning characteristics in half of the OECD case countries. As was the case for first-generation students, even in countries where there are large performance gaps between second-generation and native students, these gaps are not mirrored in other learning characteristics.

CONCLUSIONS

This chapter examined differences among first-generation, second-generation and native students on non-achievement learning outcomes. A series of findings emerged that may be of particular relevance to schools and policy makers:

(a) First-generation and second-generation students generally report similar or higher levels of non-achievement outcomes compared to their native peers. Among the three sub-groups, first-generation students tend to report the strongest learning dispositions. These findings strikingly contrast the previous chapters related to performance outcomes. First-generation and second-generation students generally report higher levels of interest and motivation in mathematics and more positive attitudes towards schooling. Furthermore, immigrant students also have very high educational expectations. First-generation students report the strongest learning characteristics which may reflect optimism associated with immigration. Second-generation students appear to have assimilated to some extent, but still often report more positive learning characteristics than their native peers.

(b) First-generation and second-generation students are much more likely than native students to report that they expect to complete a university programme, especially after accounting for student background and performance. Immigrant students have high expectations for themselves, which corresponds with the high levels of interest and motivation described in (a). Despite the challenges of being in a new country and education system, these students report that they are motivated and expect to succeed.

(c) In many countries, first-generation and second-generation students report much lower levels of self-efficacy in mathematics and higher levels of anxiety in mathematics. Of the three sub-groups, second-generation students report the lowest levels of self-efficacy and the highest levels of anxiety. Self-efficacy and anxiety do not follow the general pattern described in (a) and (b). More negative outcomes for these two characteristics tend to occur in countries with relatively large performance gaps between immigrant and non-immigrant students. Furthermore, while immigrant students in these countries may have high levels of motivation and interest, they do not have as much confidence in their ability to solve mathematics tasks and experience more anxiety when performing mathematics tasks. This may indicate that although immigrant students tend to be interested and motivated in mathematics, they realistically assess that they have problems in the subject and in turn report lower levels of confidence and higher levels of anxiety in mathematics.

Based on the results in this chapter, a comparatively positive picture emerges for the situation of first-generation and second-generation students in terms of their learning characteristics and attitudes towards schooling. Despite often facing many challenges, such as coming from more disadvantaged backgrounds, speaking a different language in school than at home or being in an unfamiliar school environment, immigrant students do not generally report lower levels of positive learning characteristics. In fact, they often reported more positive learning characteristics than

those of their native peers. These findings may point to areas where schools and policy makers could develop additional programmes to seek to reduce achievement gaps by making use of immigrant students' enthusiasm to learn. In some countries where first-generation and second-generation students' self-reports are comparatively less favourable for specific characteristics, such as lower levels of self-efficacy in mathematics, weaker sense of belonging at school or higher levels of anxiety in mathematics, schools and teachers may need to pay additional attention to reducing differences in these essential non-achievement outcomes. This could prove beneficial not only for immigrant students' potential to learn throughout life, but also for helping to increase their level of achievement.

Notes

1 The authors would like to thank Cordula Artelt for her advice in developing this chapter. In addition, we used the OECD report *Learners for Life: Student Approaches to Learning: Results from PISA 2000* by Artelt, Baumert, McElvany, and Peschar (OECD, 2003b) and Chapter 3 of *Learning for Tomorrow's World* (OECD, 2004a) as a framework for exploring relationships among immigrant status, motivation and achievement.

READER'S GUIDE

Data underlying the figures

The data referred to in Chapters 1, 2, 3, and 4 of this report are presented in Annex B. In these tables, as well as in data tables included in Chapter 5, the following symbols are used to denote missing data:

a The category does not apply in the country concerned. Data are therefore missing.

c There are too few observations to provide reliable estimates (*i.e.* there are fewer than 3% of students for this cell or too few schools for valid inferences). However, these statistics were included in the calculation of cross-country averages.

m Data are not available. These data were collected but subsequently removed from the publication for technical reasons.

n Data are negligible *i.e.* they do not occur in any significant numbers.

w Data have been withdrawn at the request of the country concerned.

Calculation of the OECD average

An OECD average was calculated for most indicators presented in this report. The OECD average takes the OECD countries as a single entity, to which each country contributes with equal weight. The OECD average corresponds to the arithmetic mean of the respective country statistics and for this report only applies to the selection of OECD *case countries* (see definition below).

Rounding of figures

Because of rounding, some figures in tables may not exactly add up to the totals. Totals, differences and averages are always calculated on the basis of exact numbers and are rounded only after calculation. When standard errors in this publication have been rounded to one or two decimal places and the value 0.0 or 0.00 is shown, this does not imply that the standard error is zero, but that it is smaller than 0.05 or 0.005 respectively.

Reporting of student data

The report uses "15-year-olds" as shorthand for the PISA target population. In practice, this refers to students who were aged between 15 years and 3 (complete) months and 16 years and 2 (complete) months at the beginning of the assessment period and who were enrolled in an educational institution, regardless of the grade level or type of institution, and of whether they were attending full-time or part-time.

Abbreviations used in this report

The following abbreviations are used in this report:

ESCS Index of economic, social and cultural status (see Annex A1 for definition)

HISEI Highest international socio-economic index of occupational status (corresponds to the highest occupational status of either the mother or father)

ISCED International Standard Classification of Education (the ISCED levels are explained in Annex A1)

SE Standard error

SD Standard deviation

SOPEMI *Système d'Observation Permanente des Migrations* (Continuous Reporting System on Migration). This was established in 1973 by the OECD to provide its European member states a mechanism for sharing of information on international migration.

Terminology used in this report

Native students or non-immigrant students: Students with at least one parent born in the country of assessment. Students born in the country who have one foreign-born parent (children of "combined" families) are included in the native category, as previous research indicates that these students perform similarly to native students.

Immigrant students: This group includes both *first-generation students* and *second-generation students* (see definitions below).

First-generation students: Students born outside of the country of assessment whose parents are also foreign-born.

Second-generation students: Students born in the country of assessment with foreign-born parents.

Case countries: This includes the 17 countries covered in this report. Fourteen OECD countries: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Luxembourg, the Netherlands, New Zealand, Norway, Sweden, Switzerland and the United States; as well as three partner countries: Hong Kong-China, Macao-China and the Russian Federation.

Further documentation

For further information on the PISA assessment instruments and the methods used in PISA, see the *PISA 2003 Technical Report* (OECD, 2005) and the PISA Web site (*www.pisa.oecd.org*).

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